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Capacidade de absorção e processos organizacionais de gestão do conhecimento: relações com a inovação

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Resumo Alargado

A presente tese de doutoramento, em Psicologia (do trabalho e das organizações), apresenta um trabalho realizado em formato de articulação de artigos científicos, pretendendo responder a objetivos gerais de investigação relacionados com a exploração e análise, teórica e empírica, das relações existentes entre a capacidade de absorção (do conhecimento), processos chave de gestão do conhecimento e a inovação organizacional. Adicionalmente, investiga e analisa, teórica e empiricamente, a dimensionalidade do constructo de capacidade de absorção.

Os capítulos teóricos desenvolvidos permitiram a criação de um modelo sinóptico, reforçando a ligação entre processos de gestão do conhecimento e fases da capacidade de absorção e enquadrando a inovação organizacional enquanto consequente de processos chave de gestão do conhecimento e da capacidade organizacional de adquirir conhecimento externamente e aplicá-lo para fins comerciais, isto é, a sua capacidade de absorção.

Cento e onze respondentes, de diferentes organizações, pertencentes a dez setores de atividade, participaram num inquérito por questionário *online* que recolheu dados sociodemográficos do respondente e da empresa, aplicando ainda uma escala de capacidade de absorção, instrumentos de avaliação de processos de gestão do conhecimento – nomeadamente: aquisição, partilha, armazenamento e criação do conhecimento – e uma escala de inovação organizacional.

Os resultados, apresentados em dois capítulos empíricos, demonstram que, nas empresas estudadas, os processos organizacionais de aquisição e partilha do conhecimento reforçam a capacidade de absorção e a criação de novo conhecimento. A partilha de conhecimento, intraorganizacional, potencia ainda a inovação organizacional, sendo esta relação mediada pela criação interna de novo conhecimento, variável que se apresenta como o mais forte preditor da inovação organizacional na amostra analisada. Considerando os primeiros resultados alcançados e procurando conhecer em maior detalhe as variáveis que podem promover a criação interna de novo conhecimento, foi testado um modelo onde a capacidade potencial de absorção, o processo de armazenamento do conhecimento e a capacidade efetiva de absorção são estudados na sua inter-relação. A análise realizada demonstrou que o armazenamento do conhecimento e a capacidade efetiva de absorção das organizações, isto é, a capacidade de transformarem e aplicarem conhecimento previamente adquirido e assimilado,

influenciam positivamente a criação de novo conhecimento, representando, ainda, de forma individual e conjunta, um papel mediador entre a capacidade potencial de absorção do conhecimento e a criação interna de novo conhecimento.

Conclusões e considerações finais são elaboradas e apresentadas, refletindo-se sobre as implicações teóricas (para a investigação em psicologia do trabalho e das organizações) e práticas (para o psicólogo do trabalho e das organizações) da tese apresentada, bem como acerca das suas limitações.

Palavras-Chave

Capacidade de absorção; gestão do conhecimento; inovação organizacional; criação de conhecimento; partilha de conhecimento.

Extended Abstract

The present doctoral thesis, written in the field of work and organizational psychology, merges theoretical and empirical scientific papers, and aims to answer to research goals related with the theoretical and empirical exploration and analysis of the existent relationships between absorptive capacity, key knowledge management processes and organizational innovation. Moreover, the present work analyzes, both theoretically and empirically, the absorptive capacity's construct dimensionality.

The developed theoretical chapters allowed the creation of an integrative model, strengthening the link between knowledge management processes and the phases of absorptive capacity as well as framing organizational innovation as a consequent of key knowledge processes and the organizational capability of acquiring external knowledge and apply it to commercial ends, that is, its absorptive capacity.

One hundred eleven respondents, from different organizations, from ten activity sectors, participated on an online survey that collected sociodemographic data of the key informant and the corresponding company. An absorptive capacity scale, as well as instruments to assess knowledge management processes – namely the key processes of acquisition, sharing, storage and documentation, and knowledge creation – and an organizational innovations scale were applied.

The results, presented on the two empirical chapters, show that, on the surveyed companies, the organizational processes of knowledge acquisition and knowledge sharing reinforce absorptive capacity and new knowledge creation. Intra-organizational knowledge sharing also potentiates organizational innovation, though the mediating role of internal knowledge creation, variable that appears to be the strongest predictor of organizational innovation on the analyzed sample. Considering the results presented on chapter three and searching for more detailed knowledge on the variables that can promote internal knowledge creation, a model that reflects the interrelationships between potential absorptive capacity, the process of knowledge storage, and realized absorptive capacity was tested.

The analysis showed that knowledge storage and the organizations' realized absorptive capacity, that is, its ability to transform an apply previously acquired and assimilated knowledge, positively

influence new knowledge creation and both, individually and conjointly, play a mediating role between potential absorptive capacity and the internal creation of new knowledge.

Conclusions and final considerations are presented, with reflections about theoretical (for work and organizational psychology research) and practical (for the work and organizational psychologist) implications of the thesis, as well as its limitations.

Keywords

Absorptive capacity; knowledge management; organizational innovation; knowledge creation; knowledge sharing.

Índice

Lista de Figuras

Lista de Tabelas

Introdução

Capítulo 1

Capítulo 2

Capítulo 3

Capítulo 4

Lista de Acrónimos

ACAP	Absorptive Capacity
AFIA	Associação de Fabricantes para a Indústria Automóvel
ANEME	Associação Nacional das Empresas Metalúrgicas e Eletromecânicas
Anetie	Associação Nacional das Empresas das Tecnologias de Informação e Eletrónica
ANIPC	Associação Nacional dos Industriais de Papel e Cartão
APEQ	Associação Portuguesa das Empresas Químicas
APICCAPS	Associação Portuguesa dos Industriais de Calçado, Componentes, Artigos de Pele e seus Sucedâneos
APIP	Associação Portuguesa da Indústria de Plásticos
ATP	Associação Têxtil e Vestuário de Portugal
AVE	Average Variance Extracted
CEFAMOL	Associação Nacional da Indústria de Moldes.
I&D	Investigação e Desenvolvimento
KMP	Knowledge Management Processes
LVS	Latent Variable Scores
PACAP	Potential Absorptive Capacity
PLS-SEM	Partial Least Squares Structural Equation Modeling
R&D	Research and Development
RACAP	Realized Absorptive Capacity
SPSS	Statistical Package for the Social Sciences
VIF	Variance Inflation Factor

Introdução Geral

Âmbito temático e objetivos gerais

A presente tese de doutoramento em Psicologia, realizada na área de psicologia do trabalho e das organizações, insere-se numa linha de investigação que estuda o conhecimento nas e das organizações (e processos específicos associados a este) e a capacidade de absorção, perspetivada como uma capacidade dinâmica das organizações, enquanto antecedentes (potenciais) da inovação organizacional. Nesse âmbito temático, segue uma abordagem dos modelos cognitivos no estudo das organizações (e.g., Nobre, Tobias, & Walker, 2016) - privilegiando uma abordagem interpretativa fundamentada na gestão do conhecimento - na qual a capacidade de absorção e o conhecimento são perspetivados como fatores críticos para a inovação organizacional (cf. Lam, 2005; Mumford, Hunter, & Byrne, 2009). Na relação entre a capacidade de absorção, processos de gestão do conhecimento e a inovação, a presente tese segue a premissa de Lane, Koka e Pathak (2006), que consideram, ao nível dos resultados da capacidade de absorção, não apenas os fins comerciais, mas também resultados associados à criação de novo conhecimento (novo conhecimento – geral, científico, técnico e organizacional - desenvolvido).

Realizada no formato de articulação de artigos científicos[1], a tese encontra-se escrita em língua portuguesa e inglesa, no caso da última, sempre que se trate de conteúdo submetido e/ou aceite para publicação em periódicos científicos internacionais e livros de *proceedings* de congressos científicos. O trabalho que aqui se apresenta, contendo diversos objetivos específicos, explicitados ao longo dos capítulos que o constituem, procura encontrar elementos de análise e resposta a questões gerais de investigação, que se encontram vertidas nos seguintes objetivos gerais:

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[1]Como previsto na alínea b), ponto 2. do Artigo 7º do Regulamento do 3º ciclo de estudos conducente ao grau de doutor em psicologia na Universidade da Beira Interior. O ponto 3. do referido Artigo 7º acrescenta que "O formato b de tese deverá constituir um conjunto articulado e coerente de, pelo menos, dois artigos científicos elaborados no âmbito do tema/plano de trabalhos, completado por enquadramento e discussão globais e originais, publicados, aceites para publicação, submetidos ou prontos a submeter em revistas com revisão por pares, podendo ser realizados em coautoria, se bem que o/a doutorando/a tenha que ser sempre o/a primeiro/a autor/a;".

- Explorar e analisar, teoricamente, a relação existente, na literatura científica, entre a capacidade de absorção, processos de gestão do conhecimento, e a inovação (Capítulo 1).
- Explorar, rever e sistematizar, teoricamente, a relação existente, na literatura científica, entre processos chave de gestão do conhecimento e a inovação organizacional (Capítulo 2).
- Analisar, empiricamente, a relação existente entre processos chave de gestão do conhecimento, a capacidade de absorção, e a inovação organizacional, numa amostra de empresas portuguesas (Capítulo 3).
- Analisar, empiricamente, a relação existente entre processos chave de gestão do conhecimento e a capacidade de absorção, potencial e efetiva, numa amostra de empresas portuguesas (Capítulo 4).

No seguimento dos objetivos gerais definidos, o presente trabalho visa, assim, integrar, conceptualmente, e testar, empiricamente, um modelo que considere as inter-relações potencialmente existentes entre os processos de aquisição, partilha, armazenamento/documentação e criação do conhecimento com a capacidade de absorção, tanto em modelos em que esta última é considerada como um fator de segunda ordem (que engloba as fases de aquisição, assimilação, transformação e aplicação) como em modelos nos quais se considere que a capacidade de absorção representa um constructo observável através de duas capacidades distintas: a capacidade potencial (que compreende as fases de aquisição e assimilação) e a capacidade efetiva (que engloba as fases de transformação e aplicação) de absorção do conhecimento.

Teoricamente, analisa-se e debate-se a (eventual) sobreposição conceptual entre a capacidade de absorção e processos de gestão do conhecimento, confluindo estas relações num modelo teórico que procura posicionar os processos de gestão de conhecimento enquanto antecedentes, mediadores e consequentes da capacidade de absorção, quer na sua vertente unidimensional de segunda ordem, quer na visão que compreende a diferenciação entre uma capacidade potencial e uma capacidade efetiva de absorção. A dimensionalidade do constructo da capacidade de absorção constitui-se, assim, como um tema presente e transversal, tanto aos capítulos teóricos como empíricos da presente tese. O explorar das relações entre a capacidade de absorção e processos organizacionais de gestão do conhecimento representa uma resposta e contributo da presente tese para uma necessidade e lacuna de investigação reconhecida e sinalizada na literatura de gestão do conhecimento (cf. Mariano &

Walter, 2015).

Como variável tida como consequente, comum aos processos associados ao conhecimento organizacional e à capacidade de absorção, a inovação organizacional é perspetivada no presente trabalho de investigação como um (potencial) resultado organizacional, que se caracteriza pela introdução ou melhoria significativa de novos produtos e/ou serviços, processos de produção, estratégias de gestão e estratégias de marketing. Esta (potencial) relação com a inovação organizacional representa, assim, um dos pontos considerados de maior inovação na presente tese, procurando-se explorar uma oportunidade de investigação identificada, na medida em que raramente os trabalhos no âmbito da cognição organizacional têm sido, explicitamente, relacionados com a temática da inovação (Lam, 2005).

Quando considerada a inovação organizacional e os processos anteriormente referidos, bem como a capacidade de absorção, é de referir que o modelo desenvolvido contemplará processos de índole intraorganizacional (como a partilha, armazenamento e criação do conhecimento) assim como interorganizacional (como a aquisição externa de novo conhecimento e a capacidade de absorção). Já no que concerne aos processos de gestão do conhecimento, os mesmos representam, em si, duas orientações distintas, com os processos de partilha e criação refletindo uma vertente humana/interpessoal da gestão do conhecimento e o armazenamento/documentação uma vertente mais tecnológica.

Para testar e analisar, empiricamente, o modelo teórico desenvolvido e apresentado ao longo da primeira parte da tese, foram recolhidos dados, em contexto organizacional, por intermédio de um inquérito por questionário autoadministrado junto de informadores chave de 111 organizações de 10 setores de atividade distintos[2]. Estatisticamente, utiliza-se um conjunto de recursos técnicos atuais de análise estatística de dados – IBM SPSS Statistics 23, IBM SPSS AMOS 23, SmartPLS (Ringle, Wende, & Will, 2005), PROCESS (Hayes, 2013) - de forma a validar as medidas utilizadas e a testar as hipóteses estabelecidas, respeitando-se sempre as limitações associadas com a dimensão e características da amostra e considerando-se a complexidade dos modelos.

[2] Relativamente à seleção dos setores de atividade analisados, sugere-se a consulta do Anexo 1

Perspetiva global e estrutural do documento

A presente tese encontra-se organizada em duas partes fundamentais. A primeira parte, composta por dois capítulos, corresponde à componente de natureza teórica da tese, ao passo que a segunda parte contém os contributos e estudos empíricos desenvolvidos. Especificando, a primeira parte é composta pelo capítulo 1, no qual uma revisão narrativa e um estudo exploratório com recurso a procedimentos de revisão sistemática da literatura são integrados, de forma a definir e apresentar soluções de medida para o constructo da capacidade de absorção e os processos chave de gestão do conhecimento considerados. A análise abrange ainda literatura teórica e empírica que aproxima a capacidade de absorção e os processos de gestão do conhecimento. Adicionalmente, são apresentados resultados de investigação empírica que permitem explorar e sustentar a relação entre a capacidade de absorção e a inovação.

O capítulo 2 apresenta uma revisão sistemática da literatura que analisará 45 artigos que estudam teórica e empiricamente a relação entre processos chave associados ao conhecimento, nas organizações, e diferentes tipos de inovação. Analisar-se-á, ainda, as relações de diferentes variáveis intervenientes (mediadoras) estudadas nos artigos empíricos que compõem a revisão. Por fim, encerrando a parte 1, apresentar-se-á um modelo teórico que contempla uma visão integrada da capacidade de absorção com os processos de gestão do conhecimento e a inovação, enquanto resultado organizacional, representando, este, o modelo de base norteador da parte empírica da presente tese.

A tabela I1 apresenta o perfil dos capítulos constituintes da parte 1 do documento.

Tabela I1 - Perfil dos capítulos teóricos da Parte 1

	Capítulo 1	**Capítulo 2**
Título	Organizational absorptive capacity, knowledge management processes and innovation: exploring the literature.	Key knowledge management processes for innovation: a systematic literature review.

	Capítulo 1	Capítulo 2
Objetivo(s)	Desenvolver um modelo teórico integrador considerando a capacidade de absorção, processos chave de gestão do conhecimento e a inovação organizacional.	Analisar os principais resultados da investigação atual sobre a relação entre processos de gestão do conhecimento e inovação; Analisar as variáveis que desempenham um papel mediador entre processos de gestão do conhecimento e inovação. Examinar que tipos de inovação são considerados na relação com os processos de gestão do conhecimento.
Metodologia(s) utilizada(s)	Revisão Narrativa; Revisão sistemática da Literatura	Revisão sistemática da literatura.

A segunda parte da tese é constituída por dois trabalhos empíricos. No capítulo 3 apresenta-se um estudo onde o modelo teórico resultante da primeira parte é parcialmente testado. Com recurso à modelação em equações estruturais por mínimos quadrados parciais (PLS-SEM), são testados vários modelos de forma a verificar empiricamente se a capacidade de absorção e a criação interna de novo conhecimento desempenham um papel mediador entre a partilha interna e a aquisição externa de conhecimento e a inovação organizacional. O capítulo 4, por sua vez, realiza uma análise mais pormenorizada das relações entre capacidade de absorção (potencial e efetiva) e os processos de armazenamento e documentação, e criação de novo conhecimento. Para testar as hipóteses de investigação delineadas é utilizado um modelo que considera dois mediadores (o processo de armazenamento e documentação do conhecimento e a capacidade efetiva de absorção), em série, entre a capacidade potencial (aquisição e assimilação de conhecimento) e a criação de novo conhecimento. Quando integrados, os dois contributos empíricos suscitam uma questão essencial, e detetada como corrente e pertinente na literatura da especialidade (cf. Flatten, Engelen, Zahra, & Brettel, 2011; Jansen, Van Den Bosch, & Volberda, 2005; Lane et al., 2006; Todorova & Durisin, 2007; Zahra & George, 2002) que remete para a dimensionalidade do constructo de capacidade de absorção, questão essa que é debatida e analisada teoricamente (cf. Capítulo 1) e empiricamente (cf. Conclusões gerais e considerações finais e Anexo 2), levando ainda a que seja introduzido conteúdo

relativo à avaliação do constructo num momento ainda de conceptualização (Capítulo 1). A tabela I2 apresenta o perfil dos capítulos empíricos, constituintes da Parte 2.

Tabela I2 - Perfil dos capítulos empíricos da Parte 2

	Capítulo 3	**Capítulo 4**
Título	Knowledge processes, absorptive capacity and innovation: a mediation analysis	From potential absorptive capacity to knowledge creation in organizations: the mediating role of knowledge storage and realized absorptive capacity.
Objetivos	Explorar e analisar o papel mediador desempenhado pela criação de conhecimento e capacidade de absorção, entre a aquisição de conhecimento, partilha de conhecimento e a inovação organizacional.	Explorar e analisar as relações existentes entre a capacidade potencial e efetiva de absorção do conhecimento e o armazenamento e documentação do conhecimento enquanto antecedentes da criação interna de novo conhecimento.
Amostra	111 participantes de 111 organizações.	111 participantes de 111 organizações.
Variáveis Independentes	Aquisição de conhecimento; Partilha de conhecimento	Capacidade potencial de absorção do conhecimento.
Variáveis Mediadoras	Criação de conhecimento; Capacidade de absorção.	Armazenamento e documentação de conhecimento; Capacidade efetiva de absorção do conhecimento.
Variáveis Dependentes	Inovação organizacional.	Criação de conhecimento.
Metodologia estatística	Modelação em equações estruturais por mínimos quadrados parciais (PLS-SEM).	Modelação em equações estruturais por mínimos quadrados parciais (PLS-SEM) para o modelo de medida; PROCESS macro para o teste de hipóteses.

Finalizando a tese, serão apresentadas as conclusões gerais, refletindo-se sobre os contributos (teóricos e empíricos) do presente trabalho para o domínio científico de especialização - a psicologia - do trabalho e das organizações - bem como acerca das suas limitações, implicações e contributos para a prática.

Parte 1

Capítulo 1 | Organizational absorptive capacity, knowledge management processes and innovation: exploring the literature.

[Partial contents of this chapter were published in the following conference proceeding

(cf. Anexo 3):

Costa, V., & Monteiro, S. (2014). Knowledge Processes, Absorptive Capacity and Innovation: Contributions for a Systematic Literature Review. In C. Vivas & P. Sequeira (Eds.), European Conference on Knowledge Management Vol 3 (pp. 1164–1172). Santarem: Academic Conferences & Publishing International Ltd.]

Abstract

The present chapter aims to explore and analyse, theoretically, the relationship between absorptive capacity (ACAP) and knowledge management processes (KMP), as well as the relationship between ACAP and innovation. Twenty-five years since Cohen and Levinthal's (1990) seminal paper, ACAP literature has generated different construct conceptualizations, and research disparities within the field are reflecting these changes. Among those conceptualizations, some view ACAP as a multidimensional construct, where different phases explain the organizations' capability to acquire knowledge and apply it to commercial ends, while others follow a unidimensional approach of ACAP.

This chapter explores the main ACAP conceptualizations and reviews influential theoretical and empirical literature on the topic. Moreover, it focus on contributions that relate ACAP with KMP. Additionally, it explores the previous research on absorptive capacity and innovation.

The theoretical analysis of the ACAP-KMP relationship shows that the knowledge acquisition process supports the phase of potential ACAP/Exploratory learning. After, knowledge storage, codification,

and sharing are KMP that allow the integration, combination and distribution of the newly acquired knowledge. Thus, knowledge storage, codification, and sharing are key KMP during the assimilation and transformation phase of ACAP. The application of knowledge, in order to exploit the acquired and assimilated/transformed knowledge, is fundamental to the exploitation phase of ACAP, and the internal creation of knowledge can represent an output of companies' ACAP. The exploration on ACAP-innovation relationship consistently suggests that innovation represents a result of ACAP.

Future research is needed to clarify ACAP dimensionality and explore its relationship (as an antecedent, mediator/moderator variable and/or consequent) with key KMP.

Keywords: Absorptive Capacity; Knowledge Management Processes; Organizational Innovation

1. Introduction

Absorptive capacity (ACAP) literature has built, over the past twenty-five years, numerous theoretical frameworks and measures. The integration of these models can reduce disparities in ACAP conceptualization and research. First introduced by Cohen and Levinthal (1990), and defined as the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (p. 128), some authors have re-conceptualized the ACAP construct (e.g., Lane et al., 2006; Todorova & Durisin, 2007; Zahra & George, 2002), suggesting different measures for its operationalization (Camisón & Forés, 2010; Flatten, Engelen, et al., 2011; Jansen et al., 2005; Jiménez-Barrionuevo, García-Morales, Molina, Jimenez-Barrionuevo, & Garcia-Morales, 2011; Minbaeva et al., 2003; Nieto & Quevedo, 2005). The multidimensional nature of ACAP is common to these major re-conceptualizations, who have consistently recognized dimensions like acquisition, transformation and application as components of ACAP. However, despite the proliferation of ACAP research since Cohen and Levinthal (1990), few studies tried to develop or reconceptualise absorptive capacity or the underlying dimensions of identification, assimilation or exploitation (see Lane et al. (2006) for a discussion). One of the most notable efforts was made by Zahra and George (2002) that defined absorptive capacity as "a dynamic capability that influences the firm's ability to create and deploy the knowledge necessary to build other organizational capabilities (p. 188)". On their reconceptualization, absorptive capacity encompasses four factors (acquisition, assimilation, transformation and exploitation). Together, acquisition and assimilation represent potential absorptive capacity (PACAP), which capture organization's capability to value and acquire external knowledge but "does not guarantee the exploitation of this knowledge" (p.190). Transformation and exploitation represents realized absorptive capacity (RACAP), meaning that the organization is able to combine and use the absorbed knowledge.

This multidimensional quality has led researchers to recognize distinct underlying processes for each dimension, as well as interrelations among these processes (Lane *et al.*, 2006). As ACAP construct has become more complex, its study needs different and multidisciplinary contributions (Jimenez-Barrionuevo *et al.*, 2011). This chapter aims to explore conceptual relationships between ACAP dimensions and specific KMP. Furthermore, it aims to provide a comprehensive overview over the existing measures to assess organizations' absorptive capacity and knowledge management processes.

ACAP literature includes numerous references to KMP (Cohen & Levinthal, 1990; Flatten, Engelen, et al., 2011; P J Lane et al., 2006; Lichtenthaler, 2009[3]; Zahra & George, 2002), but few attempts have been made to connect ACAP dimensions and KMP (e.g., Sun, 2010). Therefore, the main goals of this chapter are: (1) to identify knowledge management processes related to ACAP dimensions; (2) integrate ACAP dimensions and KMP in a convergent theoretical model; (3) identify and analyse major ACAP measures; (4) identify KMP measures; and (5) explore the ACAP-innovation literature. These goals will allow the future development of an integrated model, framing KMP with ACAP dimensions (cf. Considerações Finais – Parte 1). To do so, and considering the diversity of the ACAP and KM literature, we have only considered studies where innovation is analysed as the output of ACAP and/or KMP.

2. Absorptive capacity (ACAP) and knowledge management processes (KMP)

Absorptive capacity and knowledge management processes have previously been framed in theoretical models. Specifically, Sun (2010) considers that ACAP dimensions are "the same routines that underpin the knowledge management processes" (p. 509). Searching for an answer to the question ''how do organizational routines influence the three knowledge management processes of knowledge acquisition, knowledge creation, and knowledge utilization and sharing?'', the author argues that ACAP is a routine-based capability, as well as a specific learning process, that support KMP. In his theoretical framework, Sun (2010) hypothesizes that acquisition and assimilation (i.e., PACAP), support the process of knowledge acquisition. The transformation dimension of RACAP support the process of knowledge creation and the exploitation dimension supports the utilization and sharing of knowledge. Although Sun (2010) developed a fairly solid theoretical framework (based on previous theory), and confirms his propositions with two case studies, in the present research we will consider

[3] Considering that Lichtenthaler's 2009 paper has been retracted by Academy of Management Journal due to problems with data, we only consider this reference for theoretical purposed and do not rely on the analysis of measures or empirical results.

both theoretical (cf. section 4.1) and (already stablished) empirical relations between ACAP and KMP (cf. section 4.2) in order to build a theoretical framework that encompasses both constructs.

2.1. ACAP: a multidimensional construct

Most remarkable authors in ACAP literature have recognized different ACAP dimensions (Cohen & Levinthal, 1990; Lane et al., 2006; Lichtenthaler, 2009; Todorova & Durisin, 2007; Zahra & George, 2002), clearly conceptualizing ACAP as a multidimensional construct. This section aims to identify, understand, and articulate those dimensions. In Table C1.1, we synthetize different dimensions conceptualized by major ACAP papers.

Table C1.1 - Absorptive capacity dimensions

Author(s)	Dimensions	
(Cohen & Levinthal, 1990)	Identification	
	Assimilation	
	Exploitation	
(Zahra & George, 2002)	Potential absorptive capacity (PACAP)	Acquisition
		Assimilation
	Realized absorptive capacity (RACAP)	Transformation
		Exploitation
(Lane et al., 2006; Lichtenthaler, 2009)	Exploratory learning	Recognize
		Assimilate
	Transformative learning	Maintain
		Reactivate
	Exploitative learning	Transmute
		Apply
(Todorova & Durisin, 2007)	PACAP	Recognize the value
		Acquisition
	RACAP	Assimilation or transformation
		Exploitation

ACAP multidimensionality is a coherent finding among these contributions, as identification, acquisition, assimilation, transformation, and exploitation are frequently identified components of ACAP. These phases have been organised in major dimensions such as PACAP and RAPAC (Zahra & George, 2002) and also as exploratory, transformative, and exploitative learning (Lane et al., 2006). As stated by Gebauer, Worch, and Truffer (2012) exploratory learning is the PACAP equivalent, and exploitative learning is the RACAP equivalent. However, between the potential absorptive capacity to acquire and assimilate knowledge (that relies heavily on previous related knowledge), and the real capacity to combine new knowledge with existing one (transformation) and apply it in new products/services (exploitation), there is a gap. Therefore, to move from PACAP to RACAP, Lane, Koka, and Pathak (2006) introduced the transformative learning dimension, and Zahra and George (2002) proposed the social integration mechanisms and the efficiency factor.

The way these phases of ACAP have been framed is not so consensual as shown by other papers (e.g., Todorova & Durisin, 2007). Analysing Zahra and George's (2002) model, the authors propose that assimilation and transformation represent alternative processes. Thus, following this approach, one can assume that after knowledge has been externally acquired it will be assimilated or transformed, depending on how knowledge structures of the sender and the receiver overlap (Nieto & Quevedo, 2005; Todorova & Durisin, 2007). This differentiation has also been empirically corroborated by Gebauer et al. (2012), but it is far from being consensual (Flatten, Engelen, et al., 2011). This is understandable if we consider that organizations acquire knowledge from different competitors, suppliers and from the own organization (in the case of multinational companies), therefore relying on different capabilities for each situation.

2.2. ACAP Assessment

Traditionally, following Cohen and Levinthal's (1990) seminal paper, ACAP has been empirically measured with research and development (R&D) investment (Tsai, 2001), but this tendency also appears in recent research (e.g., C. Lin, Wu, Chang, Wang, & Lee, 2012; Vega-Jurado, Gutierrez-Gracia, & Fernandez-de-Lucio, 2009; Yu, 2013). Encompassing R&D, researchers combined other related measures, like the formal existence of a R&D unit, training of R&D workers, and the ratio of scientists and researchers (Escribano, Fosfuri, & Tribo, 2009; Kostopoulos, Papalexandris, Papachroni,

& Ioannou, 2011). Combined with R&D investment, patent citation analysis (knowledge spillover effect) was also used as an ACAP measure (Tseng, Pai, & Hung, 2011), although this indicator is quite restrictive, as only patentable knowledge is considered. In turn, Mowery, Oxley, and Silverman (1996) used technological overlapping between companies in strategic alliances as an ACAP measure.

However, critics to the capacity of these measures to reflect the richness of ACAP construct increased. Therefore, especially after Zahra and George's (2002) paper, subjective measures reflecting ACAP multidimensionality have been developed and extensively used (Cepeda-Carrion, Cegarra-Navarro, & Jimenez-Jimenez, 2012; Chao, Lin, Cheng, & Liao, 2011; Exposito-Langa, Molina-Morales, Capo-Vicedo, Expósito-Langa, & Capó-Vicedo, 2011; Flatten, Engelen, et al., 2011; Leal-Rodríguez, Ariza-Montes, Roldán, & Leal-Millán, 2014; Liao, Wu, Hu, & Tsui, 2010; Minbaeva et al., 2003; Nieto & Quevedo, 2005; C. F. Wang & Han, 2011). Aligned with the cited model, considering PACAP and RAPAC, various authors developed multi-item questionnaires (Camisón & Forés, 2010; Flatten, Greve, & Brettel, 2011; Jansen et al., 2005; Jiménez-Barrionuevo et al., 2011; Minbaeva et al., 2003; P Ritala & Hurmelinna-Laukkanen, 2013). In addition, the reconceptualization proposed by Lane et al. (2006) was also theoretically and empirically developed by Lichtenthaler (2009), considering two sub-processes for each of the three learning dimensions.

Although other researchers widely used Zahra and George's (2002) model, ACAP measures scarcely respect its focus on social integration mechanisms. In fact, existing multi-item approaches enable the measurement of PACAP and RAPAC but are ultimately not ACAP measures, because they cannot explain the barriers between PACAP and RAPAC and the efficiency of assimilation and transformation. As recognized by Camison and Fores' (2010) conclusions, PACAP and RAPAC are not simultaneous processes, as the acquired and assimilated knowledge can be accumulated and used later. This conclusion suggests the existence of an intermediate dimension, where processes of knowledge storage, codification, and sharing take place, in order to maintain and reactivate previously acquired knowledge. This dimension is conceptualized in Lane et al. (2006) as the transformative learning concept, to which Lichtenthaler (2009) added the two sub-processes of maintain and reactivate.

2.2.1. An overview on ACAP measures

This section intends to inform researchers and organizational practitioners about characteristics of main ACAP multi-item measures.

Minbaeva et al. (2003) developed the first attempt to measure ACAP conceptualized as the interaction between employees' ability (equivalent to PACAP) and employees' motivation (equivalent to RACAP), based on Zahra and George's (2002) model. Abilities represent previous related knowledge, which is known to be a key element for knowledge assimilation and application (Cohen & Levinthal, 1990), while motivation is associated with the intensity of effort in problem solving (Kim, 2001).

Chronologically, the first developed multi-item measure for each of the ACAP phases that Zahra and George (2002) identified was proposed by Jansen et al. (2005). Characterized as an interdepartmental approach of ACAP – items mainly refer to interactions among departments and business units – this measure is suitable to evaluate ACAP in the context of multinational corporations.

Camison and Fores' (2010) suggestion is clearly inter-organizational, as the external environment is the source of new knowledge's acquisition. In turn, the proposal of Jimenez-Barrionuevo et al. (2011) is at the organizational level, but follows a relative absorptive capacity approach (Lane & Lubatkin, 1998), focusing on a dyadic relationship between the teaching and the learning organization. Authors also emphasize the multilevel nature of absorptive capacity as, in their words, "the definition proposed may be applied to investigating any unit that learns relative to any unit willing to teach its knowledge, be they individuals, work groups, organizations, countries, etc." (Jimenez-Barrionuevo et al., 2011, p. 193).

Finally, Flatten, Engelen, et al. (2011) develop a measure for acquisition, assimilation, transformation, and exploitation (Zahra & George, 2002), and validate their items with two samples of workers from multiple hierarchies in the German context. As a result of the methodological approach followed, the authors argue that their approach outperforms other measures' limitations (e.g., Jansen et al., 2005), whose validity may be compromised.

2.2.2. ACAP measures: a psychometric analysis

The present section aims to analyse psychometric properties of ACAP multi-item measures. Table C1.2 summarizes the samples, ACAP dimensions, reliability statistics, and references to authors that have already used the proposed scales. In order to find these studies the authors searched article citations through the Web of Science™ platform. A second search using Google Scholar occurs if no studies initially appear using the scales.

Table C1.2 - ACAP multi-item scales

Authors	Sample	Dimensions (nº items)	Statistics	Later used by
Minbaeva et al. (2003)	168 subsidiaries of multinational corporations.	Employee's Ability (3)	α = .77	(Liao *et al.*, 2007)
		Employee's Motivation (5)	α = .75	
Flatten et al. (2011a)	Two sample of 285/361 German chemical and engineering industries.	Acquisition (3)	α = .79/.73	(Ali & Park, 2016; Ali, Seny Kan, & Sarstedt, 2016; Aljanabi, Noor, & Kumar, 2014; Flatten, Greve, et al., 2011)
		Assimilation (6/4)	α = .91/.85	
		Transformation (4)	α = .91/.93	
		Exploitation (3)	α = .82/.80	
Jansen et al. (2005)	462 questionnaires from a multi-unit European financial services firm.	Acquisition (6)	α =.79	(e.g., Chang *et al.*, 2013; Gong *et al.*, 2013; Jimenez-Castillo and Sanchez-Perez, 2013; Liu *et al.*, 2013)
		Assimilation (3)	α =.76	
		Transformation (6)	α =.72	
		Exploitation (6)	α =.71	

Authors	Sample	Dimensions (nº items)		Statistics		Later used by
Jimenez-Barrionuevo et al. (2011)	168 Spanish companies from chemical and automotive industries.	Acquisition (4)	PACAP	α = .90	α = .90	No papers were found.
		Assimilation (4)		α = .84		
		Transformation (5)	RACAP	α = .88	α = .88	
		Exploitation (2)		α = .83		
Camison and Fores (2010)	952 multi-industry Spanish firms.	Acquisition (4)	PACAP	CR[a] = .64	CR = .86	(García-Morales *et al.*, 2014)
		Assimilation (6)		CR = .68		
		Transformation (5)	RACAP	CR = .65	CR = .85	
		Application (4)		CR = .65		

a = Conjoint reliability.

An interesting point when looking at the scales' dimensionality is that a vast majority (Camisón & Forés, 2010; Flatten, Engelen, et al., 2011; Jansen et al., 2005; Jiménez-Barrionuevo et al., 2011) follow the four ACAP dimensions identified by Zahra and George (2002), that is, acquisition, assimilation, transformation and exploitation. Having multiple options to measure the same construct led other authors to shed light on some of its merits and drawbacks (Thomas & Wood, 2014).

Without questioning the multidimensional nature of ACAP, the analysed scales; however, clearly debate the organization of ACAP dimensions. Jansen et al. (2005) argues that the model fit is higher

when considering four first order factors (acquisition, assimilation, transformation, exploitation) instead of two (PACAP and RAPAC). The same result was reached by Flatten, Engelen, et al. (2011) and Flatten, Greve, et al. (2011). In turn, Jimenez-Barrionuevo et al. (2011) and Camison and Fores (2010) did not find statistically significant differences between models considering the ACAP bi-dimensionality or the four phases of acquisition, assimilation, transformation, and exploitation. However, some empirical studies frequently consider PACAP and RAPAC as the main dimensions of ACAP (Cepeda-Carrion et al., 2012; Leal-Rodriguez et al., 2014).

3. Knowledge Management Processes: definitions and measures

Knowledge management literature identifies different knowledge activities like the sharing, creation, application, storage and identification of knowledge (Heisig, 2009; J. Xu, Houssin, Caillaud, & Gardoni, 2010). In the scoping study performed for this thesis, and incorporated in this chapter (cf. Anexo 3), we analysed 21 empirical papers that relate KMP with innovation. Of the 21 papers, 10 focused on 1 process (e.g., Garcia-Muina, Pelechano-Barahona, & Navas-Lopez, 2009; Ordaz, Cruz, & Ginel, 2010), 7 analysed 2 KMP (e.g., Y. Li, Liu, Wang, Li, & Guo, 2009; Zhang, Shu, Jiang, & Malter, 2010) and 4 considered 3 or more processes (e.g., Andreeva & Kianto, 2011; Kianto, 2011; Zheng, Zhang, Wu, & Du, 2011). Knowledge acquisition appears to be the most studied process, followed by knowledge sharing, codification, creation and application. Table C1.3 shows KMP frequency and definitions.

Table C1.3 – KMP definitions and frequency

KMP	Definitions	Count	% of the sample
Acquisition	Process of acquiring knowledge that is available outside the firm (other firms, suppliers, customers) (Andreeva & Kianto, 2011; Lee, Leong, Hew & Ooi, 2013), or that is available in employees themselves (Liao et al., 2010). "Firms ability to identify and acquire useful external knowledge" (Zheng et al., 2011, p. 1038)".	10	47.6%
Sharing	Process through which internally developed or externally acquired knowledge is communicated to other individuals (Li et al., 2009); "act of placing knowledge possessed by an individual at the disposition of others within the organization" (Camelo-ordaz et al., 2011, p. 1444);	9	42.9%
Codification/ Storage/ documentation	"a process of structuring and storing of knowledge" that "formalizes knowledge and provides the possibility of utilizing it later" (Massa and Testa, 2009 cited in Lee et al., 2013, p.853) as codifiable tacit knowledge is converted into messages — patents, databases, user manuals, etc. — that can then be processed as information (Garcia Muina et al., 2009); This storage and documentation uses forms such as "written documents, electronic databases, codified knowledge in expert systems, documented organizational procedures and processes, and tacit knowledge located in individuals" (Alavi and Leidner, 2001 cited in Andreeva and Kianto, 2011, p. 1019).	6	28.6%
Creation	Organization's ability to develop new and useful ideas and solutions regarding various aspects of organizational activities, from products to technological processes to managerial practices (Andreeva & Kianto, 2011); Firm's new knowledge-based elements	5	23.8%

	generated from the strategic alliance (Inkpen 1998, cited in Zhang et al., 2010, p.81). "An upward spiral process including socialization, externalization, combination, and internalization (SECI)" (Nonaka & Takeuchi, 2008; Shu, Page, Gao, & Jiang, 2012).		
Exploitation/ application	The extent to which firms use existing competences, technologies and paradigms (March, 1991; Laursen & Salter, 2006), including technologies, managerial practices, human resources, equipment and so on (cited in Li, Li, Liu & Barnes 2011); exploitation practices are those utilized to leverage existing knowledge (Grant, 2002; He and Wong, 2004 cited in Donate and Guadamillas, 2011).	5	23.8%

Therefore, with a smaller sample and different method, when compared with Heisig's (2009) paper, we can see that similar KM activities are being currently researched. But how are KMP being measured? The analysis of the measures used by the sample papers shows that no single questionnaire stands out. Even in knowledge acquisition, the most studied KMP, only 3 (out of 10) studies used the same measure (based on Gold, Malhotra, and Segars (2001)). When presented, scales show high reliability (mainly measured with Cronbach's alpha), convergent and discriminant validity. This means that a substantial number of reliable and valid measures exist and have been recently used or developed to measure KMP.

The analysis of the number of items reveals that an effort has been made to synthetize the number of items reflecting each process. Therefore, processes were measured using between 3 and 7 indicators each. The only exception is knowledge exploitation in Donate and Guadamillas (2011), measured with 11 items. Table C1.4 shows a brief example of 3 papers that used multiple knowledge processes measures.

Table C1.4 – KMP measures

Paper	Measures	Dimensions	Items	Statistics	Items availability
Andreeva and Kianto (2011)	Knowledge creation scale (Kianto, 2011);	Knowledge Creation	4	α = .87	Yes, on the original
	Knowledge storage and documentation scale (Kianto, 2011; Karadsheh et al., 2009; Bayona et al., 2001; Alavi and Leidner, 2001).	Knowledge Storage and documentation	4	α = .87	
	Intra-Organizational Knowledge Sharing scale (Kianto, 2011; Darroch, 2003).	Knowledge sharing	5	α = .88	
	Knowledge acquisition (Kianto, 2011).	Knowledge Acquisition	3	α = .74	
Zhou and Li (2012)	knowledge sharing (Schulz, 2001);	Knowledge sharing	3	CR = 0.85; AVE = 0.65.	Yes, on the original
	Market knowledge acquisition (Tsang, 2002).	Knowledge acquisition	3	CR = 0.84; AVE = 0.64.	
Lee et al. (2013)	Knowledge acquisition, knowledge sharing, knowledge application and knowledge storage (Lopez et al., 2006; Martinez-Costa & Jimenez-Jimenez, 2009).	knowledge acquisition	5	α = .87	No
		knowledge sharing	5	α = .83	
		knowledge application	4	α =.81	
		knowledge storage	5	α =.84	

CR= composite reliability; AVE = Average Variance Extracted; α = Cronbach Alpha.

4. ACAP dimensions and KMP

This section will help us to accomplish the major goals of the present chapter, namely, to identify knowledge management processes related to ACAP dimensions and integrate ACAP dimensions and KMP in a convergent theoretical model. Therefore, the theoretical (4.1) and empirical literature (4.2) that relates ACAP and KMP will be analysed to provide some evidence about the actual theoretical and empirical contributions and findings in this field.

4.1. ACAP-KMP theoretical literature

ACAP literature has often mentioned KMP such as acquisition, transfer, sharing, dissemination, integration, and application (Cohen & Levinthal, 1990; Flatten, Engelen, et al., 2011; Lane et al., 2006; Lichtenthaler, 2009; Zahra & George, 2002). Therefore, this section aims to clarify which KMP are related to different ACAP dimension. Starting with ACAP literature, this section proposes an integrated framework converging ACAP dimensions and KMP.

The knowledge acquisition process is highlighted by Cohen and Levinthal (1990). Namely, the authors considered that the similarity between previously existing knowledge and newly acquired knowledge influences the capacity to introduce new content into memory, in other words, to acquire knowledge. External knowledge acquisition is also related to the dimensions of exploratory learning (Lane et al., 2006; Lichtenthaler, 2009) and PACAP (Zahra & George, 2002), since the capability to identify and assimilate new knowledge depends on previous knowledge acquisition.

Another relevant KMP is knowledge sharing, as the development of ACAP deeply depends on an organization's capacity to internally manage knowledge communication and sharing (Cohen & Levinthal, 1990). Zahra and George's (2002) model encompasses knowledge sharing in social integration mechanisms, which, according to Lane et al. (2006), are critical to absorptive capacity. In fact, as Lane et al. (2006, p. 858) mention, "knowledge management processes affect how such knowledge is shared between and transferred to different parts of the organization". Therefore, knowledge sharing appears to be an important intermediate process to leverage the assimilation and transformation of knowledge.

The storage of externally acquired knowledge will prevent its loss, since it cannot be immediately applied (Garud & Nayyar, 1994), thus reinforcing knowledge storage and codification as part of the transformative learning dimension, specifically the maintain process (Lichtenthaler, 2009). Finally, to reach commercial ends (Cohen & Levinthal, 1990), RACAP (Zahra & George, 2002) and exploitative learning (Lane et al., 2006; Lichtenthaler, 2009) comprise knowledge application, which can be defined as the use of knowledge resulting from the combination and/or transformation of previously existing and newly acquired knowledge.

KMP identified in ACAP research reflect processes that can be framed within a knowledge lifecycle (Xu et al., 2010), following a cyclic approach from acquisition to application. Knowledge acquisition, storage, codification, sharing, and application are KMP that are frequently found in KM literature and frameworks (Alavi & Leidner, 2001; Gold et al., 2001; Heisig, 2009; Hislop, 2009; Sun, 2010; Xu et al., 2010).

External knowledge acquisition is the first KMP related to ACAP dimensions. Its relationship with the acquisition phase of PACAP (Zahra & George, 2002) and exploratory learning is clear (Lane et al., 2006). Acquisition is the first process, and is defined as the identification and acquisition of external useful knowledge (Zheng et al., 2011) available in other companies, suppliers, or clients (Andreeva & Kianto, 2011; Lee et al., 2013). The external acquisition of knowledge seems to be particularly useful in promoting innovation and to firms with a deep knowledge base (Zhou & Li, 2012).

After external acquisition, the integration of new knowledge in the receiver's knowledge base occurs (Grant, 1996; Zhou & Li, 2012), and processes like storage, codification, and sharing are key. These processes, bridging from acquisition to application, allow the integration, distribution, and transformation of knowledge (Gold et al., 2001).

Knowledge storage, as highlighted by Lee et al. (2013), is a crucial KMP that helps organizations prevent knowledge loss. In addition, knowledge codification, facilitated by information technologies and other platforms, allows for the codification of explicit and tacit codifiable knowledge in patents, manuals, and databases (Garcia-Muina et al., 2009; Kianto, 2011), acquiring a format that allows its storage and transfer (Li et al., 2010). Following a tacit-explicit dichotomy, during the assimilation/transformation phase not only storage and codification are important, but the sharing of knowledge is also crucial for subsequent application (Lee et al., 2013; Li et al., 2009; Wang & Wang,

2012), especially in broad knowledge bases (Leal-Rodriguez et al., 2013; Zhou & Li, 2012). Tacit knowledge, due to its complex nature, is embedded in human experiences and flows through knowledge sharing, which is enabled by social interaction and face-to-face communication (Kianto, 2011). Information and communication-based technologies also facilitate the sharing of thoughts, opinions, and viewpoints in a quick manner through blogs, online forums, and repositories, emphasizing the explicit dimension of knowledge (Saenz, Aramburu, & Blanco, 2012).

Therefore, it can be argued that storage, codification, and sharing represent knowledge processes that are needed between external acquisition and application, reflecting a physic, technological, and human-oriented approach, respectively (López-Nicolás & Meroño-Cerdán, 2011; J. Xu et al., 2010). Their relationship with assimilation, transformation (Todorova & Durisin, 2007; Zahra & George, 2002), and transformative learning – both maintain and reactivate - (Lane et al., 2006; Lichtenthaler, 2009) is evident because, as referred to by Gold et al. (2001, p. 195), "the coordination and conversion of specialized knowledge represents a fundamental aspect of transformation".

Ultimately, knowledge application represents a final process in which organizations use existing knowledge to improve or develop new products that meet the market needs and expectations (Lee et al., 2013; Li et al., 2009). Application processes largely depend on storage and retrieval mechanisms and internal knowledge sharing (Gold et al., 2001). According to the knowledge-based view of the firm, "the source of competitive advantage resides in the application of the knowledge rather than in the knowledge itself" (Alavi & Leidner, 2001, p. 122). Knowledge application also enables the incorporation of knowledge in organizational systems, processes, and routines (Camison & Fores, 2010).

4.2. ACAP-KMP empirical studies

Previous reviews highlight the need to integrate ACAP and KM literatures, since they "share related underlying concepts" (Sun & Anderson, 2010, p. 147). Following this challenge, some authors have made initial attempts to relate KMP and ACAP. Namely, knowledge acquisition is an ACAP antecedent in Liao, Wu, Hu, and Tsui's (2010) study. Knowledge sharing also shows its influence on ACAP, as conceptualized by Minbaeva et al. (2003), in Liao, Fei, and Chen's (2007) research. Knowledge sharing

capability seems to "strongly connect to all three learning processes" of exploratory, transformative, and exploitative learning (Maes & Sels, 2014, p. 155). On a recent paper, Kang and Lee (2016) consider knowledge sharing as a consequent of PACAP, as well as an antecedent of RACAP and corroborate the two related hypothesis. On other hand, knowledge creation seems to be a consequence (Chou, 2005) or to have a synergistic effect with ACAP, contributing to product innovation (Su, Ahlstrom, Li, & Cheng, 2013). Kotabe, Jiang, and Murray (2011) found that the acquisition of knowledge only plays a role in the market performance of new products in the presence of RACAP. Considering the significance of these empirical contributions to our theoretical model development, Table C1.5 provides more detailed information about these papers.

However, with few exceptions (e.g., Kang & Lee, 2016; Maes & Sels, 2014), these studies only analysed specific KMP and their relationship with ACAP, sometimes measured as a one-dimensional construct (Chou, 2005; Su et al., 2013), which does not promote a comprehensive understanding of KMP's relationship or influence with specific ACAP dimensions. Thus, to surpass these limitations, the proposed model attempts to provide an integrated analysis of KMP related to ACAP dimensions.

Table C1.5 - Summary of ACAP-KMP empirical contributions

Authors	Sample	ACAP-KMP hypothesized relationship	Information about measures	Main results
(Chou, 2005)	271 middle managers of Taiwanese firms from multiple activity sectors.	"an individual's absorptive capacity is positively related to knowledge creation."	ACAP measure was adapted from Griffith et al. (2003), Szulanski (1996) and Zahra and George (2002). KC was measured with 15 items based on Becerra-Fernandez,	ACAP is positively related to knowledge creation.

Authors	Sample	ACAP-KMP hypothesized relationship	Information about measures	Main results
			(2001) and Nonaka, (1991)	
(Kang & Lee, 2017)	138 employees in the R&D department of a multinational company in South Korea.	"Potential absorptive capacity positively influences knowledge sharing"; "Knowledge sharing positively influences realised absorptive capacity."	PACAP was measured with 6 items, 3 for each dimension. RACAP was measured with 6 items, 3 for each dimension. Items were adapted from Jansen et al. (2005) and Zahra and George (2002).	Both PACAP´s effect on knowledge sharing and knowledge sharing's effect on RACAP were statistically significant.
(Kotabe et al., 2011)	121 Chinese multinational companies (MNC). Respondents were top executives.	"A firm's RACAP enhances the positive effect of a firm's knowledge acquisition from government officials on its new product market performance." "A firm's RACAP enhances the positive effect of a firm's knowledge acquisition from foreign MNC partners	ACAP was operationalized with a 9 item scale to reflect both knowledge transformation and exploitation. KA, from government officials and from foreign MNC partner was adapted from Barney (1991) and Yli-renko, Autio, and Sapienza (2001).	RACAP interacts with knowledge acquisition to improve new product market performance. Firms that are equipped with higher RACAP are more likely to increase their new product market performance by having stronger business ties with their external partners.

Authors	Sample	ACAP-KMP hypothesized relationship	Information about measures	Main results
		on its new product market performance."		
(Liao et al., 2007)	355 Taiwanese knowledge-intensive industries	"Knowledge sharing has a positive influence on absorptive capability."	ACAP was measured with items from Minbaeva et al. (2003). Knowledge sharing was measured with van den Hooff and van Weenen's (2004) items.	Knowledge sharing positively and significantly influences absorptive capacity.
(Liao et al., 2010)	362 Taiwanese knowledge-intensive industries	"Knowledge acquisition is positively related to absorptive capability."	Knowledge acquisition was measured with 7 items modified from Gold et al. (2001), Jantunen (2995), and Yang et al. (2006). ACAP was measured with the scale developed by Nieto and Quevedo (2005).	Knowledge acquisition is positively related to absorptive capabilities.
(Maes & Sels, 2014)	194 organizations in Flanders.	"Capabilities stimulating knowledge sharing are positively	ACAP was measured with 12 items from Kohli, Jaworski, and Kumar (1993). KS was	Knowledge sharing capability have a strong direct relationship with

Authors	Sample	ACAP-KMP hypothesized relationship	Information about measures	Main results
		related to (1) exploratory learning, (2) transformative learning, and (3) exploitative learning."	measured with 4 items based on Mumford (2000), Shadur and Snell (2002), and Laursen and Foss (2003).	exploratory, transformative and exploitative learning.
(Su et al., 2013)	212 firms (two respondents per firm)	"Knowledge creation capability and absorptive capacity have a synergistic effect on product innovativeness such that their interaction has a positive impact on product innovativeness in addition to their direct effects."	KC was measured with 12 items from Smith, Collins, and Clark (2005). ACAP was measured with 5 items, created by the authors (based on Cohen and Levinthal, (1990), and Zahra and George (2002).	Knowledge creation and ACAP interact, that is, have a moderating effect on product innovativeness.

5. Absorptive Capacity and Innovation

The increasing complexity of innovation, associated with the unavailability of all needed knowledge to innovate in one organization, turns external knowledge sources a key element for innovative firms. Thus, as stated by Cohen and Levinthal (1990) the capability of evaluate and use externally held knowledge (i.e., ACAP) represents a crucial factor of innovation capacity. Current research has extensively examined the relationship between ACAP and innovation in organizations. Table C1.6 presents some of the current contributions in this field.

Table C1.6 - Absorptive Capacity and Innovation Research

Author(s)	Sample	Main results
(Chao et al., 2011)	100 companies and 500 R&D workers Taiwanese manufacturing companies.	Absorptive capacity positively influences the innovation behaviour of the surveyed firms.
(Y. S. Chen, Lin, & Chang, 2009)	106 Taiwanese manufacturing companies.	Absorptive capacity positively affects innovation performance.
(Ebers & Maurer, 2014)	218 projects in 144 mechanical engineering and plant engineering firms in Germany.	PACAP and RACAP play different but complementary roles in product and process innovation.
(Ferreras-Méndez, Newell, Fernández-Mesa, & Alegre, 2015)	102 Spanish biotechnology firms.	ACAP positively influences innovation. ACAP fully mediates the effect of depth external knowledge search on innovation.
(Fosfuri & Tribo, 2008)	2464 innovative Spanish firms from the community innovation survey (CIS 4).	PACAP is a source of competitive advantage in innovation, especially in the presence of efficient internal knowledge flows that help reduce the distance between potential and realized capacity.
(Kostopoulos et al., 2011)	461 manufacturing and services firms from Greece.	Absorptive capacity is significantly positively related to firms' innovation performance.
(Moilanen, Ostbye, & Woll, 2014)	431 SME's, located in North Norway, 122 with in-house R&D, and 309 without in-house R&D.	The higher the level of ACAP a firm has, the more likely it is to have a higher level of innovation performance. The mediation role of ACAP between external knowledge inflows and innovation performance was not supported.
(Murovec & Prodan, 2009)	2422 Spanish and 641 Czech Republic firms from the community innovation survey (CIS 3) data.	Demand-pull ACAP and science-push ACAP positively contribute to product and process innovations.
(Su et al., 2013)	212 Chinese firms.	ACAP has a positive effect on product innovativeness. ACAP and knowledge creation play a synergistic effect on product innovativeness.

The results of the analysed papers in Table C1.6 show a strong tendency from empirical literature to support the positive relationship between higher absorptive capacity and different innovation types. Considering the relationship with innovation, ACAP emphasize the importance of external knowledge acquisition as a way to obtain the resources that are needed to innovate. This external linkages can be appealing, considering that the application of this (new) knowledge can be done more quickly and effective within an organizational context, producing the desired result and creating value. It avoids, simultaneously, the internal creation and sharing of knowledge in situations in which organizations lack the necessary knowledge to apply the created and shared knowledge, reducing the risks associated with the innovation process (Kluge, Stein, & Licht, 2002). The empirical relationships shown by the analysed literature will be incorporated in the theoretical model at the end of the Part 1 of the present thesis.

6. Discussion

Building upon main ACAP theoretical (re)conceptualizations (Cohen & Levinthal, 1990; Lane et al., 2006; Lichtenthaler, 2009; Todorova & Durisin, 2007; Zahra & George, 2002) and empirical papers that investigate the ACAP-KMP relationship (Chou, 2005; Kang & Lee, 2017; Kotabe et al., 2011; Liao et al., 2007, 2010; Maes & Sels, 2014; Su et al., 2013), this chapter theoretically and empirically integrates KMP with ACAP dimensions, which will allow us to provide a framework for future research. The followed multidimensional approach to ACAP, highlighting and systematizing a set of procedural phases, allows for better comprehension of the construct. Moreover, breaking ACAP construct into multiple dimensions and phases helps to clarify the relationships with KMP.

The theoretical analysis of the ACAP-KMP relationship suggests that the knowledge acquisition process supports the phase of PACAP/Exploratory learning. After, knowledge storage, codification, and sharing are KMP that can allow the integration, combination and distribution of the newly acquired knowledge. Thus, knowledge storage, codification, and sharing are key KMP during the assimilation and transformation phase of ACAP. Finally, knowledge application occurs in order to exploit the acquired and assimilated/transformed knowledge, thus, it is fundamental to the exploitation phase of ACAP.

Moreover, the analysis of empirical literature that considers ACAP and knowledge processes shows that organizations will create more knowledge when they have higher absorptive capacity (Chou, 2005). Also, the research suggests that the more knowledge that is acquired (Liao et al., 2010) and shared (Liao et al., 2007; Maes & Sels, 2014) the higher organizations' ACAP will be.

The analysis of different ACAP and KMP scales, allow the operationalization of constructs through multi-item measures. The analysed measures respect the multidimensional nature of ACAP and thus reflect the richness of this construct. Dealing with a considerable number of valid multi-item scales to measure ACAP, this chapter presents its main differences and analyse its indicators and psychometric properties, helping future researchers in their decision making process.

7. Challenges for Investigation

The presented and discussed theoretical model presents new challenges for researchers and practitioners. On one hand, academics and researchers can search for empirical evidence that supports the theoretical model (cf. Considerações Finais – Parte 1) since proposed theoretical relations need more empirical support. On the other hand, for organizational actors, understanding ACAP-KMP relationship potentiates organizational interventions through KM practices. The combination between the empirical analysis and an interventional approach may clarify which processes can block or facilitate ACAP, regardless of whether authors theoretically consider a PACAP and RAPAC division or the learning processes of exploration, transformation, and exploitation. Once the importance of each process becomes clear, interventions can move towards specific KMP in order to strengthen ACAP dimensions.

Following previous studies (Chou, 2005; Liao et al., 2007; Liao et al., 2010; Maes and Sels, 2014; Su et al., 2013), future research should clarify the ACAP-KMP relationship, respecting ACAP multidimensionality. Although ACAP is consensually regarded as a multidimensional construct (Lane et al., 2006; Lichtenthaler, 2009; Nieto & Quevedo, 2005; Todorova & Durisin, 2007; Zahra & George, 2002), future empirical research must clarify the underlying steps for each dimension (specially for assimilation and transformation phases), as well as if transformation is a consequence or an alternative process to assimilation (Flatten, Engelen, et al., 2011; Gebauer et al., 2012; Todorova & Durisin, 2007).

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Capítulo 2 | Key knowledge management processes for innovation: a systematic literature review.

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Abstract

The aim of this paper is to review current literature on knowledge management processes considering the relationship between the key knowledge processes of acquisition, sharing, storage, codification, creation, application, and different types of innovation, through a systematic literature review. This study follows systematic review protocols for management and organisational sciences and analyses 45 full papers on knowledge management processes and innovation. Results show that all knowledge processes can directly support innovation but also that other organisational variables (e.g., organisational learning, absorptive capacity) mediate this relationship. Moreover, knowledge creation and knowledge application appear as two central processes through which knowledge acquisition, sharing, codification, and storage influence innovation. Knowledge acquisition and knowledge sharing are the most frequently studied knowledge processes. The majority of the sample papers present traditional innovation definitions (product vs. process, radical vs. incremental, and technical vs. administrative). However, organisational innovation, innovation capability, and innovation performance approaches emerge from the papers' analysis. The present review includes major scientific papers, however the search is limited to the Web of Science™ platform. This literature review analyses high quality, peer-reviewed papers, following a systematic methodology that can be tested and updated. Papers were divided based upon the knowledge process(es) being analysed

and the innovation type/approach, providing a twofold contribution to knowledge management and innovation literature.

Keywords: Knowledge Management; Knowledge Processes; Innovation; Systematic Literature Review; Absorptive Capacity.

1. Introduction

The knowledge-based view of the firm recognises the importance of knowledge as the main source of competitive advantage, and emphasise the firm's role as an "institution for the production of goods and services" (R. M. Grant, 1996, p. 120). In fact, organizations need to reconfigure products and practices to stay viable (Alavi & Leidner, 2001; Davenport & Prusak, 1998). Thus, this constantly need for differentiated products and services calls for (continuous) innovation, and a "well-planned system of knowledge management" (Popadiuk & Choo, 2006, p. 302).

Therefore, knowledge provides firms with a sustained competitive advantage through its application in new or significantly improved products/services, production processes, managerial practices, and marketing strategies, that is, innovation (Ceylan, 2013; Weerawardena, 2003b). Considering the need to understand the links between knowledge and innovation, several researchers explored the relationship between knowledge processes and innovation outcomes. Such interest raises the need for a systematic review of relevant literature that can provide an up to date understanding of the research field.

By aggregating theoretical and empirical current papers, the present systematic literature review (SLR) aims to answer to the following general research question: What are the current research main findings regarding the KMP-innovation relationship? Four sub questions are also addressed by this paper: (1) Which knowledge management processes are studied by current research considering its relationship with innovation?; (2) Which methods were used by the sample papers?; (3) Which variables play a mediation role in KMP-innovation research?; and (4) Which innovation types are considered?

Following SLR protocols for management and organisational sciences (Denyer & Tranfield, 2009; Tranfield, Denyer, & Smart, 2003), this work focus on specific knowledge management processes (KMP) and innovation, shedding light on these relationships by examining six key KMP: (1) knowledge acquisition; (2) knowledge storage; (3) knowledge codification; (4) knowledge sharing; (5) knowledge application; and (6) knowledge creation. Based on a group of 45 papers (41 empirical papers and 4 theoretical contributions), the authors analyse and

discuss the influence of these KMP on different innovation types. This paper focuses on innovation framed within the knowledge management literature, and considers innovation to be a knowledge-based outcome. The remainder of the paper is organised as follows: section 2 explores the relationship between the innovation and knowledge management literature; section 3 highlights the methodological steps of the systematic review; the results from the analysis of the sample papers are presented in section 4; lastly, sections 5 and 6 discuss the research results and provide further research suggestions, respectively.

2. Knowledge management and Innovation

Organisations can innovate, through serendipity, without formally managing knowledge but this haphazard cannot compete with dynamic environments and the need to "innovate fast enough, often enough and efficiently" (Demarest, 1997, p. 382). In fact, knowledge management plays an invaluable role in innovation through diverse means like facilitating collaboration, assisting in tacit knowledge conversion into explicit knowledge, identifying knowledge gaps, and ensuring that knowledge is available and accessible (Du Plessis, 2007). Therefore, knowledge management researchers have investigated the relationship between knowledge and innovation (Boer, Caffyn, & Corso, 2001; Darroch, 2005; Darroch & McNaughton, 2002; Gopalakrishnan & Bierly, 2001; Sousa, 2006; J. Xu et al., 2010), and in particular concentrate on the role of knowledge creation as a prerequisite for innovation (Esterhuizen, Schutte, & du Toit, 2012; Kogut & Zander, 1992; Nonaka, 1991; Popadiuk & Choo, 2006; Quintane, Casselman, Reiche, & Nylund, 2011). Further, knowledge usage is another core activity, and it must follow knowledge creation in order to leverage continuous innovation (J. Xu et al., 2010; J. Xu, Houssin, Caillaud, & Gardoni, 2011).Even being critical to innovation, the processes of knowledge creation and knowledge application may depend on other processes such as acquisition, sharing, and codification, in order to positively influence innovation outcomes (Andreeva & Kianto, 2011; C. J. Chen & Huang, 2009; Y. Li et al., 2009; Zhou & Li, 2012).

Whereas that the importance of the KMP for innovation is substantiated, we must understand what innovation is, and what innovation types the literature has predominantly identified. Innovation literature is widespread throughout different research fields (Gopalakrishnan & Damanpour, 1997), which generates different conceptual approaches that have been

theoretically framed. Therefore, innovation reviews (Damanpour, 2010; Damanpour & Daniel Wischnevsky, 2006; Gopalakrishnan & Bierly, 2001; Gopalakrishnan & Damanpour, 1997; Prajogo & Sohal, 2003) frequently distinguish between innovation type – product/service vs. process, radical vs. incremental, and technical vs. administrative. Considering the organisational field, an innovation can be defined as "the development and use of new ideas or behaviors" (Damanpour & Daniel Wischnevsky, 2006, p. 271). Other authors argue that an idea is not, by itself, an innovation, and that it must first be "developed and transformed into a product, process, or service" that can be commercialised (Popadiuk & Choo, 2006, p. 303). In conclusion, the multiple definitions show a lot of diversity in innovation conceptualisation and the need to clearly differentiate which type of innovation is being addressed.

3. Method

The present section describes how the authors collected the papers and refined the results in order to achieve a sample of valuable references to work on. SLR protocols for organisational sciences guided the methodological steps (e.g., Denyer & Tranfield, 2009; Tranfield et al., 2003).

3.1. Search strategy

The search strategy for this SLR started with the identification of keywords in order to build a search string. This is an important step, as keywords determine which papers the database will retrieve. Following relevant works in the field of KM (e.g., Gold, Malhotra, & Segars, 2001; Heisig, 2009; Hislop, 2009; J. Xu et al., 2010), as well as a scoping study, six key processes were selected for this review. Hence, the authors considered the KMP of acquisition, creation, storage, codification, sharing, and application. These processes represent some of the most discussed KM activities (Heisig, 2009), and are relevant KMP for innovation, reflecting the physical, human, and technological view of KM research (J. Xu et al., 2010).

With the final search string[1], the authors performed a search on September 1st, using the Web of Science™ platform to select two databases (Science Citation Index Expanded and Social Sciences Citation Index). 335 papers were collected from a period ranging from 2009 to September 2014. The review only considered articles and reviews (document type), narrowing

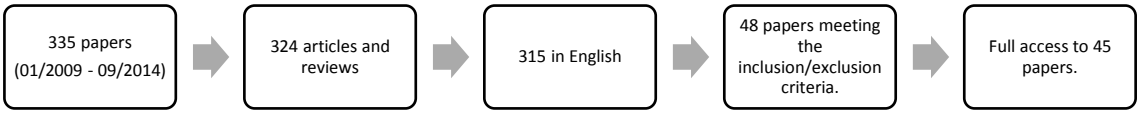
our selection to 324 papers. 315 out of which are in English. Table C2.1 shows the top ten sources. Relevant journals in the KM and innovation fields are included. These ten sources account for 32.08% of all papers, showing the consistency between the search strategy and the results.

Table C2.1 - Top ten sources considering citation counts.

Source Title	Counts	% of 315
Journal of knowledge management	23	7.30%
International journal of technology management	16	5.08%
Research policy	14	4.44%
Innovation management policy practice	9	2.86%
Journal of business research	8	2.54%
Technovation	7	2.22%
Technological forecasting and social change	6	1.91%
Knowledge management research practice	6	1.91%
Journal of product innovation management	6	1.91%
African journal of business management	6	1.91%

Forty-eight out of the 315 papers were selected after title and abstract analysis and the application of inclusion/exclusion criteria (Appendix 1). After gaining full access to the selected papers, we use 45 papers for the final sample. Figure C2.1 synthesizes the search and refinement steps.

Figure C2.1 - Steps for Results' Refinement



4. Results

4.1. Papers' method

The analysis of the sample papers shows that empirical studies are dominant in KMP-innovation recent research (41 out of 45 papers), with only 4 papers of our sample providing theoretical developments. Tables C2.2 and C2.3 provide a detailed grid that classifies the 41 empirical contributions considering studies' methodology as well as the KMP, and innovation type(s). Papers were analysed and coded using Nvivo software. The definitions provided in each study were coded considering pre-established innovation conceptualisations.

Table C2.2 - Classification of quantitative papers.

(Author(s), publication date sorted by year)	Acquisition	Creation/Generation	Codification/Storage	Sharing	Application	Service/product Innovation	Process Innovation	Radical Innovation	Incremental Innovation	Technical Innovation	Administrative Innovation	Organisational Innovation	Innovation Capability	Innovation Performance	Other
(C. J. Chen & Huang, 2009)	X			X	X					X	X				
(Garcia-Muina et al., 2009)			X							X					
(M. L. M. Hu, Horng, & Sun, 2009)				X		X									
(Huang & Li, 2009)	X			X	X					X	X				
(Y. Li et al., 2009)				X	X					X					
(Hung, Lien, Fang, & McLean, 2010)		X	X		X	X	X								
(Liao & Wu, 2010)	X				X							X			
(Liao et al., 2010)	X												X		
(Maurer, 2010)	X					X									
(Zhang et al., 2010)	X	X												X	
(Alegre, Sengupta, & Lapiedra, 2011)			X	X										X	
(Andreeva & Kianto, 2011)	X	X	X	X	X									X	

(Author(s), publication date sorted by year)	Acquisition	Creation/Generation	Codification/Storage	Sharing	Application	Service/product Innovation	Process Innovation	Radical Innovation	Incremental Innovation	Technical Innovation	Administrative Innovation	Organisational Innovation	Innovation Capability	Innovation Performance	Other
(Camelo-Ordaz, Garcia-Cruz, Sousa-Ginel, & Valle-Cabrera, 2011)				X		X									
(Kianto, 2011)	X		X	X											X
(Zheng et al., 2011)	X	X												X	
(M. L. M. Hu, Ou, Chiou, & Lin, 2012)				X		X									
(Kumar & Rose, 2012)				X		X									
(Liao, Chang, Hu, & Yueh, 2012)	X											X			
(R. J. Lin, Che, & Ting, 2012)	X			X	X	X									
(Martinez-Canas, Saez-Martinez, Ruiz-Palomino, Martínez-Cañas, & Sáez-Martínez, 2012)	X					X									
(Marvel, 2012)	X							X							
(Saenz et al., 2012)				X									X		
(Shu et al., 2012)		X				X	X								
(Z. N. Wang & Wang, 2012)				X											X
(Zhou & Li, 2012)	X			X				X							

(Author(s), publication date sorted by year)	Acquisition	Creation/Generation	Codification/Storage	Sharing	Application	Service/product Innovation	Process Innovation	Radical Innovation	Incremental Innovation	Technical Innovation	Administrative Innovation	Organisational Innovation	Innovation Capability	Innovation Performance	Other
(Lee, Leong, Hew, & Ooi, 2013)	X		X	X	X					X					
(Parra-Requena, Ruiz-Ortega, & Garcia-Villaverde, 2013)	X					X									
(Wong, 2013)				X		X	X								
(Zelaya-Zamora & Senoo, 2013)		X												X	
(Aboelmaged, 2014)	X			X	X					X	X				
(L. Y. Hu & Randel, 2014)				X										X	
(Lai, Hsu, Lin, Chen, & Lin, 2014)	X	X	X	X										X	
(Maes & Sels, 2014)				X				X							
(Molina-Morales, Garcia-Villaverde, & Parra-Requena, 2014)	X					X									
(Soto-Acosta, Colomo-Palacios, & Popa, 2014)				X											X

Table C2.3 - Classification of qualitative and explorative papers.

		KMP					Innovation									
(Author(s), publication date sorted by year)	Methodology	Acquisition	Creation/Generation	Codification/Storage	Sharing	Application	Service/product Innovation	Process Innovation	Radical Innovation	Incremental Innovation	Technical Innovation	Administrative Innovation	Organisational Innovation	Innovation Capability	Innovation Performance	Other
(Taminiau, Smit, & de Lange, 2009)	EX				X		X									
(Spaeth, Stuermer, & von Krogh, 2010)	EX		X													X
(Iacono, Martinez, Mangia, & Galdiero, 2012)	QL		X				X	X								
(G. N. Xu, Liu, Zhou, & Su, 2012)	EX;QN	X				X					X					
(Connell, Kriz, & Thorpe, 2014)	QL				X											X
(Pattinson & Preece, 2014)	QL	X			X				X	X						

Note: EX = Explorative; QL = Qualitative; QN = Quantitative

4.2. Knowledge management processes and innovation

4.2.1. Knowledge acquisition and innovation

Several past contributions have linked external knowledge acquisition to the innovation process (e.g. Zahra & George, 2002). Organisations engage in knowledge acquisition when they lack the internal resources to successfully innovate (Maes & Sels, 2014). In table C2.4 the authors summarize the sample papers' contribution to the acquisition-innovation link.

Table C2.4 - Literature on knowledge acquisition and innovation

Author(s)	Sample	Innovation type	Main findings
(Liao et al., 2010)	362 questionnaires from financial and manufacturing firms.	Product, process, and management innovation.	Absorptive capacity is the mediator between KA and innovation capability.
(Liao et al., 2012)	449 questionnaires from 23 companies.	Product, market, process, behavioural, and strategic innovation.	Organisational learning fully mediates the KA-innovation link.
(Martinez-Canas et al., 2012)	214 firms located inside science and technology parks.	New product development.	KA fully mediates the social capital-firm innovation relationship.
(Marvel, 2012)	166 founders of new technology ventures.	Radical product/service innovation.	KA (customer problems and markets) is positively associated with innovation radicalness.
(Maurer, 2010)	218 projects directed by 144 firms in the German engineering industry.	Product innovation	KA from project partners positively influences product innovation.
(Molina-Morales et al., 2014)	224 Spanish footwear firms.	New product performance.	KA is positively associated to the innovative performance of the firm.
(Parra-Requena et al., 2013)	166 Spanish footwear firms.	New product performance.	Combinative capability positively moderates the KA-innovation relationship.

Note: KA = Knowledge Acquisition

Knowledge acquisition is frequently studied considering its indirect effect on innovation outputs, being mediated by other organisational variables (see section 4.4.2.).

On other hand, it seems to directly influence radical product/service innovation (Marvel, 2012), product innovation (Maurer, 2010), and new product performance (Molina-Morales et al., 2014).

Knowledge acquisition is defined as "the process by which organisations obtain knowledge" (Molina-Morales et al., 2014, p. 236), and it is studied by taking into account external sources of knowledge, but also by encompassing internal creation (Liao et al., 2012), or several dimensions, such as technological knowledge, ways to serve markets, customer problems, and market knowledge acquisition (Marvel, 2012).

Papers which study knowledge acquisition highlight related organisational themes like social capital (Martinez-Canas et al., 2012; Molina-Morales et al., 2014; Parra-Requena et al., 2013), absorptive capacity (Liao et al., 2010), and networks (Zheng et al., 2011), focusing on external ties and the competition/cooperation dilemma (Zhang et al., 2010).

4.2.2. Knowledge sharing and innovation

Knowledge sharing, which can be defined as "the act of placing knowledge possessed by an individual at the disposition of others within the organization" (Camelo-Ordaz, Garcia-Cruz, Sousa-Ginel, & Valle-Cabrera, 2011, p. 1444), plays a key role in innovation by directly influencing product innovation (Camelo-Ordaz et al., 2011; Wong, 2013), radical innovation (Maes & Sels, 2014), and innovation capability (Saenz et al., 2012). When shared trough web platforms knowledge is also positively related to innovation (Soto-Acosta et al., 2014). Table C2.5 summarizes the sample papers' contributions to the knowledge sharing-innovation literature.

Despite the general definition presented above, some papers conceptualize knowledge sharing as comprising different dimensions, such as symbiosis, reputation, and altruism (M. L. M. Hu et al., 2009). Other papers consider different mechanisms that allow the sharing of knowledge, like information and communication technology, personal interaction, and management processes (Saenz et al., 2012).

Table C2.5 - Literature on knowledge sharing and innovation

Author(s)	Sample	Innovation type	Main findings
(Camelo-Ordaz et al., 2011)	87 R&D departments of Spanish companies.	Product innovation.	KSH positively influence innovation.
(Connell et al., 2014)	4 Industry clusters located in Dubai and Australia.	Collaborative innovation	Interaction between firms can promote KSH and foster innovation.
(M. L. M. Hu et al., 2009)	621 employees in 35 different international tourist hotels in Taiwan.	Service innovation performance.	Team culture moderates the relationship between KSH and service innovation.
(L. Y. Hu & Randel, 2014)	219 work teams, representing 1,012 team members.	Team innovation.	Tacit KSH fully mediates the relationship between explicit KSH and team innovation.
(M. L. M. Hu et al., 2012)	1,260 employees from 35 of Taiwan's international tourist hotels.	Team service innovation performance.	KSH-service innovation relationship is mediated by leader member exchange and team member exchange.
(Kumar & Rose, 2012)	472 Administrative and Diplomatic Service Officers from Malaysian's public sector organisations.	Innovation Capability.	Islamic Work Ethic moderates the KSH-innovation relationship.
(Maes & Sels, 2014)	194 Belgian SME's.	Radical Innovation.	KSH directly influences radical innovation.
(Saenz et al., 2012)	75 Spanish and 69 Columbian medium-high and high technology firms.	Innovation capability (new idea generation and innovation project management)	KSH (except ICT-based) is key to enhance innovation capability.
(Soto-Acosta et al., 2014)	535 Spanish SME's.	Innovation (new technological knowledge and ideas in new products and processes)	Web KSH positively contributes to innovation.

Author(s)	Sample	Innovation type	Main findings
(Z. N. Wang & Wang, 2012)	89 high technology firms in Jiangsu (China).	Innovation speed.	Explicit and tacit KSH practices facilitate innovation. Explicit KSH has more significant effects on innovation speed. Tacit KSH has more significant effects on innovation quality.
(Wong, 2013)	203 green innovation project leaders from electronics manufacturers in China.	Green product innovation; Green process innovation; New green product success.	KSH positively influences green product/process innovation.

Note: KSH = Knowledge Sharing

The sample papers highlight research topics like team culture (M. L. M. Hu et al., 2009), and affective commitment (Camelo-Ordaz et al., 2011), showing the importance of commitment-based human resources practices (Soto-Acosta et al., 2014), during this human-oriented stage. Absorptive capacity is related to knowledge sharing in Maes and Sels' (2014) paper, which demonstrates the importance of sharing knowledge in order to transform and exploit existing knowledge for innovation. Firm location in industry clusters with similar businesses (Connell et al., 2014), and the construction of apprentice-based and intra-organisational communities of practice (Pattinson & Preece, 2014) also support knowledge sharing.

4.2.3. Knowledge codification and innovation

One paper from the sample examines knowledge codification's role on a sample of 54 companies in the Spanish biotech sector. The results underline the influence of knowledge codification on innovation, concluding that "the process of converting the codifiable tacit knowledge into messages" is beneficial to firms that are developing incremental innovations (Garcia-Muina et al., 2009, p. 142).

4.2.4. Knowledge creation and innovation

The sample papers conceptualize knowledge creation in different manners. Shu, Page, Gao, and Jiang (2012) consider the two dimensions of knowledge exchange and knowledge combination, in order to test the influence of knowledge creation on product and process

innovation. The results from a cross-sectional survey of 270 Chinese companies show that knowledge creation, particularly knowledge combination, positively influences product and process innovations. Zelaya-Zamora and Senoo (2013) see knowledge creation capability as a construct encompassing six dimensions (absorptive capacity, SECI performance, external ties, inter-unit ties, members' commitment, and cooperation and trust), which are positively and significantly associated with innovation performance. Spaeth, Stuermer, and von Krogh's (2010) case study analyses knowledge creation in the context of a push model of open innovation, which is defined as "knowledge creation by external contributors that is uncompensated by the firm but that pushes knowledge into the open innovation process" (p. 423). Through examining explicit knowledge shared within discussion forums, the authors shed light on knowledge creation in open innovation, which is enhanced through "lowering the entry barriers for external participants who seek to join and contribute" (p. 427). Another case study by Iacono, Martinez, Mangia, and Galdiero (2012) draws attention to inter-organisational relationships for knowledge creation and product and process innovation in the context of temporary project networks.

4.2.5. Knowledge management processes and innovation

Sixteen papers from the sample study the relationship of more than one KMP with innovation. Table C2.6 summarizes nine of these contributions and the main conclusions concerning the KMP-innovation relationship. These papers provide empirical analysis, showing that KMP directly impact on innovation (Aboelmaged, 2014; Hung et al., 2010; Lee et al., 2013; Liao & Wu, 2010; R. J. Lin et al., 2012; G. N. Xu et al., 2012; Zhou & Li, 2012). KMP also mediate the relationship between numerous organisational variables and innovation (see section 4.4.1.)

Table C2.6 - Knowledge management processes and innovation

Author(s)	Sample	KMP	Innovation type	Main findings
(Andreeva & Kianto, 2011)	221 companies from Finland, Russia, and China.	KC; KST; KSH; KA.	Innovation performance (products/services, processes, management, and marketing).	All KMP positively influence innovation.

Author(s)	Sample	KMP	Innovation type	Main findings
(C. J. Chen & Huang, 2009)	146 Taiwanese firms.	KA; KSH; KAPP.	Administrative innovation; Technical innovation.	KMP directly influence innovation.
(Huang & Li, 2009)	176 firms in Taiwan.	KA; KSH; KAPP.	Administrative innovation; Technical innovation.	KMP positively influence innovation.
(Lee et al., 2013)	162 Malaysian manufacturing firms.	KA; KSH; KAPP; KST.	Technological innovation.	KMP are positively and significantly related to technological innovation.
(Y. Li et al., 2009)	607 Chinese firms.	KSH; KAPP.	Technological innovation.	The positive relationship between KSH and a firm's innovation is mediated by KAPP.
(Liao & Wu, 2010)	327 Taiwanese companies (manufacturing and finance).	KA; KAPP.	Product innovation, market innovation, process innovation, behavioural innovation, and strategic innovation.	Knowledge management is significantly and positively related to organisational innovation.
(G. N. Xu et al., 2012)	228 Chinese manufacturing firms.	KA; KAPP.	Technology innovation performance.	KMP contribute to the enhancement of technological innovation performance.

Author(s)	Sample	KMP	Innovation type	Main findings
(Zhang et al., 2010)	127 German firms engaged in strategic alliances.	KA; KC.	Innovative performance.	KA's effect on innovation is mediated by KC.
(Zhou & Li, 2012)	2 samples of 177/68 Chinese firms respectively.	KSH; Market KA.	Radical innovation.	KSH is beneficial for innovation in broad knowledge bases. KA positively influences radical innovation in deep knowledge bases.

Note: KA = Knowledge Acquisition; KC = Knowledge Creation; KST = Knowledge Storage; KSH = Knowledge Sharing; KAPP = Knowledge Application

4.2.6. Theoretical developments on KMP-innovation literature.

Four papers theoretically discuss the impact and relationship of knowledge management and innovation (Alguezaui & Filieri, 2010; Esterhuizen et al., 2012; Quintane et al., 2011; J. Xu et al., 2010). Esterhuizen et al. (2012) develop an innovation maturity model regarding Nonaka's SECI model of knowledge creation. The authors argue that externalisation is the key action necessary to move from the limited innovation practices of maturity level 1, to maturity level 3, where the best innovation practices are identified and implemented. Thereafter, combination and internalisation will help organisations move from maturity level 3 to level 5, where practices are institutionalised and become natural behaviour. Lastly, socialisation acts as an underlying process that supports innovation maturity growth across all five levels. The idea that knowledge creation is intrinsically related to innovation is shared by Quintane et al. (2011). In their work, they conceptualize innovation as useful new knowledge that can be duplicated and which is new to the context it is introduced to. Although knowledge creation is critical for innovation, organisations also need to use and apply existing knowledge to support

innovation (J. Xu et al., 2010). These key processes to innovation are complemented with acquisition, personalisation and sharing, and knowledge refinement, creating a knowledge life cycle that leverages the innovation process. Tacit knowledge sharing with partners in cohesive and sparse networks is essential to incremental and radical innovation, respectively (Alguezaui & Filieri, 2010).

4.3. Innovation type

This section analyses the sample papers by innovation type, considering the established innovation categories of product/service and process innovation, radical and incremental innovation, and administrative or technical innovation (Gopalakrishnan & Damanpour, 1997). The authors also consider papers which conceptualisation does not match these categories but provide a solid theoretical definition. The tables provided in section 4.3. follow the terminology used by the papers in the innovation type row.

4.3.1. Product/service and process innovation

Fourteen papers empirically studied or theoretically developed product/service innovation. These papers consider different characteristics of product innovation such as new product performance (Molina-Morales et al., 2014; Parra-Requena et al., 2013), and product ergonomics (Iacono et al., 2012). Diverse indicators, such as the new products count (Martinez-Canas et al., 2012), the introduction of new products (Maurer, 2010), market share, sales, growth rate (R. J. Lin et al., 2012), and the frequency of a products' renewal (Camelo-Ordaz et al., 2011) are used to operationalize this type of innovation. Only three out of the fourteen papers focus exclusively on service innovation. The development of new services and employee service innovation behaviour reflect service innovation performance (M. L. M. Hu et al., 2009, 2012). A qualitative contribution was made to service innovation research by Taminiau, Smit and de Lange (2009). The authors state that service innovation research faces different challenges when compared with product innovation, because service innovation is "much more difficult to pinpoint" (p.43), than innovation in manufacturing firms.

Four papers consider process innovation as a knowledge-based outcome. This innovation type is operationalised as the improvement in "manufacturing or operational processes" (Shu, Page,

Gao, & Jiang, 2012, p. 133) and "the efficient use of energy, materials and resources" (Wong, 2013, p. 323), in relation to manufacturing and production processes.

4.3.2. Radical and incremental innovations

Incremental innovation is theoretically studied by Alguezaui and Filieri's (2010) paper, which considers the contributions of social capital and specially sparse networks to the "minor changes to the firm's current products, services, processes, administrative or technical conditions" (p. 902), which are obtained through the integration and combination of different knowledge sources. This type of innovation can also benefit from knowledge acquisition in apprentice-based and intra-organisational communities of practice (Pattinson & Preece, 2014).

Radical innovation is consensually conceptualised as the significant improvement in companies' products/services, as well as new technological patterns, which alter consumption patterns in a market (Alguezaui & Filieri, 2010; Maes & Sels, 2014; Marvel, 2012; Zhou & Li, 2012). This is reflected in indicators used to measure this innovation type, for example, "Our product/service represents an entirely new type of product/service" (Marvel, 2012, p. 456).

4.3.3. Technical and administrative innovation

Three papers from our sample study administrative innovation (Aboelmaged, 2014; C. J. Chen & Huang, 2009; Huang & Li, 2009), which measures the degree of innovation in "planning procedures, process control systems, and integrated mechanisms" (Huang & Li, 2009, p. 294). In turn, technical innovation measures the extent to which companies develop technologies, incorporate them into new products, and facilitate new processes to improve quality and lower costs (C. J. Chen & Huang, 2009; Huang & Li, 2009; Y. Li et al., 2009). Garcia-Muina et al. (2009), make a distinction between radical and incremental technical innovations, based upon the diffusion of the technological knowledge used to produce the new product and/or process. Indicators used to assess firms' technological innovation include the number of new products, the speed of new product development, and the rate of success of the new product (G. N. Xu et al., 2012).

4.3.4. Other innovation conceptualisations

Results highlight that, while traditional categories of innovation are frequently found, almost half of the sample papers (19 out of 45) provide different definitions of innovation. Theoretical papers propose new definitions that see "innovation as the creation of new knowledge that is necessary to replicate the process leading to innovation outcomes" (Quintane et al., 2011, p. 940), in addition to intrinsically relate the process of continuous innovation to KM and knowledge bases (J. Xu et al., 2010). Empirical papers also provide theoretical developments to the innovation literature. In Kianto's (2011) paper, continuous innovation encompasses the three factors of individual creativity, knowledge implementation, and strategic flexibility. In turn, the combination of different activities (knowledge creation and utilisation) with the main actors in innovation (firms and external constituents) results in a new framework for open innovation (Spaeth et al., 2010). Emphasizing the importance of time for innovation, innovation speed is conceptualised as the time elapsed between initial development and ultimate commercialisation of products/services in Wang and Wang's (2012) paper.

Three approaches to innovation emerge from the analysis of the remaining papers:

(1) Organisational innovation - these papers provide broad definitions of innovation, and they consider innovation as a construct encompassing product innovation, market innovation, behavioural innovation, and strategic innovation, all as organisational innovation dimensions (Liao et al., 2012; Liao & Wu, 2010);

(2) Innovation capability - the organisational means that generate innovative outputs (Esterhuizen et al., 2012), encompass new idea generation and innovation project management (Saenz et al., 2012), and affect innovation performance;

(3) Innovation performance - the degree to which companies innovate in terms of products/services, processes, management, and marketing (Andreeva & Kianto, 2011), in order to increase innovative outcomes (Zhang et al., 2010; Zheng et al., 2011) when compared with competitors (Zelaya-Zamora & Senoo, 2013). Innovation performance comprises market and product performance in Lai et al.'s (2014) conceptualisation and can be applied to team innovation performance as well (L. Y. Hu & Randel, 2014).

4.4. Mediation results

Eighteen papers from the sample empirically analyse mediation effects between: (1) KMP (as mediating variable), independent variables, and innovation; (2) KMP (as independent variable), mediating variables, and innovation; or (3) KMP (with some processes mediating the relationship between other processes and innovation).

4.4.1. KMP as mediating variable

Eight papers empirically analyse the mediating role that KMP play between independent variables and innovation. These papers, while analysing the mediating role of KMP, provide evidence that knowledge processes, more than directly influence innovation, can act as an intervening variable through which different dependent variables like social capital (Martinez-Canas et al., 2012) or strategic human resources practices (C. J. Chen & Huang, 2009) influence innovation. Results are synthesised in Table C2.7.

Table C2.7 - KMP as mediators between independent variables and innovation

Author(s)	Independent variable	Mediator variable	Mediation results
(C. J. Chen & Huang, 2009)	Strategic Human Resources Practices	KM Capacity (Acquisition; sharing; application).	Full mediation occurs.
(L. Y. Hu & Randel, 2014)	Extrinsic incentives for knowledge sharing.	Tacit knowledge sharing.	Partial mediation occurs.
(Huang & Li, 2009)	Social interaction (trust; communication; coordination).	KM (acquisition; sharing; application).	Full mediation occurs.
(Lai et al., 2014)	Industry clusters	KM (Knowledge creation and acquisition; knowledge dissemination and storage).	Full mediation occurs.
(R. J. Lin et al., 2012)	Market orientation	Customer KM (acquisition; sharing; application).	Full mediation occurs.

Author(s)	Independent variable	Mediator variable	Mediation results
(Martinez-Canas et al., 2012)	Social Capital	Knowledge acquisition	Full mediation occurs.
(Molina-Morales et al., 2014)	Cognitive proximity	Knowledge acquisition.	Partial mediation occurs.
(Shu et al., 2012)	Managerial ties	Knowledge creation (exchange and combination).	Full mediation occurs.

4.4.2. Other mediating variables

Five papers analyse KMPs as independent variables, whose relationship with innovation is mediated by other organisational variables. Table C2.8 shows the results about the mediation effects.

Table C2.8 - Mediation variables between KMP and innovation.

Author(s)	Independent variable	Mediator variable	Mediation results
(Alegre et al., 2011)	KM practices (dissemination; storage).	KM dynamic capabilities (internal and external learning competence).	Full mediation occurs.
(M. L. M. Hu et al., 2012)	Knowledge Sharing.	Leader-member exchange (LMX; Team-member exchange (TMX).	Partial mediation occurs.
(Hung et al., 2010)	KM initiatives (creation; storage; transfer; and application).	Total quality management practices.	Full mediation occurs.
(Liao & Wu, 2010)	KM (acquisition; conversion; application).	Organisational learning.	Full mediation occurs.
(Liao et al., 2010)	Knowledge Acquisition	Absorptive capacity	Full mediation occurs.

The results show that, while knowledge processes are important and can directly affect innovation, dynamic learning capabilities (Alegre et al., 2011; Liao & Wu, 2010; Liao et al., 2010) are mediating this relationship.

4.4.3.Mediation effects between KMP

Lastly, some authors provide interesting results about interactions between different KMP. Table C2.9 presents the results about mediation effects between KMP, with some processes acting as mediators between other KMP and innovation.

Table C2.9 – KMP as mediators and independent variables related to innovation.

Author(s)	Independent variable	Mediator variable	Mediation results
(Andreeva & Kianto, 2011)	Knowledge acquisition; knowledge sharing and application; knowledge storage and documentation.	Knowledge creation.	Full mediation occurs.
(Lee et al., 2013)	Knowledge acquisition.	Knowledge sharing.	Full mediation occurs.
(Y. Li et al., 2009)	Knowledge sharing.	Knowledge application.	Full mediation occurs.
(Zhang et al., 2010)	Knowledge acquisition.	Knowledge creation.	Full mediation occurs.
(Zheng et al., 2011)	Knowledge acquisition; knowledge generation.	Knowledge combination	Full mediation occurs.

The full mediation results found by the analysed papers show that some knowledge processes exert their effect on innovation through other processes like the creation of new knowledge (Andreeva & Kianto, 2011; Zhang et al., 2010) or its application (Y. Li et al., 2009).

5. Discussion and conclusion

This SLR aims to discover which knowledge management processes are frequently studied, considering its relationship with innovation, as well as to show and discuss the main findings of KMP-innovation literature. Results show that the knowledge processes are important to leverage innovation. However, each key KMP not always directly influence innovation, but also is mediated by other organisational variables. Particularly, knowledge acquisition seems to be more effective for innovation purposes when it is market-focused (Darroch & McNaughton, 2002; R. J. Lin et al., 2012; Zhou & Li, 2012). Otherwise, newly acquired knowledge may depend on organisational dynamic capabilities (e.g., absorptive capacity), organisational learning, combinative capabilities or other KMP like creation and application. Thereby, results suggest that knowledge is more likely to promote innovation results in organisations with high absorptive capacity and learning capabilities. Even more, they support Xu et al.'s (2010) review that emphasises the key role of knowledge creation and application. In fact, knowledge creation fully mediates the impact of other KMP on innovation (Andreeva & Kianto, 2011; Zhang et al., 2010), while knowledge application mediates the relationship between knowledge sharing and innovation (Y. Li et al., 2009). Thus, it seems that the impact that KMP like acquisition, sharing, and storage have on innovation happens through two central processes: knowledge creation and knowledge application.

Knowledge sharing and knowledge acquisition are the most frequently studied KMP by empirical papers, considering the relationship with innovation. This is an interesting result considering that theoretical KM papers emphasize the role of knowledge creation and application for innovation (Esterhuizen et al., 2012; Nonaka, 1991; Popadiuk & Choo, 2006; Quintane et al., 2011; J. Xu et al., 2010). However, this shows the current research's concern about external search and organisational networks in order to broaden and deepen the organisational knowledge base, as well as the need for human interaction for ideation and innovation purposes. Nevertheless, strengthening the knowledge base through external acquisition, or internal knowledge creation, provides a potential for innovation activities and outcomes. This potential innovation capacity is realised when knowledge is shared among individuals and units,

and is subsequently applied, highlighting the importance of creating a knowledge sharing culture in organisations (Aboelmaged, 2014; He & Abdous, 2013).

Considering the innovation types in this study, this SLR concludes that normally innovation is defined in a narrow manner (Garcia & Calantone, 2002), and can become a buzzword. Hence, many authors use it in a paper's title and abstract, even when only a dimension of the overall construct is discussed by the paper (e.g., Parra-Requena et al., 2013). However, other authors choose to identify the specific innovation type under study in the title of their papers (e.g., Garcia-Muina et al., 2009; Maurer, 2010; G. N. Xu et al., 2012). Regarding the different ways to measure innovation, we argue that the use of new product count (e.g. Zhang et al., 2010) is a questionable way to measure innovative performance. As noticed by other authors, the simple introduction of a new product does not necessarily count as an innovation, as some characteristics first need to be fulfilled by the new product (Quintane et al., 2011).

Product/service innovations, which were studied by 14 out of the 45 papers, are the most popular innovation types being researched. Nevertheless, some innovation conceptualisations that do not satisfy the traditional categories were identified by this review, reflecting the need for broader conceptualisations of innovation (Weerawardena, 2003a). The authors' codification procedure aggregates them in three emerging innovation approaches: organisational innovation (i.e., when papers broadly define innovation as the combination of all traditional innovation types.), innovation capability (i.e., when papers consider the means through which organisations innovate), and innovation performance (i.e., when papers analyse indicators in terms of the degree of innovation and the performance of the innovation outcomes).

In short, this SLR provides strong evidence that the KMP-innovation relationship exist but is not always through a direct link. This goes in line with Du Plessis (2007, p. 22) that asserted that "knowledge management is not solely focused on innovation, but it creates an environment conducive for innovation to take place".

6. Limitations and implications for research and practice

This review is limited to journals indexed in the Web of Science™ platform, and the findings are the result of a sample of papers obtained through a research string. However, considering

SLR steps, and the proliferation of papers in the fields of KM and innovation, it becomes necessary to consider both a limited time span, and a limited number of knowledge processes, so that the literature review becomes feasible. Furthermore, the authors suggest that future research aiming at review papers from multiple databases should apply quality criteria to the search results. It is also expected that slightly differences will occur during future reproduction of the search steps, as the number of papers retrieved by the databases depend upon institutional subscriptions.

Lastly, the extensive review provided by this paper reaches some important practical implications for both researchers and practitioners. The results provided from recent relevant literature show that organisations that want to innovate must set up a bundle of key KMP to achieve innovation outcomes. This paper provides a synthesis of KMP-innovation research that can be valuable as a starting point for future investigation. Further research is needed to deeply understand the intervening role of dynamic capabilities and organisational learning between KMP and innovation. Knowledge sharing through web platforms calls for further research since the results are divergent (Saenz et al., 2012; Soto-Acosta et al., 2014). The considerable amount of papers (44% of the empirical papers) that investigate the intervening effects of mediating variables shows that KMP-innovation research is a mature research field. Thus, process (mediation) analysis should complement causal relations, providing answers to "how" questions. Additionally, following previous qualitative research (e.g., Connell et al., 2014; Iacono et al., 2012; Pattinson and Preece, 2014; Spaeth et al., 2010; Taminiau et al., 2009), qualitative studies should continue to expand our knowledge about the complex relations between knowledge and innovation in specific organisational realities. Managers should encourage interaction with competitors and customers, required for knowledge acquisition about companies' products, and thus promoting innovation. Human resources managers should also implement commitment-based practices, promoting trust, and motivation, increasing knowledge sharing.

Innovation, as a widely researched topic, calls for frequent reviews that can aggregate new conceptualisations. The sample papers analysed by this review show that broad conceptualisations of innovation (e.g., Wang and Ahmed, 2004; Weerawardena, 2003b) are

currently used, suggesting that KMP play a key role in diverse innovation outcomes. Additionally, innovation studies should also contribute to advance our understanding about the empirical relationships between different innovation types (Ceylan, 2013).

Note

1. TS[4] = ("Knowledge Management" OR "knowledge sharing" OR "knowledge acquisition" OR "knowledge codification" OR "knowledge storage" OR "knowledge application" OR "Knowledge creation") AND TI[5]= ("innovation")

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[4] TS = Topic. Searches for topic terms in the following fields within a record: Title; Abstract; Author Keywords; and Keywords Plus.

[5] TI = Title; Searches the Title field within a record.

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Appendix 1

Inclusion criteria:

- Papers written in English. Reasoning: as English is the dominant language of the scientific community, and considering the replicability goal of our SLR, we only included papers written in English.
- Published in peer-reviewed journals. Reasoning: as we are concerned with the papers' quality, we assume that by only examining peer-reviewed papers we will ensure higher quality and reliability in our sample.
- Articles and reviews. Reasoning: the present review only considers these document types, and excludes, for example, conference proceedings, editorial notes, and books.
- Full paper availability. Reasoning: considering the goals of this review, full access to the papers is mandatory. Thus, papers that were not available through the authors' institutional login, or due to an embargo policy, were not considered in the final sample.

Exclusion criteria:

- Papers where the level of analysis surpasses the inter-organisational level. Reasoning: considering the scientific domain of the authors, only individual, group, and organisational levels were considered.
- Papers that do not explore, directly or indirectly, the KMP-innovation relationship. Reasoning: Some papers refer to KMP, but do not contribute theoretically or empirically

to its relationship with innovation (e.g., Laursen et al., 2012; Y. A. Li, Lee, Li, & Liu, 2010).

- Papers that do not provide enough information about what type of innovation is analysed. Reasoning: we do not restrict papers by innovation type, although papers that do not clearly define which innovation type is studied were not considered (e.g., Iqbal et al., 2011).

Considerações Finais – Parte 1

A parte 1 da presente tese, que agora se encerra, definiu conceptualmente e operacionalizou ao nível de potenciais medidas a capacidade de absorção e os processos de gestão do conhecimento, nas suas inter-relações, bem como na sua relação com a inovação. Nesse sentido, a literatura teórica e empírica consultada e analisada permite sustentar, de forma fundamentada, o estabelecimento de relações teóricas entre processos chave de gestão do conhecimento, a capacidade de absorção, e a inovação organizacional.

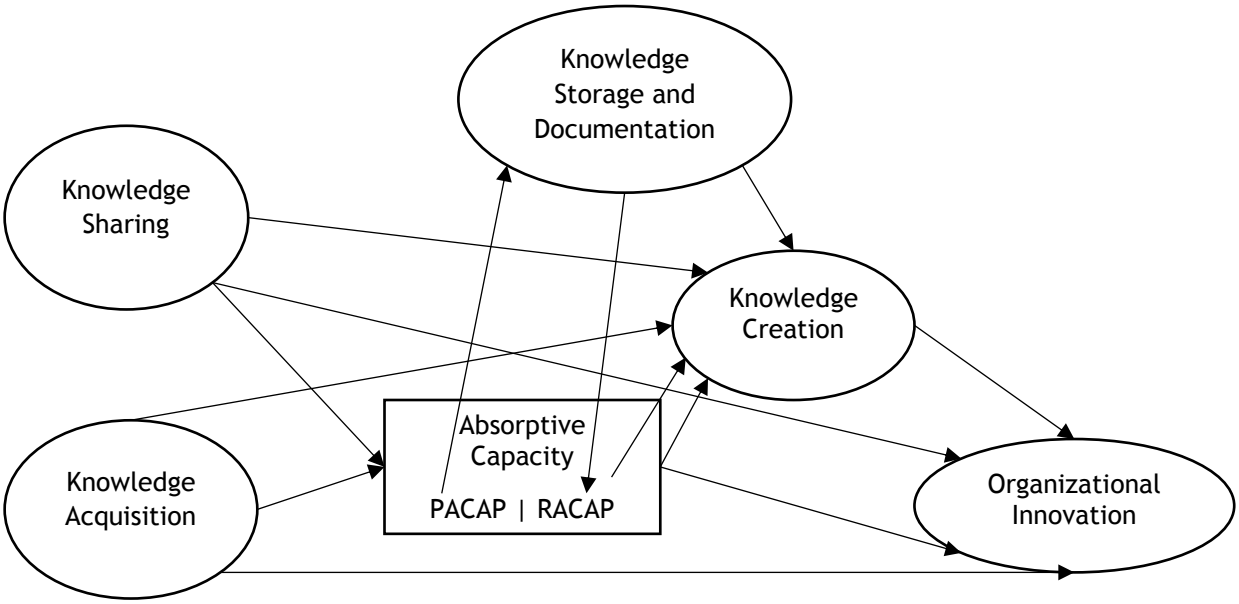
O Capítulo 1, ao apresentar uma revisão de literatura sobre capacidade de absorção e processos de gestão do conhecimento, sustentou teoricamente as relações entre processos organizacionais de gestão do conhecimento e fases da capacidade de absorção, na relação com a inovação. Os referenciais teóricos e empíricos apresentados justificam, assim, a elaboração de um modelo teórico conjunto, onde a capacidade de absorção e os processos de gestão do conhecimento sejam perspetivados de forma integrada, reforçando a importância do conhecimento enquanto variável influente nos resultados organizacionais.

O Capítulo 2, por seu turno, centrou-se na ligação entre os processos de aquisição, partilha, codificação, armazenamento, criação e aplicação do conhecimento e diferentes tipos de inovação, fornecendo uma análise às relações diretas e indiretas (mediadas) entre processos organizacionais de gestão do conhecimento e a inovação.

Da integração de elementos dos dois capítulos constituintes da primeira parte da tese, com a sua diversidade metodológica e atendendo aos principais contributos teóricos (Cohen & Levinthal, 1990; Lane et al., 2006; Mariano & Walter, 2015; Sun, 2010; Zahra & George, 2002) e empíricos (Chou, 2005; Kotabe et al., 2011; Liao et al., 2007, 2010; Maes & Sels, 2014; Su et al., 2013) apresentados, surge o modelo cuja lógica orientará o desenvolvimento e estruturação da parte 2 – e respetivos conteúdos empíricos – e que em seguida se apresenta esquemática e sinteticamente na Figura CF.1.

A Figura CF.1 apresenta uma representação pictórica do posicionamento das variáveis e lógica das principais relações teóricas, estabelecidas a partir dos contributos teóricos dos capítulos 1 e 2, que serão testadas e analisadas nos capítulos empíricos constituintes da parte 2 da tese.

Figure CF.1 – Modelo teórico[6]



Como é possível verificar na Figura CF.1, a capacidade de absorção é posicionada como antecedente e consequente de diversos processos. Nomeadamente, o modelo prevê que a partilha interna de conhecimento, bem como a aquisição externa de novo conhecimento, desempenhem um papel preditor da capacidade de absorção. Nesse sentido, é expectável que estes processos reforcem a capacidade de as organizações identificarem, assimilarem, e aplicarem conhecimento externamente adquirido. Já a criação interna de novo conhecimento é posicionada no modelo como um resultado, não apenas dos restantes processos de gestão do conhecimento, mas, também, da capacidade de absorção das organizações, considerando que esta capacidade reforçará o processo de criação, por via da combinação de conhecimento existente e novo conhecimento externamente adquirido. O processo de armazenamento e

[6] Considerando a natureza dos capítulos empíricos, que correspondem a conteúdo publicado (Capítulo 3) ou submetido a periódico científico internacional (Capítulo 4) e à consequente utilização, nos mesmos, da língua Inglesa, optou-se por apresentar o modelo teórico da tese com os nomes das variáveis/constructos em língua Inglesa.

documentação do conhecimento é posicionado enquanto variável antecedente da criação de novo conhecimento e da capacidade efetiva de absorção do conhecimento. Por último, a inovação organizacional posiciona-se como um potencial resultado das restantes variáveis.

Parte 2

Capítulo 3 | Knowledge processes, absorptive capacity and innovation: a mediation analysis

[Contents of this chapter were published in the following paper (cf. Anexo 5):

Costa, V., and Monteiro, S. (2016) Knowledge Processes, Absorptive Capacity and Innovation: A Mediation Analysis. *Knowledge and Process Management, 23*(3), 207–218.

doi: 10.1002/kpm.1507.]

Abstract

The present research aims to explore the role of knowledge creation and absorptive capacity as mediating variables between knowledge acquisition, knowledge sharing, and companies' organizational innovation. A theoretical model supporting the hypothesized relationships is developed, and then research hypotheses are tested with a sample of 111 industrial organizations, using partial least squares structural equation modelling. The results show that knowledge creation positively influences innovation and partially mediates the relationship between intra-firm knowledge sharing and innovation. Knowledge acquisition from external partners is not enough to promote innovation results, but significantly reinforces absorptive capacity, as well as knowledge sharing. Companies' absorptive capacity fosters the creation of knowledge, but does not significantly influence organizational innovation. The small sample size limits generalization of the present findings. Further research should explore the complementary role of knowledge creation and absorptive capacity in both small and medium-sized enterprises and large companies. Knowledge management practitioners should facilitate

a knowledge sharing environment, where new ideas and solutions can be developed and consequently innovation outcomes are likely to occur. This paper follows recent approaches to mediation analysis and covers advanced topics in PLS-SEM literature, providing empirical examples of the application of hierarchical component models and mediation analysis using bootstrap.

Keywords: knowledge management; knowledge processes; knowledge creation; absorptive capacity; innovation; PLS-SEM.

1. Introduction

Organizations in general, and particularly small and medium-sized enterprises (SME) facing constantly changing environments seek to innovate in order to survive and gain competitive advantage (Purcarea, Espinosa, & Apetrei, 2013). To do so, they need to manage knowledge required for innovation, that is, the development of new products, production processes, administrative changes, and marketing improvements (Weerawardena, 2003a). The literature has identified several knowledge management processes (KMP) such as creation (Popadiuk & Choo, 2006), acquisition (Martinez-Canas et al., 2012), and sharing (Liao et al., 2007) as precursors of innovation outcomes. Furthermore, the organization's capacity to identify, acquire, and commercially exploit external knowledge, that is, its absorptive capacity (ACAP) (Cohen & Levinthal, 1990), has also been studied considering its impact on innovation (e.g., Gebauer et al., 2012; Murovec and Prodan, 2009).

Innovation is a very broad research topic, and different types of innovation are frequently identified, as well as different stages of the innovation process, and diverse levels of analysis (Gopalakrishnan & Damanpour, 1997). Focusing on the knowledge management field, knowledge is considered a knowledge-based outcome, that is, innovation as new, duplicable, and useful knowledge (Quintane et al., 2011). However, researchers frequently consider innovation outputs as new concrete products, services, managerial practices, and marketing strategies (Andreeva & Kianto, 2011; Popadiuk & Choo, 2006; Paavo Ritala, Olander, Michailova, & Husted, 2015; Weerawardena, 2003a).

However, according to recent contributions in the field (cf. Costa & Monteiro, 2014), only a few papers have previously addressed the relationship between KMP, absorptive capacity and innovation (Chou, 2005; Kotabe et al., 2011; Liao et al., 2007, 2010; Maes & Sels, 2014; Su et al., 2013). Therefore, this paper follows a knowledge-based view of the firm, in which knowledge is considered the most valuable resource to achieve a sustained competitive advantage (R. Grant, 2006; R. M. Grant, 1996; Kogut & Zander, 1992), and investigates the relationship between absorptive capacity, knowledge processes and innovation, being guided by the following questions: (1) Do knowledge processes positively impact on organizational innovation? (2) Is absorptive capacity playing a mediating role between knowledge acquisition,

knowledge sharing, and organizational innovation? (3) Is internal knowledge creation reinforcing innovation, and mediating the effect of other knowledge processes?

By answering these questions, this paper contributes to knowledge management, dynamic capabilities, and innovation research and practice, showing that innovation can be diversely influenced by knowledge and organizational capabilities and routines.

The remainder of the paper is organized as follows: section 2 presents the literature review and research hypotheses; section 3 shows the method of the research; section 4 states the results of the measurement and structural model and the test of the research hypotheses; section 5 presents the discussion of the results, conclusions, limitations and further research challenges.

2. Literature Review and Hypotheses

Some research has recently explored the relationship between knowledge management and innovation, both empirically (e.g., Alegre et al., 2011; Andreeva and Kianto, 2011; Lee et al., 2013), and theoretically (e.g., Quintane et al., 2011; Xu et al., 2010). Moreover, the literature on knowledge management and innovation "share related underlying concepts" with absorptive capacity (Sun & Anderson, 2010, p. 147), a routine-based capability (Sun, 2010; Zahra & George, 2002). However, this relationship has been little explored, with a few exceptions (e.g., Liao et al., 2007, 2010; Su et al., 2013) that focus on only one knowledge process. Thus, this paper aims to theoretically and empirically explore the relationship between the knowledge processes of acquisition, sharing and creation, with companies' absorptive capacity, and their organizational innovation intensity. The authors argue theoretically that knowledge creation and absorptive capacity mediate the relationship between knowledge acquisition and innovation, as well as between knowledge sharing and innovation. Companies' absorptive capacity is expected to foster knowledge creation and innovation. Figure C3.1, at the end of the present section, presents the theoretical model.

2.1. Knowledge Acquisition and Innovation

External knowledge search and acquisition represents an important process for every organization, especially when internal resources are scarce and innovation is an imperative (Maes & Sels, 2014). Several papers investigate the relationship between knowledge acquisition and innovation (e.g., Pattinson & Preece, 2014; Segarra-Cipres, Roca-Puig, & Bou-Llusar, 2014; Zhou & Li, 2012), concluding that the acquisition of external knowledge promotes different innovation types, such as administrative and technical innovation (C. J. Chen & Huang, 2009), product/service innovation (Marvel, 2012), product innovation (Maurer, 2010), and new product performance (Molina-Morales et al., 2014). Thus, the authors formulate the following hypothesis:

H1a: Knowledge acquisition positively impacts on organizational innovation.

2.1.1. Relationship between knowledge acquisition, absorptive capacity and innovation

Research on knowledge acquisition, absorptive capacity and innovation has found that knowledge acquisition positively impacts on innovation, and the relationship is either moderated (Kotabe et al., 2011), or fully mediated (Liao et al., 2010) by absorptive capacity. In fact, external knowledge acquisition broadens the knowledge base, reinforcing firms' capacity to identify and successfully assimilate, transform and apply new knowledge, that is, their absorptive capacity. Therefore, the authors formulate the following research hypothesis:

H1b: Knowledge acquisition positively impacts on absorptive capacity.

Considering that knowledge acquisition can directly impact on innovation results, but that when absorptive capacity is considered in the equation, the effect of acquisition tends to change, we formulate the following hypothesis:

H1c: Absorptive capacity mediates the relationship between knowledge acquisition and innovation.

2.1.2. Relationship between knowledge acquisition, knowledge creation and innovation

Knowledge acquisition seems to directly influence new knowledge creation (Zheng et al., 2011), which in turn promotes organizational innovation (Andreeva & Kianto, 2011; Zhang et al., 2010). Therefore, some papers found that mere acquisition was not enough to stimulate innovation (Aboelmaged, 2014; Andreeva & Kianto, 2011; Lee et al., 2013; Zhang et al., 2010) or that its effect on innovation depends on the characteristics of the recipient firm's knowledge base (Zhou & Li, 2012). Hence, internal knowledge creation plays a mediating role between acquisition of new external knowledge and innovation (Andreeva & Kianto, 2011; Zhang et al., 2010). The following hypotheses are then formulated:

H1d: Knowledge acquisition positively impacts on knowledge creation.

H1e: Knowledge creation mediates the relationship between knowledge acquisition and innovation

2.2. Knowledge sharing and innovation

The knowledge management literature consistently recognizes knowledge sharing as a key process (e.g., Heisig, 2009; Hislop, 2009), and theoretically and empirically relates knowledge sharing to innovation outcomes (Lee et al., 2013; Saenz et al., 2012; Z. N. Wang & Wang, 2012; J. Xu et al., 2010). In fact, when knowledge is actively shared, different innovation outcomes such as radical innovation (Maes & Sels, 2014), product innovation (Camelo-Ordaz et al., 2011), administrative and technical innovation (C. J. Chen & Huang, 2009; Huang & Li, 2009), organizational innovation (Aboelmaged, 2014), and team innovation (L. Y. Hu & Randel, 2014) take place in organizations. Therefore, the literature allows the authors to hypothesize that:

H2a: knowledge sharing positively impacts on organizational innovation.

2.2.1. Relationship between knowledge sharing, absorptive capacity, and innovation

When knowledge is shared within organizations, individual and group knowledge turns into organizational knowledge, and knowledge can effectively be managed (van den Hooff & van Weenen, 2004). Previous research, exploring the relationship between knowledge sharing and absorptive capacity concludes that knowledge sharing promotes absorptive capacity, considering the three learning processes of exploratory, transformative and exploitative learning, and especially influences the intermediate process of transformative learning (Maes & Sels, 2014). Knowledge sharing also shows its positive influence on ACAP, as conceptualized by Minbaeva et al. (2003), in Liao et al.'s (2007) research. As stated by Zahra and George (2002), relevant knowledge needs to be shared to build mutual understanding, and this is a pre-requisite for exploitation. Lane et al. (2006, p. 838) also stated that ACAP "depends on the organization's ability to share knowledge and communicate internally". Thus, knowledge sharing seems to underpin different ACAP phases (Todorova & Durisin, 2007) and it is expected that the sharing of knowledge will strengthen firms' absorptive capacity. Following previous literature, the authors state that:

H2b: Knowledge sharing positively impacts on absorptive capacity.

Previous research findings substantiate that knowledge sharing influences innovation through firms' absorptive capacity, that is, when a knowledge sharing culture exists, absorptive capacity is reinforced, and knowledge is translated into innovations (Liao et al., 2007). The authors formulate the following hypothesis.

H2c: Absorptive capacity mediates the relationship between knowledge sharing and innovation.

2.2.2. Relationship between knowledge sharing, knowledge creation, and innovation

The knowledge management literature recognizes the relevance of sharing knowledge for new knowledge creation and innovation (Camelo-Ordaz et al., 2011; Nonaka, 1991; J. Xu et al.,

2010). Empirical studies show that knowledge sharing positively influences technical and administrative innovation (Aboelmaged, 2014), as well as innovation capability (Kumar & Rose, 2012). Moreover, empirical research has found that knowledge creation mediates the relationship between intra-firm knowledge sharing and innovation (Andreeva & Kianto, 2011). Therefore, the authors hypothesize that:

H2d: Knowledge sharing positively impacts on knowledge creation

H2e: Knowledge creation mediates the relationship between knowledge sharing and innovation.

2.3. Knowledge creation and innovation

The creation of new knowledge is closely linked to the concept of innovation. However, as stated by Andreeva and Kianto (2011), knowledge creation refers to the process through which ideas and solutions are developed within organizations, and innovation refers to the results of the application of the new knowledge. Conceptual papers have also explored the links between the knowledge creation theory (Nonaka, 1991) and the innovation process (e.g., Esterhuizen et al., 2012; Popadiuk and Choo, 2006). Current empirical research reinforces the positive and significant relationship between knowledge creation and product and process innovation (Smith et al., 2005), product and market performance (Lai et al., 2014), and organizational innovation performance (Andreeva & Kianto, 2011). Therefore, the authors hypothesize that:

H3: Knowledge creation positively impacts on organizational innovation.

2.4. Absorptive capacity and knowledge creation

The literature on knowledge creation and absorptive capacity reveals mixed results. On one hand, some studies show that new knowledge creation can be an outcome of the firm's absorptive capacity (Chou, 2005; Matusik & Heeley, 2005; Sun, 2010), since absorptive capacity acts as an accelerator of new knowledge creation (Zelaya-Zamora & Senoo, 2013). On the other hand, some authors found that both can create a synergistic effect, reinforcing each other and supporting innovation (Su et al., 2013). In fact, absorptive capacity overall – and the transformation phase in particular – seems to underpin the creation of new knowledge (Sun, 2010), resulting from the combination of firms' knowledge base with the external knowledge

already acquired and assimilated. However, some firms with lower absorptive capacity can rely on internal knowledge creation to foster innovation outcomes.

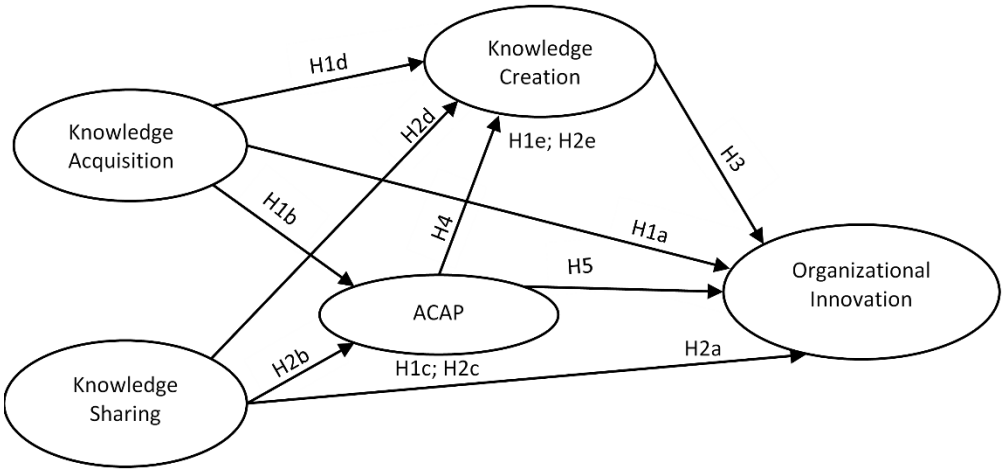
H4: Absorptive capacity positively influences knowledge creation.

2.5. Absorptive capacity and innovation

It is widely accepted that firms need external knowledge to innovate (Ferreras-Méndez et al., 2015). However, more than recognizing the benefits of access to externally developed knowledge, it is important to provide evidence that firms take advantage of such knowledge, for example, in the form of innovations (Fabrizio, 2009). Several papers have recently contributed to this understanding, by empirically linking ACAP with innovation outcomes (Y. S. Chen et al., 2009; Ebers & Maurer, 2014; Ferreras-Méndez et al., 2015; Fosfuri & Tribo, 2008; Moilanen et al., 2014; Murovec & Prodan, 2009; Su et al., 2013). In general, researchers found that absorptive capacity positively affects innovation performance (Y. S. Chen et al., 2009; Moilanen et al., 2014), product and process innovation (Murovec & Prodan, 2009), and product innovativeness (Su et al., 2013). Following current research, the authors formulate the following research hypothesis:

H5: Absorptive capacity positively influences organizational innovation intensity.

Figure C3.1 - Theoretical Model.



3. Method

3.1. Data Collection and sample

Data was collected with an online survey (cf. Anexo 6). Companies were emailed with a cover letter stating the goals of the study and containing a link to the online questionnaire. The population of this study comprises Portuguese companies with more than 10 employees that are connected with industry in multiple sectors of activity, namely: footwear, textile, moulds, metallurgy, information technologies, automotive components, plastics, chemicals, paper and cardboard, and ceramics[7]. These industries were selected considering the important role that they ascribe to innovation. Moreover, they represent, simultaneously, some of the most mature and cutting-edge industries in Portugal.

First, companies' email addresses were collected from industry associations' websites (e.g., APICCAPS; ATP; CEFAMOL; ANEME). Overall, 1739 email addresses were collected. 188 emails were automatically returned, and 111 valid answers were obtained out of the 1551 valid emails, giving a response rate of 7.16% (cf. Anexo 8).

Key informants were companies' Chief Executive Officers (CEO), top managers, middle managers and human resources professionals (86.5%), and also production managers, R&D directors or other professionals (13.5%) who were aware of the organizational processes under study. Respondents are mainly qualified workers, with 79.3% holding a degree or higher. On average, respondents have worked in the firm for 13 years and 6 months, and companies began activities 33 years ago (cf. Anexo 9).

Companies were small (52.3%), and medium-sized enterprises (41.4%), with only 7 companies having more than 250 employees. Twenty-eight firms (25.2%) have an internal R&D unit (cf. Anexo 10).

[7] Considerando a diversidade de setores incluídos na recolha de dados, foi necessário assegurar a existência de homogeneidade, de forma a conferir sentido a uma análise conjunta dos dados. Nesse sentido, sugere-se a consulta do Anexo 7, onde é apresentada uma análise da variância entre os setores de atividade analisados.

3.2. Measures

The authors requested permission to use previously developed measures (Andreeva & Kianto, 2011; Flatten, Engelen, et al., 2011; Weerawardena, 2003a), and followed guidelines for translation and cross-cultural adaptation (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Brislin, 1986; Gjersing, Caplehorn, & Clausen, 2010) in order to adapt the measures from English to European Portuguese.

The online questionnaire comprises the following measures:

Absorptive Capacity: absorptive capacity is measured with the scale developed by Flatten, Engelen, Zahra, and Brettel (2011, cf. Anexo 11). Following Zahra and George's (2002) model, several authors have recently used this measure (e.g., Aljanabi, Noor, & Kumar, 2014; Flatten, Greve, & Brettel, 2011), and its reliability has been tested in different cultural contexts (Flatten, Adams, & Brettel, 2014).

Three items (e.g., "Our management motivates the employees to use information sources within our industry") assess the acquisition dimension, that is, the use of external sources to obtain information. Assimilation, "the firm's routines and processes that allow It to analyse, process, interpret, and understand" (Zahra & George, 2002, p.189) external information, is measured with 4 items (e.g., "Our management emphasizes cross-departmental support to solve problems"). Knowledge processing in the organizations surveyed was assessed with 4 items that represent the transformation dimension (e.g., "Our employees successfully link existing knowledge with new insights"). The commercial exploitation of new knowledge was measured by 3 statements (e.g., "Our company has the ability to work more effective by adopting new technologies"). All fourteen items are measured with a seven-point Likert-type scale (CR= .947; α= .939; AVE= .563).

Knowledge Management Processes were assessed using three independent scales, translated from the work of Andreeva and Kianto (2011), and measured by a six-point semantic differential scale, with a seventh ''I don't know'' option (cf. Anexo 11).

Knowledge sharing: The intra-organizational knowledge sharing scale, with 5 items, aims "to evaluate both vertical and horizontal knowledge sharing within the organization" (Andreeva &

Kianto, 2011, p. 1023). A sample item was "In our organisation information and knowledge are actively shared within the units". The scale shows good validity in the present study (CR= .938; α= .917; AVE= .752).

Knowledge acquisition: with 3 items, the knowledge acquisition scale provides information about companies' interactions with the external environment. A sample item was "Our organisation regularly captures knowledge of our competitors". The scale presents good validity in our sample (CR= .847; α= .730; AVE= .649).

Knowledge creation: measured with 4 items (e.g., "Our organisation frequently comes up with new ideas about our products and/or services"). The knowledge creation scale evaluates the frequency of new idea development considering organizations' different activities (CR= .921; α= .886; AVE= .746).

Organizational innovation intensity: Incorporating different innovation types (product; process; managerial; marketing), organizational innovation intensity was measured with 4 items, adapted from Weerawardena (2003). The five-point scale ranges from "1= limited" to "5= extensive" (CR= .821; α= .717; AVE= .536) (cf. Anexo 11).

Control Variables: Considering the dependent and independent variables, the authors followed research guidelines (e.g., Atinc, Simmering, & Kroll, 2012) and introduced several variables to control for firm, and respondent factors. *Firm size*: several authors argue that firm size can positively influence innovation, as larger firms have more access to resources (Zheng et al., 2011). However, Damanpour (2010), analysing 20 studies on size and innovation, does not find substantial differences. Firm size was measured considering the number of employees. *Firm age:* measured by asking respondents the year of company's foundation (Huang & Li, 2009; Y. A. Li et al., 2010), this control variable was introduced considering previous research which states that firm age tends to be inversely related to innovation (Hansen, 1992; Huergo & Jaumandreu, 2004). *Firm revenue*: considering the previous year's revenue in millions of euros. *Research and Development*: a variable that is equal to 1 if the firm reports having a formal R&D department or 0 if it does not. *Exporting*: adapted from Moilanen, Østbye and Woll (2014), this variable measures the percentage of the previous year's sales which was to foreign countries, if applicable.

3.3. Statistical Method

Partial least squares structural equation modeling (PLS-SEM) using Smart PLS (Ringle et al., 2005) was used considering the sample size and the research model complexity. Additionally, the PLS algorithm does not make any assumptions about data normality (Hair, Hult, Ringle, & Sarstedt, 2014). First, the measurement model (or *outer model*) was evaluated, and then the author estimated the structural model (or *inner model*) to test the hypotheses, following the two-stage approach (Ringle, Sarstedt, & Straub, 2012). To represent the absorptive capacity construct, and its four dimensions, the authors followed a repeated indicators approach, suitable for the representation of reflective-reflective type higher-order components (Ringle et al., 2012; Wetzels, Odekerken-Schröder, & van Oppen, 2009; Wilson, 2010). The absorptive capacity indicators are suitable for this analysis since the items are similarly distributed through the 4 dimensions. Hence, items were assigned to each dimension and a higher order construct was created, incorporating all the items. Then, the authors ran the PLS algorithm and saved the latent variable scores (LVS), creating a new database. Further analysis was performed with the LVS of the low order components as manifest variables.

4. Results

Common method variance (CMV) concerns appear in the business research literature (Chang, van Witteloostuijn, & Eden, 2010; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In the present study, we undertook several steps to minimize this potential bias, since self-reported data was collected from a single source. First, data was collected using different measurement scales (cf. section 3.2). Moreover, the online survey does not allow the respondent to skip the scales and thus relate dependent and independent variables. We perform a post-hoc analysis, assessing possible CMV with Harman's single factor test. The analysis shows a 7-factor solution with eigenvalues greater than 1 and a first component that explains 44.4% of the variance. Because the first component does not account for the majority of the variance and a single factor solution did not emerge from the data, CMV was not found to be an issue.

4.1. Measurement Model

Convergent validity: the indicators' *outer loadings* are higher than the recommended .708, with the exception of the item "innov5" (cf. Table C3.1). However, average variance extracted (AVE) is above the .50 threshold showing the convergent validity of the items, and the composite reliability of all factors exceeds the .70 recommendation. Table C3.1 presents the indicators' loadings, construct reliability and convergent validity.

Table C3.1 - Individual reliability, Composite reliability and average variance extracted for the first and second-order constructs.

Factor	Items	Loadings	Composite Reliability	Cronbach's Alpha	AVE
ACAP (2nd order reflective-reflective)			.95	.94	.56
Acquisition	acap1.1	.90	.93	.89	.82
	acap1.2	.94			
	acap1.3	.89			
Assimilation	acap2.1	.90	.94	.92	.80
	acap2.2	.91			
	acap2.3	.88			
	acap2.4	.87			
Transformation	acap3.1	.88	.96	.94	.85
	acap3.2	.96			
	acap3.3	.95			
	acap3.4	.89			
Application	acap4.1	.84	.90	.84	.76
	acap4.2	.93			
	acap4.3	.84			
Knowledge Acquisition	Kaquisition1	.77	.85	.73	.65
	Kaquisition2	.81			
	Kaquisition3	.84			
Knowledge Creation	KCreation1	.80	.92	.89	.75
	KCreation2	.91			
	KCreation3	.87			
	KCreation4	.87			
Knowledge Sharing	KSharing1	.92	.94	.92	.75
	KSharing2	.90			

Factor	Items	Loadings	Composite Reliability	Cronbach's Alpha	AVE
	KSharing3	.89			
	KSharing4	.73			
	KSharing5	.88			
Organizational Innovation	Innov1	.76	.82	.72	.54
	Innov3	.82			
	Innov5	.63			
	Innov7	.71			

Discriminant validity: we assess constructs' discriminant validity with the Fornell-Larcker criterion (Fornell & Larcker, 1981). Table C3.2 shows that the correlations between the constructs are less than .80, and less than the squared root of the AVE, revealing the distinctiveness of the constructs and thus discriminant validity. Cross loadings between constructs were also analysed, showing that loadings were always higher on the intended factor.

Table C3.2 - Constructs discriminant validity assessment

	1	2	3	4	5	6	7	8	9	10
1. ACAP	0.75									
2. Knowledge Creation	0.65	0.86								
3.Knowledge Acquisition	0.50	0.44	0.81							
4. Knowledge sharing	0.74	0.76	0.52	0.87						
5.Organizational Innovation	0.46	0.45	0.36	0.41	0.73					
6. R&D	0.26	0.18	0.20	0.16	0.24	-				
7. Revenue	0.09	0.04	0.21	0.03	0.12	0.19	-			
8. Size	0.21	0.17	0.23	0.13	0.19	0.30	0.70	-		
9. Age	0.03	- 0.10	- 0.14	- 0.18	- 0.01	- 0.23	- 0.35	- 0.32	-	
10. Export	0.23	0.15	0.16	0.17	0.29	0.13	0.14	0.32	-0.03	-
Mean	5.23	4.74	4.34	4.78	3.16	0.25	1.87	1.54	1982,24	2.58
S.D.	1.01	0.95	1.03	0.94	0.76	0.44	0.82	0.62	24.98	1.46

Av. Average score of all items included in the construct/variable; S.D. Standard Deviation;

Multicollinearity assessment: Using LVS from Smart PLS, the authors ran a regression model using IBM SPSS Statistics 23 (IBM Corporation, NY, USA). The highest VIF value is 3.2 with tolerance values above .31. Therefore, VIF values are below the recommended cut-off value of 5.0, and correlations between constructs are far below .90, showing that multicollinearity is not present in the data (Hair, Black, Babin, & Anderson, 2010; Hair et al., 2014).

4.2. Structural Model

Having previously assessed the appropriateness of the measurement model, the authors use the R^2 values as a measure of predictive power, and Q^2 (Geisser, 1974; Stone, 1974) as a measure of predictive relevance. Latent variables scores from the PLS algorithm were used as indicators of the constructs to test the hypotheses. The bootstrap procedure was performed with 5,000 sub-samples and 111 cases according to recommendations in the literature to assess the significance of path coefficients (β) (Hair et al., 2014; Hayes, 2009). The test of mediation hypotheses relies on the bootstrap procedure and follows recent contributions on the topic (Hayes, 2009; Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007; Zhao, Lynch Jr., & Chen, 2010).

To empirically test the research hypotheses, four models were created, considering that the full model has two mediators, and a relationship between the mediators (cf. Klarner, Sarstedt, Hoeck, & Ringle, 2013). Table A1 (See Appendix 1) shows a comparison between the 4 models. Model 1 considers the independent variables of knowledge acquisition and sharing, and the dependent variable of innovation (see Table C3.3). Thus, when considering the model without the mediators, knowledge acquisition has a non-significant effect on innovation (β = .15, t=1.16). The effect of knowledge sharing on organizational innovation has a significant (p<.05) value of .21 (t = 2.48). Thus, hypothesis 1a is not substantiated by the data and hypothesis 2a is supported. The R^2coefficient is .27, which means that 27% of the organizational innovation variance is explained by the combined effect of the exogenous variables. With a Q^2 value larger than 0 (Q^2 = .29), the authors confirm that the model has predictive relevance (Hair et al., 2014). Control variables have no significant relationship with organizational innovation, at a confidence interval of 95%. However, the results suggest, with a 90% confidence interval, that

exporting plays a significant role in organizational innovation (β= .19, p=.05), as well as the formal existence of an internal R&D department (β= .16, p= .08).

Table C3.3 - Structural Model Assessment (Model 1, without mediators)

Path	Path Coefficient (β)	T Statistics (t)	P Value
Knowledge Acquisition -> Innovation	.15	1.16	.25
Knowledge Sharing -> Innovation	.29	2.48*	.01
Age -> Innovation	.12	1.09	.28
Export -> Innovation	.19	1.93	.05
R&D -> Innovation	.16	1.78	.08
Revenue -> Innovation	.06	0.46	.65
Size -> Innovation	.01	0.06	.95

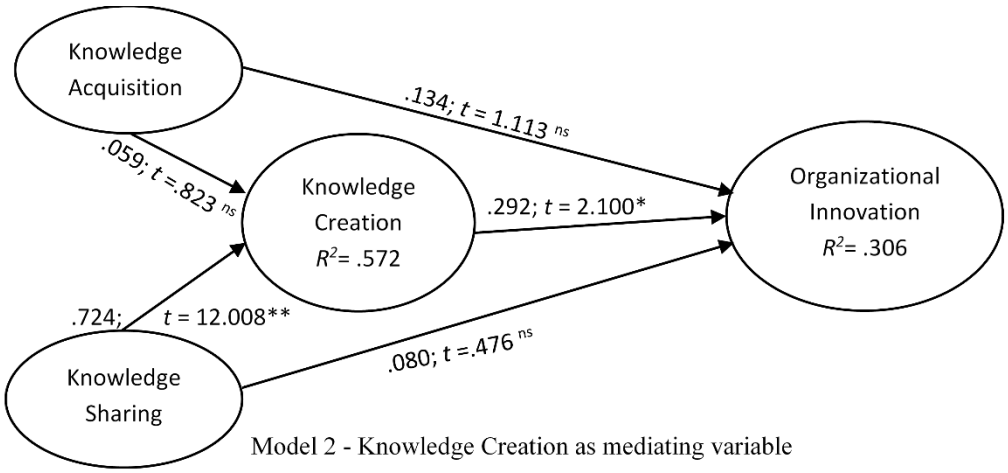
* $p < .05$

Next, in model 2 and model 3 (see Figure C3.2), we separately consider the effect of knowledge creation and absorptive capacity as mediating variables, respectively (Hypotheses 1b, 1c, 1d, 2b, 2c, and 2d). Model 2 shows that knowledge sharing strongly supports knowledge creation (β= .724; t = 12.008 p< 0.01), providing empirical evidence to substantiate *H2d*. However, knowledge acquisition has a non-significant relationship with knowledge creation (β= 0.059). The direct effect of knowledge sharing on innovation vanishes when we control for the effect of knowledge creation. The direct effect decreases from .209 (without the mediator) to a non-significant .080 (with the mediator). Therefore, the results provide empirical support to *H2e*, which states that knowledge creation mediates the relationship between knowledge sharing and innovation, with a significant (p< 0.05) indirect effect of .211 (t = 2.080). Considering that the indirect effect is significant and the direct effect is non-significant, the results support an indirect-only mediation type (cf. Zhao et al., 2010). However, with a variance accounted for (VAF) of 72.5%, only partial mediation is supported (Hair et al., 2014; Helm, Eggert, & Garnefeld, 2010). This result shows that 72.5% of knowledge sharing's effect on innovation is explained via knowledge creation. The relationship between knowledge creation and organizational innovation has a significant value of .292 (t = 2.100, p= 0.036), supporting *H3*. To assess the effect size of knowledge creation on innovation, the f^2 effect size was calculated,

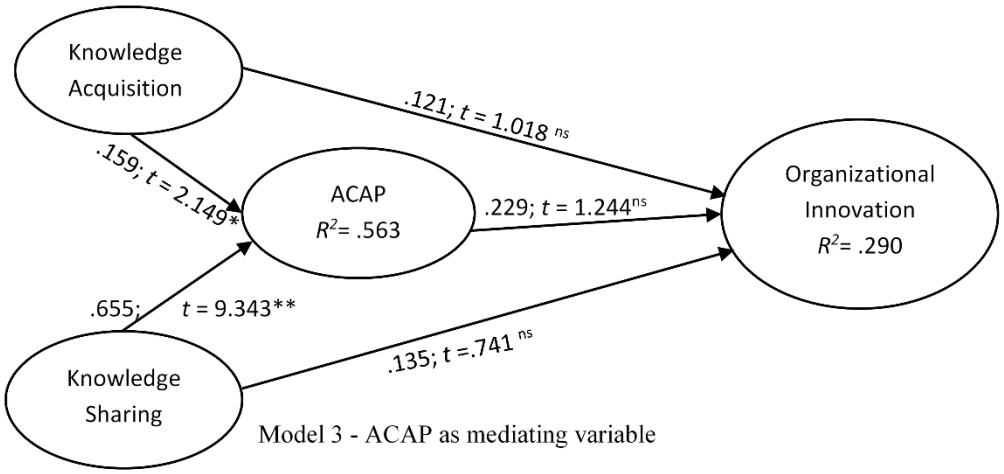
considering the R^2 values of model 1 (i.e., $R^2_{excluded}$) and model 2 (i.e., $R^2_{included}$). With an f^2 value of .05 the introduction of knowledge creation produces a small effect.

Model 3, with ACAP as a mediating variable, shows that both acquisition (β= .159; t = 2.149, p< 0.05) and sharing (β= .655; t = 9.343, p< 0.01) reinforce absorptive capacity, thus substantiating hypotheses 1b and 2b, respectively. However, ACAP's relationship with innovation is not significant, despite the positive tendency (β= .229; t = 1.244, p= .214). Thus, no support was found for *H5*. When controlling the effect of ACAP, knowledge sharing's direct relationship with innovation is no longer significant (β= .135; t = .741), as well as the indirect effect (β= .150; t = 1.219). However, the total effect remains significant with a value of .285 (p= 0.016). The indirect effect of knowledge acquisition on innovation is non-significant (β= .036), and thus no support was found for the mediating effect of ACAP between knowledge acquisition and innovation (hypothesis *H1c*). With an f^2 effect size of .03, the introduction of ACAP represents a small effect.

Figure C3.2 - Models 2 and 3 structural model representation.



Model 2 - Knowledge Creation as mediating variable



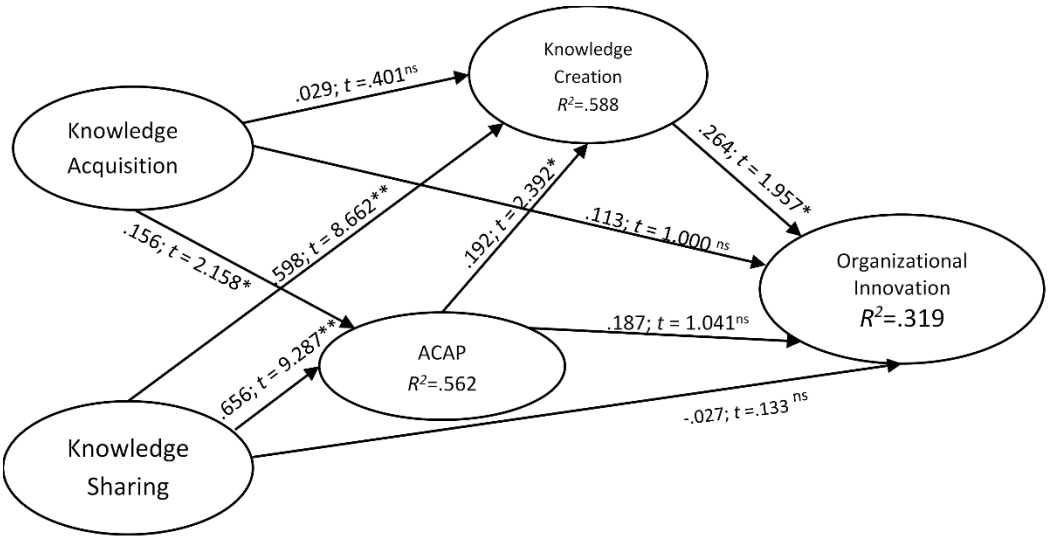
Model 3 - ACAP as mediating variable

Note: The representation of the structural models excludes the control variables for simplification purposes.

* $p < .05$; ** $p < .01$; ns= non-significant.

Lastly, model 4 (see Figure C3.3) incorporates the two mediators (knowledge creation and ACAP), as well as the hypothesized relationship between ACAP and knowledge creation. The relationship between ACAP and knowledge creation is significant (t = 2.392, p = 0.017) with a path coefficient of .192. This result supports hypothesis 4. The mediating effect of knowledge creation between knowledge sharing and innovation remains significant, as well as the relationship between knowledge creation and innovation (on the threshold of statistical significance).

Figure C3.3 - Structural model representation of Model 4.



Note: The models representation excludes the control variables for simplification purposes.

* $p < .05$; ** $p < .01$; ns= non-significant.

5. Discussion

The present study aims to analyse the mediating role that knowledge creation and absorptive capacity play between external knowledge acquisition, intra-firm knowledge sharing, and organizational innovation. Therefore, it contributes to the increasing body of research that relates knowledge processes to absorptive capacity, in order to understand their critical role in innovation.

The results show that the creation of new knowledge within the firm positively impacts organizational innovation. Additionally, companies' absorptive capacity and intra-firm knowledge sharing significantly reinforce knowledge creation. However, for the respondent firms, the acquisition of external knowledge and their knowledge absorptive capacity do not influence organizational innovation, either directly or indirectly. These results are in line with the findings of Aboelmaged (2014), that knowledge acquisition is not enough to promote innovation. On the other hand, when knowledge is shared within organizations, organizational innovation is significantly reinforced, via the creation of new knowledge, which is consistent with previous findings on the mediating effect of knowledge creation between knowledge

sharing and innovation (Andreeva & Kianto, 2011). Knowledge sharing also leverages the absorptive capacity of the respondent firms, reinforcing previous claims and findings from the literature (Maes & Sels, 2014; Zahra & George, 2002). The acquisition of external knowledge, while having no impact on knowledge creation or innovation, strengthens companies' absorptive capacity, consistent with previous findings (Liao et al., 2010).

This result suggests that the respondent firms rely on internal knowledge sharing and creation to develop new products, production processes, marketing strategies and management practices. Although the respondent companies report high absorptive capacity (considering a mean of 5.23 on a 1 to 7 scale), they are not taking direct advantage of this capacity for innovation purposes, which suggests a poor knowledge integration capacity and/or very sparse networks, with a low knowledge overlap between the organizations' knowledge base.

Considering the implications of the present findings, it is important to emphasize the role of knowledge creation as the main driver of companies' innovation. Therefore, knowledge management practitioners should promote an organizational climate where knowledge can be shared and, even more importantly, created. Even considering that our findings suggest a prominence of internal processes (sharing and creation) leading to innovation, the external acquisition of knowledge should not be neglected, since this knowledge reinforces companies' absorptive capacity.

Limitations of the present study include the small sample size and consequently limited generalization of the research findings. Moreover, with a single method for data collection, as well as a single respondent from each organization, the threat of common method variance is a limitation, despite the pre and post-hoc analysis.

Future research should continue to explore the relationship between KMP, ACAP and innovation, considering previous theoretical models (Liao et al., 2007; Maes & Sels, 2014; Sun, 2010). Since the inclusion of three knowledge processes in the present research is not exhaustive, further research should consider other processes such as knowledge storage, codification, application and refinement (cf., J. Xu et al., 2010), which can play a role in companies' innovation. The complementary/competitive role of knowledge creation and absorptive capacity in innovation should be explored in both SMEs and large companies.

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Appendix 1

Table A1 – Structural models assessment

	Endogenous Constructs	R^2	Q^2	R^2	Q^2	R^2	Q^2	R^2	Q^2
	Innovation	.27	.29	.31	.33	.29	.31	.32	.34
	Knowledge Creation			.57	.57			.59	.59
	ACAP					.56	.39	.56	.39
		Model 1		Model 2		Model 3		Model 4	
	Path	β (*t*)		β (*t*)		β (*t*)		β (*t*)	
Control Variables	Age -> Innovation	.12 (1.09)		.11 (0.99)		.07 (0.64)		.06 (0.59)	
	Export -> Innovation	.19 (1.93)		.20 (1.96)*		.18 (1.75)		.19 (1.82)	
	R&D -> Innovation	.16 (1.78)		.14 (1.56)		.12 (1.29)		.12 (1.21)	
	Revenue -> Innovation	.06 (0.46)		.07 (0.64)		.05 (0.40)		.07 (0.58)	
	Size -> Innovation	.01 (0.06)		-.03 (0.26)		-.01 (0.12)		-.04 (0.38)	
	K_Acquisition -> Innovation	.15 (1.16)		.13 (1.11)		.12 (1.02)		.11 (1.00)	
	K_Sharing -> Innovation	.29 (2.48)*		.08 (0.48)		.14 (0.74)		-.02 (0.13)	
	K_Acquisition -> K_Creation			.06 (0.82)				.03 (0.40)	
	K_Sharing -> K_Creation			.72 (12.01)**				.60 (8.66)**	
	K_Creation -> Innovation			.29 (2.10)*				.26 (1.96)*	
	ACAP -> Innovation					.23 (1.24)		.19 (1.04)	
	K_Acquisition -> ACAP					.16 (2.15)*		.16 (2.16)*	
	K_Sharing -> ACAP					.66 (9.34)**		.66 (9.29)**	

* $p < .05$; ** $p < .01$

Capítulo 4 | From potential absorptive capacity to knowledge creation in organizations: the mediating role of knowledge storage and realized absorptive capacity

[Contents of this chapter were submitted on the 27th July 2016 for publication in the Journal of Information and Knowledge Management (cf. Anexo 12).]

Abstract

The present research explores the role of knowledge storage and documentation and realized absorptive capacity as mediating variables between potential absorptive capacity and internal knowledge creation. The theoretical model is developed and further tested with a sample of 111 organizations from multiple industry sectors. The results show that the process of knowledge storage and documentation, as well as the realized absorptive capacity of the respondent companies, reinforce the internal creation of knowledge, and mediate, individually and jointly, the relationship between potential absorptive capacity and intra-firm knowledge creation. Mediation analysis relies on the use of bootstrapping confidence intervals. The authors draw practical implications for organizational psychologists and human resources managers. The small sample size and the cross-sectional design limit generalization of the present findings. Further research should explore the complementarity of absorptive capacity phases

with other knowledge management processes that could enable the creation of new knowledge in organizations.

Keywords: knowledge creation; knowledge storage and documentation; knowledge management; absorptive capacity; organizational processes; PLS-SEM.

1. Introduction

The creation of new knowledge in organizations is recognized as a vital activity (Nonaka, von Krogh, & Voelpel, 2006) considering that new knowledge with distinctive characteristics defines innovation (Quintane et al., 2011). Therefore, to understand the paths from the acquisition of external information in companies' environment to internal knowledge creation is an important topic in organizational cognition research.

Since the seminal paper of Cohen and Levinthal (1990), absorptive capacity (hereafter ACAP), that is, the "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128) has been an influencing construct. Valuable re-conceptualizations extended this construct and proposed different antecedents, consequents, and intervening variables (Jansen et al., 2005; Lane et al., 2006; Todorova & Durisin, 2007; Volberda, Foss, & Lyles, 2010; Zahra & George, 2002). ACAP theoretical models and empirical research shows that independently of whether ACAP is considered an organizational dynamic capacity or learning process, it shows a positive relationship with organizational outcomes like innovation. Knowledge management processes (KMP) have also been studied considering its relationship with innovation (e.g., Alegre, Sengupta, & Lapiedra, 2011; Huang & Li, 2009; Lee, Leong, Hew, & Ooi, 2013), as well as considering the way they interact to promote new knowledge creation (Andreeva & Kianto, 2011). Currently, some authors made initial attempts to develop theoretical models that approximate KMP and ACAP (Chou, 2005; Kotabe et al., 2011; Liao et al., 2010; Maes & Sels, 2014; Su et al., 2013; Sun, 2010), since they share underlying concepts (Sun & Anderson, 2010).

Therefore, the present research, following current organizational cognition theoretical perspectives (cf. Mumford, Hunter, & Byrne, 2009), aims to shed light on the previously identified potential areas in the ACAP-KMP research (Mariano & Walter, 2015) and considers the critical role of knowledge and absorptive capacity, exploring the interrelationships between ACAP and the intra-organizational knowledge processes of storage and documentation and knowledge creation. The authors follow the conceptualization of Andreeva and Kianto (2011) where knowledge creation is an outcome of other knowledge processes, like storage and documentation. Thus, the present research posits knowledge storage and realized absorptive

capacity (RACAP) as mediating variables between potential absorptive capacity (PACAP) and internal knowledge creation. It also postulates that knowledge storage and RACAP operate as serial mediators, with companies' RACAP being reinforced by the internal process of store and documentation of knowledge.

The remaining of the paper is organized as follows: (1) section 2 presents the theoretical models and the proposed hypotheses; (2) section 3 shows the method of the empirical research; (3) section 4 presents the results for the measurement model, validity of the measures and the hypotheses testing; (4) section 5 closes the paper with a discussion about main findings, further research and limitations.

2. Theory and Hypotheses

2.1. Absorptive Capacity

First introduced by Cohen and Levinthal (1990), absorptive capacity define the ability of a firm to identify, assimilate and apply external knowledge. Differences in this capacity may explain why some firms successfully acquire, assimilate, transform, and apply outside developed knowledge, while others are unable to take advantage of the same knowledge (Fabrizio, 2009). Since the introduction of the absorptive capacity construct, various authors have re-conceptualized it (Lane et al., 2006; Murovec & Prodan, 2009; Todorova & Durisin, 2007; Zahra & George, 2002), and suggest different measures for its operationalization (Camisón & Forés, 2010; Flatten, Engelen, et al., 2011; Jansen et al., 2005; Jiménez-Barrionuevo et al., 2011; Minbaeva et al., 2003; Nieto & Quevedo, 2005).

ACAP multidimensionality is a coherent finding among these contributions, as identification, acquisition, assimilation, transformation, and exploitation are frequently identified components of ACAP. These phases have been organized in major dimensions such as PACAP, and RAPAC (Zahra & George, 2002), and also as exploratory, transformative, and exploitative learning (Lane et al., 2006).

The way these phases of ACAP have been framed is not so consensual as shown by other papers (e.g., Todorova & Durisin, 2007). Analyzing Zahra and George's (2002) model, the authors propose that assimilation and transformation represent alternative processes. This

differentiation was empirically corroborated by Gebauer et al. (2012), but it is far from being consensual (Flatten, Engelen, et al., 2011).

This paper follows Zahra and George's (2002) reconceptualization and sees absorptive capacity as an organizational dynamic capability encompassing two major dimensions of potential absorptive capacity (acquisition and assimilation), and realized absorptive capacity (transformation and exploitation).

2.2. Knowledge processes and Absorptive Capacity

Some theoretical contributions made initial attempts to understand the relationship between ACAP and knowledge processes (cf. Mariano & Walter, 2015; Sun, 2010). However, with a few exceptions (Chou, 2005; Kotabe et al., 2011; Liao et al., 2010; Maes & Sels, 2014; Su et al., 2013), there is a clear lack of empirical research relating knowledge processes and companies' ACAP. Considering the relationship between ACAP and knowledge creation, Chou's (2005) paper explores 271 firms located in Taiwan from multiple sectors, corroborating the idea that organizations with higher ACAP will create more knowledge. However, there is no research that explores the empirical relationship between PACAP and RACAP with new knowledge creation. Therefore, following Chou's (2005) research and Zahra and George (2002) conceptualization of ACAP, the authors hypothesize that:

H1: Absorptive capacity positively reinforce knowledge creation

H1a: Potential absorptive capacity positively reinforces knowledge creation.

H1b: Realized absorptive capacity positively reinforce knowledge creation

Knowledge storage is recognized as an important process for effective knowledge management (Alavi & Leidner, 2001). The storage of externally acquired knowledge will prevent its loss, since it cannot be immediately applied (Garud & Nayyar, 1994), thus reinforcing knowledge storage and codification as an important intermediate process to bridge from the acquisition and assimilation of knowledge (i.e., PACAP), to its transformation and application (i.e., RACAP). Knowledge storage as an antecedent of RACAP is congruent with the view of ACAP as a learning process. In fact, looking at Lane et al.'s (2006) transformative learning dimension,

specifically the maintain process (cf. Ferreras-Méndez et al., 2015), the importance of knowledge storage as a condition for exploitation is highlighted. This theoretical claim is reinforced by empirical research that shows the statistically significant relationship between knowledge storage and the application of knowledge (Donate & Sánchez de Pablo, 2014), as well as the mediating role played by the storage and retrieval of knowledge between PACAP and RACAP (Martelo-Landroguez & Cegarra-Navarro, 2014). Therefore, the authors hypothesize that:

H2: Knowledge storage positively reinforces RACAP to a statistically significant degree.

Regarding the knowledge storage's interaction with other KMP, namely knowledge creation, Andreeva and Kianto's (2011) paper show that the storage and documentation of knowledge positively impacts on new knowledge creation. Therefore, the authors hypothesize that:

H3: Knowledge storage positively reinforces knowledge creation to a statistically significant degree.

Lastly, the present study argues that the capacity to acquire and assimilate external information (i.e., PACAP) is not sufficient to promote knowledge creation, since organizations need to store this knowledge, as well as be capable of transform it and apply it, in order to move from PACAP to new knowledge creation. The authors hypothesize that:

H4: Knowledge storage and documentation and RACAP are mediating the relationship between PACAP and knowledge creation

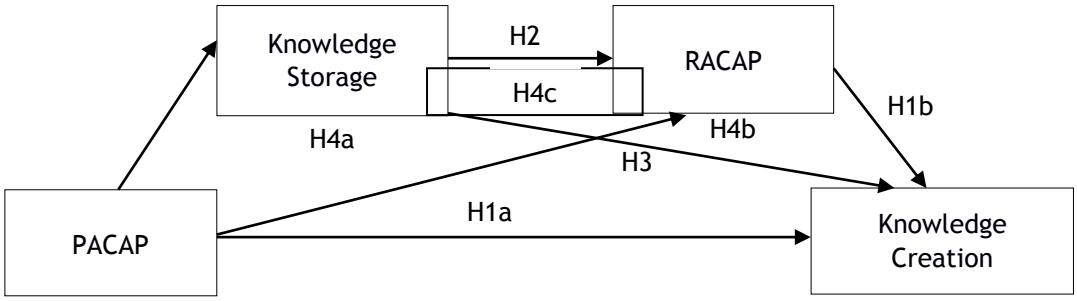
H4a: Knowledge storage mediates the relationship between PACAP and knowledge creation, to a statistically significant degree.

H4b: RACAP mediates the relationship between PACAP and knowledge creation, to a statistically significant degree.

H4c: Knowledge storage and RACAP, in serial, mediate the relationship between PACAP and knowledge creation, to a statistically significant degree.

Figure C4.1 shows the representation of the theoretical model.

Figure C4.1 - Theoretical Model



Legend: H1a: Potential absorptive capacity positively reinforce knowledge creation; H1b: Realized absorptive capacity positively reinforce knowledge creation; H2: Knowledge storage positively reinforce RACAP to a statistically significant degree; H3: Knowledge storage positively reinforce knowledge creation to a statistically significant degree; H4a: Knowledge storage mediates the relationship between PACAP and knowledge creation, to a statistically significant degree; H4b: RACAP mediates the relationship between PACAP and knowledge creation, to a statistically significant degree; H4c: Knowledge storage and RACAP, in serial, mediate the relationship between PACAP and knowledge creation, to a statistically significant degree.

3. Method

The present study uses SmartPLS 3 (Ringle et al., 2005) and PROCESS macro (Hayes, 2013) to assess the measurement model and to test research hypotheses, respectively. This option was made considering the small sample size and the advantages associated with testing mediation hypothesis with the bootstrap procedure, using bootstrap confidence intervals (cf. Hayes, 2009, 2013). The latent variable scores calculated by the SmartPLS algorithm are used in the PROCESS macro, following Leal-Rodríguez, Ariza-Montes, Roldán, and Leal-Millán's (2014) procedure. The measurement model of PACAP and RACAP (second-order latent variables) was operationalized following the repeated indicators approach (Ringle et al., 2012; Wetzels et al., 2009).

3.1. Sample

Data was collected with an online survey. Overall, 1739 companies' email addresses were collected. Contact with companies was made twice, with the first email and with a follow-up email up to 15-20 days later. Overall, 188 emails were automatically returned, and 111 valid answers were obtained out of the 1551 valid emails, giving a response rate of 7.16% (cf. Anexo 8).

The authors sent an email with a cover letter stating the goals of the study and containing a link to the online questionnaire. Surveyed companies have more than 10 employees and operate in the following sectors: footwear, textile, moulds, metallurgy, information technologies, automotive components, plastics, chemicals, paper and cardboard, and ceramics. This sectors represent, simultaneously, some of the most mature and cutting-edge industries in Portugal, where new knowledge creation is vital for organizations.

Key informants were companies' CEOs, top managers, middle managers and human resources professionals (86.5%), but also production managers, R&D directors or other professionals (13.5%) who were aware of the organizational processes under study. Respondents are mainly qualified workers, with 79.3% holding a degree or higher. On average, respondents have worked in the firm for 13 years and 6 months, and companies began activities 33 years ago (cf. Anexo 9).

Companies were small (52.3%), and medium-sized enterprises (41.4%), with only 7 companies having more than 250 employees. Twenty-eight firms (25.2%) have an internal R&D unit (cf. Anexo 10).

3.2. Non-respondent bias

To assess non-respondent bias the authors use the extrapolation method (Armstrong & Overton, 1977), differentiating between different waves, that is, initial and follow-up email, in which the late respondents were considered as equivalent to non-respondents. The independent samples *t*-test revealed no significant difference on control variables (industrial sector, firm size, firm age, firm revenue, existence or non-existence of a research and development

department, key informant tenure, perceived market competitiveness and percentage of sales for foreign markets) between first and late respondents ($p > .05$).

3.3. Measurement variables

The questionnaire survey is built on the literature review and considers four variables: Potential and Realized Absorptive capacity are measured with the scale developed by Flatten et al. (2011). Following Zahra and George's (2002) model, several authors have recently used this measure (Ali & Park, 2016; Aljanabi et al., 2014; Flatten, Greve, et al., 2011; Vicente-Oliva, Martínez-Sánchez, & Berges-Muro, 2015), and its reliability has been tested in different cultural contexts (Flatten et al., 2014). Knowledge storage and documentation, with 4 items, collects information about the intensity of both tacit and explicit knowledge storage and documentation, and knowledge creation is measured with 4 items, evaluating the frequency of new idea development considering organizations' different activities (Andreeva & Kianto, 2011).

4. Results

4.1. Common Method Bias

Considering the applied method for data collection, it is important to debate the possible threat of common method bias. Following Conway and Lance (2010) recommendations, we argue that: (1) self-reports are appropriate in the present research. In fact, several criticisms arose against the use of direct measures (e.g., research and development expenditures) to assess ACAP (cf. Flatten, Engelen, et al., 2011; Lane et al., 2006). Moreover, the use of key informants in organizational research represents a viable way to collect data when "complete or in-depth information cannot be expected from representative survey respondents" (Kumar, Stern, & Anderson, 1993, p. 1634); (2) measures have construct validity and no harmful overlap is found between different constructs (cf. Measurement model section); and (3) the authors took several measures to minimize the threats associated with collecting data with one respondent for organization. As an example, the developed online questionnaire does not allow the respondent

to move forward and backwards from different sections, which hinders the association between different constructs.

4.2. Measurement model

4.2.1. Convergent validity

The indicators' *outer loadings* are higher than the recommended .708, with the exception of the item "Kst2" (cf. Table C4.1). However, average variance extracted (AVE) is above the .50 threshold showing the convergent validity of the items, and the composite reliability of all factors exceeds the .70 recommendation. Table C4.1 presents the indicators' loadings, construct reliability and convergent validity.

4.2.2. Discriminant validity

We assess constructs' discriminant validity with the Heterotrait-Monotrait ratio of correlations (HTMT) (Jörg Henseler, Ringle, & Sarstedt, 2014). Table C4.2 shows that the highest value is .78, which is far below the more restrictive threshold of .85.This result is in line with the analysis of the correlation matrix and the square root of the AVE, applying the criterion developed by Fornell and Larcker (1981). Cross loadings between constructs were also analysed, showing that loadings were always higher on the intended factor.

4.3. Multicollinearity assessment

Multicollinearity is assessed with IBM Statistics SPSS, using LVS from Smart PLS. The highest variance inflation factor (VIF) value is 2.62 with tolerance values above .38, which is below the recommended VIF cut-off value of 5.0 (Hair et al., 2010, 2014). Therefore, multicollinearity is not an issue in the data.

Table C4.1 – Measurement Model

Construct	Items	Path Coefficient	Outer Loadings	SOL	C.R.	α	AVE
Knowledge Creation	KC1		.80		.92	.89	.75
	KC2		.91				
	KC3		.87				
	KC4		.87				
Knowledge Storage and Documentation	Kst1		.80		.87	.80	.63
	Kst2		.62				
	Kst3		.89				
	Kst4		.85				
PACAP (2nd order, repeated indicators)							
Acquisition	acap1.1		.90	.732	.93	.89	.83
	acap1.2	.860	.94	.853			
	acap1.3		.89	.750			
Assimilation	acap2.1		.90	.827	.94	.92	.80
	acap2.2	.937	.92	.863			
	acap2.3		.88	.785			
	acap2.4		.87	.863			
RACAP (2nd order, repeated indicators)							
Transformation	acap3.1		.873	.773	.956	.938	.845
	acap3.2	.921	.957	.899			
	acap3.3		.949	.886			
	acap3.4		.894	.820			
Application	acap4.1		.821	.610	.902	.836	.754
	acap4.2	.822	.929	.784			
	acap4.3		.852	.731			

Note: α= Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted; SOL = second-order loadings.

Table C4.2 - Discriminant validity assessment – Heterotrait-Monotrait Ratio (HTMT)

	1	2	3	4	5	6
1. Acquisition						
2. Assimilation	.69					
3. Transformation	.55	.67				
4. Application	.68	.78	.59			
5. Knowledge Creation	.48	.68	.57	.67		
6. Knowledge Storage and Documentation	.55	.69	.59	.66	.75	

4.4. Test of Hypotheses

In the present sample, PACAP revealed no significant effect on knowledge creation, with a coefficient of .17 (t=1,54, p= .13), therefore the authors cannot reject the null hypotheses that PACAP relationship with knowledge creation is not different from zero to a statistically significant degree. However, the realized dimension of absorptive capacity shows a positive and statistically significant relationship with knowledge creation with a coefficient of .28 (t= 2,54, p< 0.05), thus substantiating H1b. H2 stated that the organizational process of store and document knowledge will reinforce the realized absorptive capacity of the respondent firms. This hypothesis is substantiated with a coefficient of .23 (t= 2,98, p<.01) between the two variables. The relationship between knowledge storage and documentation, and knowledge creation is also positive (.35) and statistically significant (t= 3,87, p<.001). Table C4.3 summarizes the standardized model coefficients.

Table C4.3 - Standardized model coefficients (standard errors in parentheses)

Predictor Variable	Outcome Variable		
	Knowledge Storage and Documentation	RACAP	Knowledge Creation
PACAP	.61 (.08)***	.62 (.08)***	.17 (.11)
Knowledge Storage and Documentation		.23 (.08)**	.35 (.09)***
RACAP			.28 (.11)*
R^2	.37***	.61***	.49***

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

The mediating role of knowledge storage/documentation and RACAP, conjointly and independently, were assessed with bias corrected bootstrap confidence intervals. The results, on table C4.4, show that the indirect effects are different from zero, with a 95% level of confidence. Therefore, the data provide support to H4a, H4b and H4c.

Table C4.4 - Test of mediation using bootstrap confidence intervals

Effect of	Indirect Effect	Bootstrap S.E.	95% Bootstrap C.I.
PACAP -> KSt -> Kc	.21	.08	(.08, .40)
PACAP -> RACAP -> Kc	.17	.08	(.04, .33)
PACAP -> KSt -> RACAP -> Kc	.04	.02	(.01, .10)

Note: KSt = Knowledge Storage and Documentation; Kc = Knowledge Creation; Bootstrap S.E. = Bootstrap Standard Error; 95% Bootstrap C.I. = 95% Bootstrap Confidence Interval. Bootstrap confidence intervals are based on 5,000 bootstrap samples.

5. Discussion and Conclusions

The present paper aimed to explore the relationships between ACAP and the knowledge processes of storage and documentation and creation. The results show that companies internal knowledge creation is reinforced by ACAP, namely RACAP, and by the process of systematically store and document knowledge, which corroborates previous research findings (Andreeva & Kianto, 2011; Chou, 2005). Contrary to our hypothesis (H1a), PACAP do not directly impact on knowledge creation, but its effect on the internal creation of new knowledge is mediated by the storage and documentation of knowledge (H4a), as well as RACAP (H4b) and the conjoint effect of both mediators (H4c). The organizational process of document and store knowledge strengths the respondent companies' RACAP (H2), as well as the knowledge creation process (H3), which is in line with previous research findings (Andreeva & Kianto, 2011; Martelo-Landroguez & Cegarra-Navarro, 2014). Hence, the present findings highlight the role of technology-driven approaches to knowledge management, through knowledge storage and documentation, as well as the role of absorptive capacity in foster the internal creation of new knowledge. Particularly, the existence of mechanisms to store and document knowledge promotes the availability of knowledge and therefore its combination with previous held knowledge through transformation and application, as well as boosting new knowledge creation. Moreover, a greater realized absorptive capacity expands the cognitive capacity to transform and apply the acquired knowledge into new knowledge.

Although the important findings, this work is not without limitations. The small sample size and limited generalization of the results must be acknowledged, as well as the cross-sectional design. However, important theoretical and practical implications result from this study. First, this study extends the current knowledge about the relationship between dynamic capabilities and knowledge processes, showing that knowledge storage plays an intermediate role between PACAP and RACAP, and conjointly with RACAP mediates the relationship between PACAP and knowledge creation. Second, it provides results based on a survey in multiple sectors that reinforce the need for higher ACAP, specifically RACAP, as well as the implementation of knowledge storage processes in order to create new knowledge.

The findings presented in this paper should be explored in further research. The paths from contacts with the external environment to acquire information and knowledge, to the internal process of knowledge creation can be explored in the light off different topics such as redundancy and complexity of the knowledge system (Nonaka et al., 2006). The results provide practical implications for human resources managers and organizational psychologists. Recruitment and selection processes play a crucial role, especially for individuals that will act as an interface between the firm and the external environment (i.e., gatekeepers). Therefore, assessment of individual communication abilities and cognitive skills are needed to potentiate the successful acquisition of external information and its assimilation, since "individual cognitions are the basis of a firm's absorptive capacity" (Lane et al., 2006, p. 857). Proficient organizational structures must allow the transfer of knowledge across different units, and reward systems, as well as training, should encourage individual learning, reinforcing individual – and consequentially organizational – absorptive capacity. The implementation of peer mentoring should be considered to enhance knowledge creation (Bryant, 2005). Job rotation through different functions or units, whenever possible, should be encouraged, since it enhances realized absorptive capacity (Gong, Zhou, & Chang, 2013).

In conclusion, this study offers some evidence that the two distinctive ACAP dimensions play different roles in companies' new knowledge creation. Moreover, it shows that companies dynamic capability to transform and apply knowledge (i.e., RACAP) depend on the internal process of knowledge storage and documentation. This result reinforces the claim that knowledge is not immediately applied and therefore must be stored to prevent its loss. This storage will then translate the acquired and assimilated knowledge to a format that is understandable and available to be further transformed and applied. Therefore, to store knowledge is an essential organizational knowledge management process to create new knowledge, and strength the capacity to transform and apply knowledge (RACAP) will make firms become more capable to develop new knowledge internally.

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Conclusões e considerações finais

A tese apresentada ao longo dos capítulos precedentes, que agora se conclui, pretendeu explorar, teoricamente, e analisar, empiricamente, a (potencial) relação existente entre a capacidade de absorção, processos chave de gestão do conhecimento e a inovação organizacional. Quatro objetivos gerais, estabelecidos inicialmente, representaram o repto para o desenvolvimento e estruturação do trabalho exposto, guiando, teórica e empiricamente, a tese sobre a qual se tecem agora conclusões gerais e considerações finais.

Nesse sentido, de forma a atingir o primeiro objetivo delineado, que visava explorar e analisar, teoricamente, a relação existente, na literatura científica, entre a capacidade de absorção, processos de gestão do conhecimento, e a inovação, foi explorada e analisada a literatura científica teórica e empírica que relaciona a capacidade de absorção com processos de gestão do conhecimento, considerando-se ainda a relação entre a capacidade de absorção e a inovação (cf. Capítulo 1).

Da análise realizada, conclui-se que as inter-relações perspetivadas teoricamente entre a capacidade de absorção e processos chave de gestão do conhecimento são sustentadas e corroboradas por estudos empíricos encontrados em periódicos científicos da especialidade. No entanto, a investigação encontrada na literatura parece demonstrar-se ainda escassa e apresentar alguma dispersão na forma como a variável capacidade de absorção é estudada, nomeadamente, no que se refere à sua dimensionalidade e consequente operacionalização enquanto constructo. As múltiplas conceptualizações, respeitando uma visão uni ou bidimensional, de segunda ordem, da capacidade de absorção, refletem-se num posicionamento não consensual, nos modelos testados pela literatura empírica, dos processos de gestão do conhecimento, face à capacidade de absorção e suas dimensões.

A partir de um processo de integração da literatura teórica e empírica analisada, algumas relações foram consolidadas pela sua plausibilidade teórica e confirmação empírica, permitindo estruturar a base de um modelo sinóptico, de variáveis e relações, desenvolvido e apresentado nas considerações finais da Parte 1. As relações teóricas estabelecidas permitiram-nos levantar as hipóteses de que a implementação de processos de aquisição do conhecimento externo e

partilha interna tendem a reforçar a capacidade de absorção das organizações. Por sua vez, o armazenamento e documentação de conhecimento, quando a capacidade de absorção é perspetivada na sua bidimensionalidade, isto é, enquanto capacidade potencial e efetiva, representa um importante processo para manter na organização o conhecimento adquirido e assimilado, mantendo-o disponível para a sua subsequente transformação e aplicação. Quanto à capacidade de absorção, esperou-se que esta desempenhasse um papel relevante na promoção da criação interna de novo conhecimento e na inovação organizacional. O processo de criação interna de novo conhecimento apresentou-se, segundo a lógica estabelecida no modelo, como preditor linear da inovação organizacional.

Relativamente ao segundo objetivo geral apresentado, que visou explorar, rever e sistematizar, teoricamente, a relação existente, na literatura científica, entre processos chave de gestão do conhecimento e a inovação organizacional, o alcançar do mesmo pressupôs a aplicação de uma metodologia de revisão sistemática da literatura. A análise realizada permitiu, assim, a realização de uma sistematização teórica de um conjunto alargado de referências e de evidências acerca das relações entre processos de gestão do conhecimento e diferentes tipos de inovação. Para além do estabelecimento dessas relações teóricas, a análise mais detalhada dos estudos considerados permitiu conhecer variáveis associadas e, em alguns casos, o seu posicionamento enquanto variáveis mediadoras. O trabalho realizado e apresentado no capítulo 2 originou uma consolidação de relações teóricas – entre processos chave de gestão do conhecimento e a inovação - que se refletiram no desenvolvimento e aprofundamento da base inicial do modelo apresentado nas considerações finais da parte 1.

Estabelecidas as potenciais relações teóricas, pretendeu-se analisar, empiricamente, a relação existente entre processos chave de gestão do conhecimento, a capacidade de absorção, e a inovação organizacional. Os resultados apresentados no capítulo 3 forneceram evidências que permitem agora concluir que, nas organizações que compõem a amostra (cf. Anexo 10) do estudo empírico realizado, a variável relativa à criação interna de novo conhecimento representa o principal impulsionador da inovação organizacional. Por sua vez, a capacidade de absorção, evidenciou-se como uma importante variável antecedente da criação interna de novo conhecimento.

Os resultados alcançados demonstraram, assim, que é na criação interna de novo conhecimento que parece estar assente a inovação organizacional nas e das empresas analisadas. Este facto, na ótica de Kluge, Stein e Licht (2002), poderá trazer riscos acrescidos para as organizações, na medida em que os custos de criação tendem a ser superiores, quando comparados com a aplicação de conhecimento externamente adquirido. Assim, será importante que as empresas sustentem os seus processos de inovação organizacional não apenas em conhecimento criado internamente, mas, também, naquele que recolhem externamente através de relações interorganizacionais previamente estabelecidas. Este conhecimento de múltiplas proveniências, isto é, o conhecimento internamente criado e o conhecimento externamente adquirido representará, assim, a fonte de recursos (cognitivos) necessários para o desenvolvimento, intraorganizacional, de novos produtos, processos, estratégias de gestão e de marketing. Para que o conhecimento externamente adquirido possa ser aplicado, é, no entanto, necessário que as empresas disponham de recursos humanos qualificados e capazes de moderar a relação entre a capacidade potencial das empresas adquirirem e assimilarem novos conhecimentos e os seus resultados de inovação.

Os resultados apresentados demonstraram, ainda, que a capacidade de absorção não parece potenciar, nas empresas estudadas, os resultados de inovação de forma estatisticamente significativa, contrariando, assim, uma tendência que tem sido amplamente divulgada na literatura que sustentou a hipótese apresentada. Considerando este resultado, o mesmo evidencia oportunidades de melhoria nas distintas fases associadas a esta capacidade organizacional, levantando assim desafios acrescidos para os profissionais nas organizações, nomeadamente, para o psicólogo que atua em contexto organizacional.

Continuando a análise conclusiva – e encerrando, assim, as considerações relativas aos capítulos empíricos da tese – o capítulo 4, propôs-se dar resposta ao objetivo de analisar, empiricamente, a relação existente entre processos chave de gestão do conhecimento e a capacidade de absorção, potencial e efetiva. Especificando, procurou-se compreender a importância do processo de armazenamento e documentação do conhecimento na transição entre a capacidade potencial e efetiva de absorção do conhecimento. Foi ainda testada a relação entre a capacidade de absorção, nas dimensões potencial e efetiva, e a criação de novo conhecimento.

Do teste realizado às hipóteses formuladas, pode concluir-se acerca da importância do processo de armazenamento e documentação do conhecimento, assim como da capacidade efetiva de absorção do conhecimento, como importantes antecedentes da criação de novo conhecimento na amostra de organizações estudada. O referido processo de armazenamento e documentação do conhecimento e a capacidade efetiva de absorção apresentam-se ainda, individual e conjuntamente, como mediadores entre a capacidade potencial e a criação de novo conhecimento.

Na sua globalidade - e ligação com o modelo sinóptico apresentado nas considerações finais da parte 1 - os resultados da presente tese reforçam a importância, nos contextos estudados, da ligação entre processos intraorganizacionais associados ao conhecimento (partilha, armazenamento/documentação e criação) e a criação de novo conhecimento e inovação. Já o processo (interorganizacional) de aquisição de conhecimento externo e a capacidade de absorção, não demonstraram desempenhar um papel de influência linear com a inovação organizacional, embora, relativamente à capacidade (efetiva) de absorção, esta pareça permitir o reforço do conhecimento interno que, por sua vez, parece potenciar a inovação nas/das organizações estudadas.

Relativamente à dimensionalidade do constructo da capacidade de absorção, os resultados apresentados, quando interpretados à luz de algumas das limitações do presente trabalho, como a dimensão da amostra, não permitem, nesta componente, tecer conclusões definitivas na comparação dos dois modelos testados (cf. Anexo 2). De facto, embora o modelo que considera a capacidade potencial e a capacidade efetiva como dimensões distintas (Capítulo IV) obtenha validade discriminante, quando utilizado o método dos mínimos quadrados parciais (PLS-SEM), os resultados obtidos na análise fatorial confirmatória (cf. Anexo 2), com recurso ao AMOS, sustentam uma organização dos itens em torno de 4 variáveis de primeira ordem e uma de segunda ordem, o que é consentâneo com a validação inicial do instrumento (Flatten, Greve, et al., 2011).

O trabalho que agora se conclui, pretende, assim, e para além do contributo académico e para a investigação, ser um contributo para potenciar a influência estratégica do psicólogo em

contexto organizacional, munindo os profissionais de referenciais teóricos atuais e instrumentos de medida que permitam uma análise válida de processos e capacidades organizacionais que poderão ser uma importante mais-valia nas suas atividades, reconhecidas pela Ordem dos Psicólogos Portugueses, de consultoria e assessoria à direção da organização.

Como referido anteriormente, são diversos os desafios para a prática que decorrem dos resultados alcançados pela presente tese. Nomeadamente, ao constatar-se que, na amostra estudada, os processos intraorganizacionais associados ao conhecimento (e sua gestão) são de importância maior para a inovação organizacional, os desafios para o psicólogo do trabalho e das organizações passam por, desde logo, garantir a existência de condições internas que facilitem a comunicação interpessoal presencial, reforçando assim a componente humana, vital para a partilha e criação de conhecimentos. Também a implementação e/ou estímulo de sistemas de comunicação à distância e repositórios institucionais será de utilidade uma vez que a disponibilização do conhecimento existente parece potenciar a criação de novo conhecimento. Por outro lado, no que concerne à capacidade de absorção, o desafio para o psicólogo, em contexto organizacional, passa por detetar, em cada fase, qual(quais) o(s) elemento(s) na organização mais capacitado(s) para adquirir conhecimento junto de entidades externas (isto é, quem será o *gatekeeper*) e posteriormente difundi-lo internamente (assimilação), bem como que elemento(s) terão a capacidade de transformar (efetivamente) e aplicar esse conhecimento em resultados organizacionais. Próximo deste desafio, o desenvolvimento de estratégias que permitam o armazenamento do conhecimento existente, poderá representar um fator de eficiência, promotor da efetiva realização (em fins comerciais) da capacidade potencial de absorção das organizações. A monitorização destas fases e o apoio à gestão/administração da empresa deverá potenciar a capacidade de absorção da organização, reforçando a importância da cognição individual enquanto um fator interno crítico para a capacidade de absorção. Um outro desafio para o psicólogo em contexto organizacional, resultante dos dados obtidos nas organizações analisadas, passa também pelo estímulo às relações interorganizacionais, potenciadoras da aquisição externa de novos conhecimentos, nomeadamente junto de universidades e instituições públicas de investigação, uma vez que

essa, segundo os dados recolhidos e analisados, se apresenta como a vertente com maior potencial de desenvolvimento.

Ao nível das implicações teóricas, a tese que agora se conclui apresentou contributos teóricos, (reconhecidos e validados, em diferentes momentos, ao longo do processo de investigação, por pares da/na comunidade científica[8]), que fornecem um estado da arte atual e relevante para os investigadores em ciências da organização, em geral, e da psicologia do trabalho e das organizações, em particular, nos domínios da gestão do conhecimento, capacidade de absorção e inovação. Para além dos contributos teóricos que resultam e ficam da presente tese, os capítulos empíricos contribuem para o desenvolvimento de conhecimento científico, fornecendo evidências, num contexto específico, da importância do estudo das inter-relações entre capacidade de absorção e processos organizacionais de gestão do conhecimento, bem como da relação destes com a inovação organizacional.

Dos resultados empíricos alcançados derivam importantes implicações conclusivas para a conceptualização da capacidade de absorção e seu posicionamento face a processos chave de gestão do conhecimento, que desempenham um papel antecessor, mediador ou consequente das distintas fases e dimensões consideradas. Especificamente, o presente trabalho permite reforçar a importância de um processo intermédio de armazenamento e documentação do conhecimento, enquanto potencial mediador entre a capacidade potencial - isto é, a capacidade de reconhecer, adquirir e assimilar conhecimento externo – e a capacidade efetiva de absorção do conhecimento – ou seja, a aplicação desse conhecimento para fins comerciais. Nesse sentido, o presente trabalho, contribuiu teoricamente para o aprofundamento da compreensão dos processos que potenciam aquilo que Zahra e George (2002) designaram por

[8] Neste ponto, é importante enaltecer a importância do *feedback* (positivo e negativo) obtido ao longo de diversos momentos da realização deste trabalho, quer presencialmente (como é exemplo a apresentação realizada na *European Conference on Knowledge Management*), quer por escrito (como são exemplo as respostas obtidas em processo de submissão e/ou revisão por pares) reforçando a importância do acesso à comunidade científica, na área de especialização, como forma de testar e consolidar os contributos e conteúdos constituintes da presente tese.

fator de eficiência, ou seja, que permitem a concretização e efetivação - por via da transformação e aplicação do conhecimento - do potencial existente.

Por último, os resultados apresentados deverão ser interpretados à luz das limitações do estudo realizado. Em primeiro lugar, a dimensão da amostra obtida, indissociável da baixa taxa de resposta, apresenta-se como uma limitação à generalização dos resultados obtidos para outras organizações dos setores estudados. Em segundo lugar, o desenho transversal do estudo empírico não possibilitou, nem possibilita, um acompanhamento da realidade temporal das capacidades e resultados organizacionais das empresas consideradas na amostra. Uma terceira limitação da investigação apresentada prendeu-se com a recolha de dados acerca de todas as variáveis em estudo junto de um único respondente, por organização. Esta opção, também um limite, embora controlado com análise pré e pós recolha, não deixou de estar presente na análise efetuada e deverá ser considerado na interpretação dos resultados e dirimido em estudos subsequentes.

O trabalho apresentado e inscrito ao longo da presente tese procurou atingir e concretizar os objetivos explicitados na introdução geral do documento. Ainda que se considere que os mesmos foram cumpridos, do processo decorrido emergiram, necessariamente, novas questões e desafios que se explanam nesta secção.

Ao nível da investigação instrumental, sugere-se que a análise da dimensionalidade da escala de capacidade de absorção seja, na continuidade dos contributos (teóricos e instrumentais) desta investigação, testada e aprofundada em estudos futuros. Estes estudos, em contexto português, deverão, se possível, analisar a escala utilizada em amostras de maior dimensão, que permitam esclarecer, inequivocamente, a organização das quatro fases de capacidade de absorção (aquisição, assimilação, transformação e aplicação) num único fator latente (capacidade de absorção), ou em dois fatores latentes (capacidade potencial e capacidade efetiva), correlacionados, mas distintos.

Ao nível empírico, os estudos realizados permitiram compreender quais os processos organizacionais de gestão do conhecimento que estão implicados na criação de novo conhecimento interno e na inovação organizacional. Permitiram, ainda, clarificar o papel da capacidade de absorção enquanto antecedente da criação de novo conhecimento e da inovação organizacional, bem como enquanto consequente da partilha interna e aquisição externa de conhecimento. No entanto, atendendo à natureza multinível da capacidade de absorção, a investigação futura em psicologia do trabalho e das organizações poderá debruçar-se sobre os alicerces (individuais) da capacidade de absorção, analisando o impacto das características individuais dos trabalhadores do conhecimento na capacidade (organizacional) de absorção do conhecimento, bem como o seu papel na criação de novo conhecimento, criatividade e inovação organizacional.

No que concerne à recolha de dados, a experiência da investigação realizada permite antecipar que os desafios serão imensos para a investigação futura realizada em contexto organizacional. De facto, como sinalizado no artigo de Rogelberg e Stanton (2007), as taxas de resposta têm sofrido um decréscimo assinalável e nenhuma tecnologia recente de recolha de dados se apresenta como uma panaceia para aumentar as taxas de resposta. Acrescentando à literatura existente o *feedback* recolhido no momento da recolha de dados, pode afirmar-se que a proliferação de recolha de dados através de questionários junto das empresas representa, simultaneamente, uma ameaça e um desafio à investigação e aos investigadores em contexto organizacional. Novas formas de envolvimento, com devolução efetiva de dados e de elementos relevantes e significativos, perspetivados como uma efetiva mais-valia para o(s) respondente(s), a(s) organização(ões) respondente(s), as associações e/ou representantes setoriais, poderão representar um importante incentivo à participação e ao efetivo envolvimento por parte dos respondentes alvo[9]. O aumento da taxa de resposta poderá também

[9] Nesse sentido, o presente trabalho apresenta já um contributo, uma vez que foi dada a possibilidade aos respondentes de fornecerem um contacto de endereço eletrónico (tendo sido registados 66 contactos para o efeito), canal através do qual se fará chegar um relatório do presente trabalho e suas principais conclusões. A devolução de resultados será igualmente realizada junto dos representantes setoriais/associações dos setores estudados.

procurar-se através de um contacto prévio com organizações pertencentes à população em estudo, realizando-se o envio posteriormente apenas para as que aceitarem previamente responder ao questionário (Evans & Mathur, 2005). No entanto, estes procedimentos envolvem custos acrescidos e a necessidade de mobilização de recursos quando a população em estudo é numerosa.

Por último, num período temporal marcado pela crescente instabilidade, a diversos níveis – económico, social e político, com um reflexo visível na organização das empresas, na organização do trabalho e no emprego, em que se tem enfatizado a importância e centralidade da inovação nas organizações como fator crítico à sua sobrevivência e competitividade, o trabalho que agora se ultima pretendeu oferecer um contributo da e para a psicologia do trabalho e das organizações no aprofundamento da compreensão dos fenómenos associados com o conhecimento organizacional, processos a ele associados e sua gestão, na relação com a capacidade de absorção e a inovação organizacional.

Face ao trabalho desenvolvido e resultados alcançados, crê-se que a presente tese representa e apresenta diversos contributos - teóricos, instrumentais e empíricos - relevantes (para a psicologia, nas e das organizações), contribuindo para o alargamento das fronteiras do conhecimento, nesta área de especialização, e representando uma mais-valia para a crescente afirmação da psicologia e do psicólogo (do trabalho e das organizações) como elemento chave na investigação, na avaliação e intervenção nas organizações e processos, do conhecimento e sua gestão, empreendidos por esta, assim como nas atividades de consultoria e apoio à gestão (estratégica) das pessoas e da inovação organizacional.

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