UNIVERSIDADE BEIRA INTERIOR

The Role of Management Innovation in Service Sector Performance:
A Study Applied to Knowledge Intensive Business Services

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À Família, com quem Partilho a Vida.

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Resumo

A inovação de gestão é importante nas empresas porque contribui para a inovação tecnológica e está direta ou indiretamente associada ao seu desempenho de forma positiva. No entanto, a sua influência no desempenho depende da sua difusão pela empresa como sistema social, abrangendo uma variedade de processos e métodos. Como a inovação de gestão é orientada para as pessoas, é um campo interessante para investigar o seu papel na inovação e no desempenho das empresas de serviços.

Em particular, a conceptualização de diferentes relações causais entre a inovação de gestão e a tecnológica, bem como as complementaridades entre estes tipos de inovação influenciam o desempenho das empresas. No entanto, verificam-se lacunas relativamente a estudos sobre os efeitos das relações entre a inovação de gestão e a tecnológica. Além disso, a literatura tem demonstrado que inovação de gestão é relevante no setor industrial, carecendo o seu estudo no setor dos serviços.

Acresce-se que nas regiões periféricas da Europa, inovar requer mais esforço devido à menor densidade organizacional e institucional. Portanto, é importante investigar se a novas atividades de gestão criam valor na inovação e no desempenho das empresas aí localizadas.

Assim, a presente tese prossegue o objetivo genérico de avaliar como a introdução da inovação de gestão determina a inovação e o desempenho empresariais no setor dos serviços. Esta tese engloba o papel da inovação de gestão no desempenho das empresas de serviços, considerando os seus efeitos combinado, antecedente e mediador. As influências e os efeitos referidos foram consolidados em três modelos e testados empiricamente através da técnica de modelação com equações estruturais, tendo como base uma amostra com dados primários, recolhidos através de inquérito por questionário, em empresas de serviços empresariais de conhecimento intensivo localizadas em Portugal.

Os resultados fornecem evidências empíricas que confirmam a existência de efeitos diretos e indiretos positivos e significativos entre a inovação de gestão, a tecnologia, a inovação de serviço e o desempenho das empresas de serviços.

Conclui-se que nas empresas de serviços empresariais de conhecimento intensivo a inovação de gestão funciona através de uma relação de reciprocidade e complementaridade com a tecnologia e a inovação de serviço. A constatação do seu efeito direto e indireto no desempenho expande esta linha de investigação.

Palavras-chave

Inovação de gestão; inovação organizacional; inovação de serviço/produto; tecnologia; desempenho; serviços; serviços empresariais de conhecimento intensivo; KIBS; inovação em simultâneo; complementaridade na inovação; perspectiva sócio-técnica; visão baseada em recursos.

Abstract

Management innovation is important in firms because it contributes to technological innovation and is directly or indirectly associated with their performance in a positive way. However, its outcome on performance depends on its diffusion by the firm as a social system, encompassing a variety of processes and methods. As management innovation is people-oriented, it is an interesting field for investigating its role in the innovation and performance of service firms.

In particular, the conceptualisation of different causal relationships between management and technological innovation, as well as the complementarities between these types of innovation influence the performance of firms. However, there are gaps regarding studies on the effects of the relationships between management and technological innovation. Furthermore, the literature has shown that management innovation is relevant in the industrial sector, lacking its study in the services sector.

Additionally, in the peripheral regions of Europe, innovating requires more effort due to lower organisational and institutional density. Therefore, it is important to investigate whether new management activities create value in innovation and performance of firms located there.

Thus, this thesis pursues the generic objective of assessing how the introduction of management innovation determines business innovation and performance in the services sector. It encompasses the role of management innovation in the performance of service firms, covering its combinative, antecedent and mediating effects. These influences and effects were consolidated into three models and empirically tested using the structural equation modelling technique, based on a sample of knowledge-intensive business services firms located in Portugal and using primary data collected through a questionnaire survey.

The results provide empirical evidence that confirms the existence of direct and indirect positive and significant effects between management innovation, technology, service innovation and the performance of service firms.

It is concluded that in knowledge-intensive business service firms, management innovation operates through a reciprocal and complementary relationship with technology and service innovation. The finding of its direct and indirect effects on performance expands this line of research.

Keywords

Management innovation; organisational innovation; service/product innovation; technology; performance; services; knowledge intensive business services; KIBS; simultaneous innovation; innovation complementarity; socio-technical perspective; resource based view.

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List of acronyms and abbreviations

AVE	Average Variance Extracted
CR	Composite Reliability
DC	Dynamic Capabilities
EU	European Union
FP	Financial Performance
KIBS	Knowledge-Intensive Business Services
MI	Management Innovation
NACE	Nomenclature statistique des Activités économiques dans la Communauté Européenne
NECE	Research Center in Business Sciences
NFP	Non-Financial Performance
OP	Organisational Performance
p-KIBS	Professional Knowledge-Intensive Business Services
PLS-SEM	Partial-Least Square, Structural Equation Model
R&D	Research and Development
RBV	Resource Based View
SABI	Iberian Balance Sheet Analysis System
SD	Standard Deviation
SI	Service Innovation
t-KIBS	Technology Knowledge-Intensive Business Services
TEC	Technology
VAF	Variance Accounted For
VIF	Variance Inflation Factor

Chapter 1 - General Introduction

1.1. Problem statement

Innovation plays a critical role in firms' success and sustainable development (Kahn & Candi, 2021; Le Anh et al., 2021; Nemlioglu & Mallick, 2021). It focuses mainly on new or significantly improved technological products and processes, focusing on the technical development of new products and new production techniques (García-Piqueres et al., 2020; OECD/Eurostat, 2018; Ringberg et al., 2019). Firms adopt and implement innovations to respond to the competitive or institutional environment (Walker et al., 2015) or internal organisational choices (Damanpour et al., 2009). By innovating, a firm can therefore undertake a transformational process and scale up its future capacity to grow (OECD, 2021), and the necessity for firm survival (Ortiz-Villajos & Sotoca, 2018).

The notion that innovation based on technological innovations alone is not enough to sustain change but requires innovations in the social domain (van Oorschot et al., 2018). The challenges that firms face in today's global marketplace are related to offering new products and changing their management because of its positive effects on organisational renewal and performance (Khosravi et al., 2019). The firms' innovation challenge also focuses on changes in management practices, processes and organisational structures (Heyden et al., 2018; Vaccaro et al., 2012). This type of innovation occurs mainly in the internal context of the organisation (Khosravi et al., 2019; Mol & Birkinshaw, 2009), driven internally by regular management initiatives (O'Brien, 2020). Management innovations are initiated at the corporate level and then implemented at unit levels (Heyden et al., 2018; Jaakkola & Hallin, 2018; Qin et al., 2015). This type of innovation is systemic (Su & Baird, 2018) and its effectiveness depends on the diffusion process through the organisation's social system, which is directed to the firm's employees and their relationships (Janka et al., 2020).

Management innovation has been an interesting topic for academics and professionals because of its positive effects on a firm's renewal and performance (Khosravi et al., 2019). Management innovation is recognised as creating a long-lasting advantage and producing significant shifts in competitive position (Boadu et al., 2021; Hamel, 2006; Qin et al., 2015). The adoption of management innovation is context-specific (Mol & Birkinshaw, 2009), and the less conventional the principle underlying the adoption of management innovation, the longer it will take competitors to respond (Hamel, 2006).

The purpose of adopting management innovation may include reducing time and costs, pursuing direct and tangible benefits or improving quality and innovation skills (Meroño-Cerdán & López-Nicolás, 2017). Nonetheless, the link between management innovation and business results is relatively unclear and uncertain (Damanpour, 2014). Accordingly, the evidence of the link between management innovation and the desired firm outcome remains weak (Khosravi et al., 2019).

The importance of researching this gap in the innovation literature is that differences in performance may result from the use and effectiveness of simultaneous innovation practices. Firms combine any innovation (process, organisational, and marketing) types in the presence of product innovation (García-Piqueres et al., 2020). In this sense, and as stated by González-Blanco et al. (2019) and Le Anh et al. (2021), the simultaneous implementation of different types of innovation is advisable. There is a complementarity between management and technological innovations in manufacturing firms (Arranz et al., 2019). Nevertheless, the literature on complementarities between technological and non-technological innovations is scarce in the services sector (González-Blanco et al., 2019). In Knowledge-Intensive Business Services (KIBS), technological and non-technological innovations are crucial in improving performance (Ryu & Lee, 2016).

Another gap identified in the literature is related to the capacity of management innovation to contribute to the development and implementation of technological innovation. Several authors indicated that management innovation enhances technological innovation (Bas et al., 2015; Hollen et al., 2013). Existing research finds that management innovation positively affects product and process innovation (Ozturk & Ozen, 2021). It was assumed that strategic changes in management practices, processes and structures result in leveraging the technological knowledge base of the firm's innovation (Kraśnicka et al., 2018). Management innovation can provide unique and valuable working practices and organisational structures that can advance the ability of organisations to adopt new technology (Khosravi et al., 2019). The management innovation benefits are significant for service firms due to their flexible nature of operations (Ozturk & Ozen, 2021). This view is in line with a stream of literature that suggests that management innovation enhances flexibility and creativity, facilitating technological innovation development (Anzola-Román et al., 2018; Bas et al., 2015; Herhausen et al., 2021). In addition, in manufacturing firms, the relationship between efficiency and management innovation is complementary in the presence of flexibility innovation (H. Zhang, 2022). However, it is not entirely clear the way management innovation affects the service sector (Saunila, 2020; Walker et al., 2015).

In the services sector, a firm's management and innovation will likely provide competitive advantages (Mol & Birkinshaw, 2009). Service firms, whose innovation is based on the service encounter between employees and clients, such as KIBS, especially need to implement a management system that facilitates the creation of ideas, classification, decision, and integration of innovative practices (Sørensen et al., 2013).

Human and organisational resources are very relevant to the innovation process in service firms (Sørensen et al., 2013; Storey et al., 2016). Human capital and management orientation are essential capabilities that enable professional services firms to innovate (Bello et al., 2016). Moreover, human capital is relevant to the performance of service firms, especially when their activity is knowledge-intensive (Corrocher et al., 2013). Human resources and knowledge are fundamental elements in service organisations because innovation requires creativity, knowledge, skills and entrepreneurship to achieve the end (Taques et al., 2021). Consequently, managing professional service firms is about managing the knowledge embedded in the professionals (Jensen et al., 2010; Williams & van Triest, 2021). In fact, management innovation affects the creation, sharing and application of knowledge (Magnier-Watanabe & Benton, 2017). On the other hand, knowledge exchange is related to management innovation (Černe et al., 2013).

The research gaps mentioned above were addressed by integrating management innovation into the service firm's innovation process and analysing its role in innovation outcomes and, ultimately, firm performance. As management innovation is oriented towards people, it is an interesting field to investigate its role in the innovation and performance of KIBS. We suggest that KIBS firms can be more successful in innovation and performance if they establish management practices, processes and structures that fit the firm's innovation and performance. This thesis adopted a rational perspective and assumed that management innovation, like the other innovation types, is introduced in service firms to maintain or improve their performance.

1.2. Research objectives

Given the role of KIBS as knowledge providers and as relevant actors in the uptake of innovation in the economy (Content et al., 2022), it is necessary to understand the management innovation of these firms in the context of their innovative activity and performance. For example, a management structure implemented across the organisation creates organisational capabilities to deliver new quality services (Boadu et al., 2021). Furthermore, management innovation is relevant to competitiveness and efficiency in the service sector and can contribute to its economic growth (Damanpour

& Aravind, 2012). Additionaly, management innovation is often necessary to operationalise the technological innovation and to improve firm performance (Chen et al., 2020). However, the scarcity of studies on management innovation and its relationship with business performance signal the complexity of these relationships (Kraśnicka et al., 2018).

The general objective of this thesis is to evaluate how the introduction of management innovation determines innovation and firm performance and to provide implications for the strategic and operational management of KIBS, applying a national and sub-sectoral service context approach. The chapters are developed according to the specific objectives in Table 1.1.

Table 1.1 - Research objectives and studies

General objective To evaluate how the introduction of management innovation determines innovation and firm performance	
Research objectives	**Studies**
First, to trace the evolution of the intellectual structure of the management innovation research field during the period 1960-2018; second, to identify relevant papers, authors, and scientific journals; third, to outline future research directions on the management innovation field in core areas and key developments.	Intellectual structure of management innovation: a bibliometric analysis
To analyse management innovation and performance in services firms from a rational and an institutional perspective. To identify useful directions for future research, looking more closely at the interaction of rational and institutional perspectives in adopting management innovation.	Management innovation and business performance in services: economic and social potential
To analyse the simultaneous use of technology, management and service innovations on firm performance.	Relationships between innovation and organisational performance: evidence in knowledge-intensive business services
To analyse the precedence of management innovation in the relationship of technology and service innovation in the firm's performance.	The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology
Analyse if and how, the firm's management innovation influences the results in innovation and firms performance.	The impact of technology on service innovation and firm performance: the mediating role of management innovation

1.3. Study context

This study focuses on Portugal, located in the south of Europe. The country covers an area of 92.000 km² and has little more than 10 million inhabitants (Statistics Portugal, 2021). Portugal has improved the availability of a high-skilled and educated workforce (11.3%) between 2020 and 2021, while the EU average decreased by 2.6% in the same period (Commission, 2021).

This peripheral European country, with a large population of low-productive micro firms, represents a barrier to scaling up local innovation performance (OECD, 2022b). However, the micro and small and medium-sized enterprise sectors contribute to 78% of employment and 68% of value added (OECD average, 69% and 59%) (OECD, 2021). In 2021, 31,7% of employment was in knowledge-intensive services (EU is 35,1%) (Commission, 2021), and these knowledge-sourcing activities play a crucial role in the innovation process of Portuguese service firms (Teixeira & Bezerra, 2016).

In Portugal, innovation performance increased between 2019 and 2020 but strongly declined in 2021 (Commission, 2021). Moderate innovative countries need to improve their capacities to produce radical innovations that contribute to the economic performance of the firms to reverse this decline (Parrilli et al., 2020).

Service firms are beginning to attach greater importance to the role of services in value creation, seeking new points of economic growth by innovating service content and changing service forms (Feng et al., 2021). The services are a major part of the global economy, generating more than two-thirds of the global gross domestic product (OECD, 2022a).

KIBS, one of the services subsector, have been recognised as innovators (Martin-Rios & Ciobanu, 2019; Muller & Doloreux, 2009). They exert direct positive effects on creating new economic activities, providing regions with the conditions to diversify economically (Content et al., 2022). In Portugal, being a small and open economy, the policy priority of recent governments has been to move the economy towards knowledge-intensive and high-technology sectors (OECD, 2022b). KIBS will likely play an important role in this recovery from the pandemic crisis, and policymakers can mobilise their services (Miles et al., 2021). Portugal demonstrates its commitment to the European project based on shared prosperity, following the *Next Generation EU* (European Commission, 2020) that directs initiatives such as "… the increase in the

contributions of the services with intensive use of knowledge for the country's added value will allow increasing the capacity for innovation and the firms' competitiveness…" (Ministry of Planning, 2021). To meet this challenge, it is necessary to understand how management innovation can influence innovation and performance in KIBS. Many studies on management innovation were conducted in the United States of America, Spain, and France (Khosravi et al., 2019; Montalván-Burbano et al., 2020), with very little research in other countries (Khosravi et al., 2019). In this context, it seems highly relevant to try refining management innovation's role and outcomes towards firm performance at Portuguese KIBS firms.

1.4. Conceptual model

The conceptual model is based on a sectoral and national context approach. In this sense, this investigation is centred on innovative KIBS in Portugal. So far, KIBS have been recognised as innovators (Muller & Doloreux, 2009). Innovation outputs in KIBS firms include service innovations and service modifications (Bumberová & Milichovskỳ, 2020). The greatest and the least degree of service innovation differentiates it into incremental and radical innovation (Cheng & Krumwiede, 2012). Alternatively, process innovation employs technologies to develop new products and services (Ryu & Lee, 2018). Process innovations largely introduce new machines, incorporating new knowledge and technologies (Karlsson & Tavassoli, 2016).

Research has found that firms tend to undertake certain innovation practices linked to service innovation simultaneously. Ryu & Lee (2018) revealed that technology is a precondition for driving service creation orientation and achieving better firm performance. Amara et al. (2016) showed that knowledge embodied in managerial practices and advanced technologies increases innovation propensity in KIBS. In turn, Walker et al. (2015) showed that there are no differences in the direction and the strength of the association of management and technological innovations on firm performance. Ozturk & Ozen (2021) found that management innovation is a prerequisite for product/service innovation. These studies show that service firms can derive synergistic gains from simultaneous innovation, indicating the existence of complementarities between these innovation types. The complementarities perspective helps to enrich the understanding of how different innovation types are combined and how such combinations shape subsequent performance (Ballot et al., 2015).

This thesis conceptual model (Figure 1.1) postulated that management innovation is an antecedent factor of technological innovation, and also plays a mediating role in enhancing the relationships between technological innovation and performance.

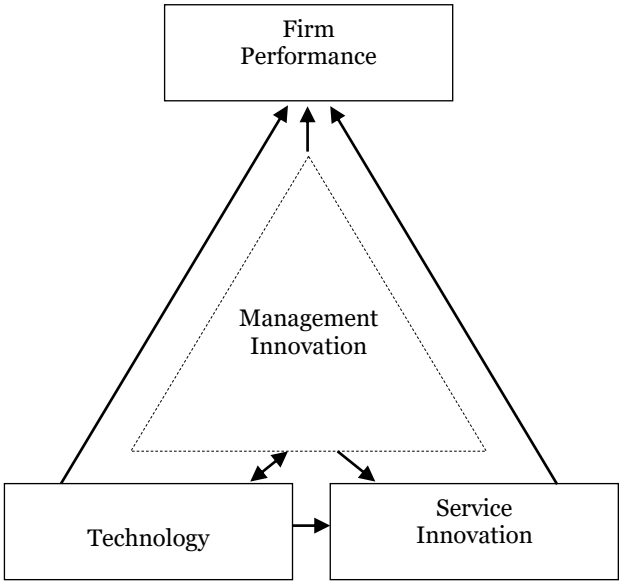

Figure 1.1 - Thesis conceptual model

The complementary role of innovation in performance is theoretically supported by the resource-based view (RBV) (Barney, 1991). The firm's RBV uses technological and management resources to explain their competitive advantage. The application of the RBV also supports the perspective of organisations as socio-technical systems (Trist & Bamforth, 1951) applied to study the correspondence between types of innovation (Alexiev et al., 2018; Hervas-Oliver et al., 2018). This conceptual model reinforces management and technological innovation activities in line with the resource-based and socio-technical perspectives. KIBS firms benefit from their implementation and harmonisation to optimise their innovation processes and performance results.

1.5. Research design and methodology

1.5.1. Research approach

Positivism states that the social world exists externally and that its properties can be measured through objective methods (Easterby-Smith et al., 2018). This thesis can be included in the positivist view.

We opted for a quantitative approach through hypothesising and demonstrating the hypotheses' truth or falsity. We chose the positivism perspective based on the assumption of management innovation capacity in service firms. Then, measures of management innovation, service innovation, technology application and performance were formulated, based on those developed by service firms and related to innovation and firm performance. Aiming to achieve the objectives of this thesis, primary data

were collected through a survey, and 232 KIBS were examined using the firm level as the unit of analysis.

1.5.2.Unit of analysis

Services can be described as "doing things rather than making things" (Miles et al., 2018, p.2). Following the taxonomy developed by Castellacci (2008), service firms are classified into three patterns of innovation: supplier-dominated service, infrastructural services, and KIBS. KIBS cover professional and technology-related services (Desyllas et al., 2018). Accordingly, Muller & Doloreux (2009) state that professional services are liable to be intensive users of new technology (e.g., business and management services, legal and accounting activities, and market research). Technology-based services are mainly related to information and communication technologies and technical activities (e.g., information technology-related services, engineering, R&D consulting) (Muller & Doloreux, 2009).

This thesis proposes that innovative KIBS could benefit their service innovation and firm performance by focusing on management innovation. As this study focuses on KIBS, a proper definition is required. KIBS, as knowledge creators have always characterised them (Hipp, 1999), and a significant variety among KIBS is the 'type' of knowledge central to their activities (Pina & Tether, 2016). For Muller & Doloreux (2009), KIBS refer to service firms characterised by high knowledge intensity and services which are predominantly non-routine. Chung & Tseng (2019) suggest a more precise definition of KIBS as a high-performance service sector that serves its clients with high value-added knowledge, satisfying them with professional consultations and as a means of creating, applying and disseminating information and knowledge. To Miles et al. (2021), KIBS are private firms which apply specialised knowledge to business customers' problems. In common with these definitions, KIBS activities depend on their human capital, whose services are knowledge-based; thus, the customers are mainly other firms.

In this thesis, KIBS firms are considered as professional organisations whose main value creation activities comprise the accumulation, creation or dissemination of knowledge in order to provide a personalised service or solution that meets customers needs (Jaakkola & Hallin, 2018). This definition indicates that managers can work daily at the operational and strategic levels to develop organisational practices to secure knowledge transfer, efficiently connecting expertise and social interaction between individuals across organisational structures. The reason for choosing this sector is that it is a knowledge-intensive sector where continuous innovation is crucial, and

management innovation influences the nature and the way it treats knowledge. It is expected that this type of innovation relates to technology application and service innovation impacts on KIBS performance.

This study addresses the firm-level introduction of management innovation, in which KIBS firms are the unit of analysis, and Portuguese KIBS are the object of study. Specifically, KIBS firms with a minimum turnover of 1Eur and more than one worker in 2018. Particularly the knowledge-intensive service industries, can include units with fewer persons employed (OECD/Eurostat, 2018).

1.5.3. Sample and data collection

The empirical research was conducted with a database of Portuguese KIBS, obtained through questionnaires, using a set of procedures recommended in the submission of surveys (Dillman, 2011). A series of practices were applied to ensure the highest possible response rate and data reliability. These included testing the questionnaires (pre-tests), supplying the responsible manager of the firm with the necessary knowledge to provide valid answers, defining and reporting the objectives of the project and the expected contributions, and providing the telephone contact and e-mail address to answer any questions about the research.

Before the final questionnaire was sent out, a pre-test was carried out in a group of three academics specialised in innovation, research, and services, as well as four managers of firms of different sizes and activities in KIBS. The comments and suggestions for improvement were considered when drafting the final questionnaire (Appendix). However, as Ettlie & Rosenthal (2011) point out, the wording preferences may affect the responses.

The Iberian Balance Sheet Analysis System (SABI), which includes business information on Iberian firms, was accessed to determine the universe and its distribution by activity and size. This database is updated weekly and contains information on the study population that can be accessed. There are 9.946 Portuguese KIBS that meet the above selection criteria.

There are no uniform criteria for identifying KIBS (Miles et al., 2018). The service activities have been identified according to the two main sets of services in the KIBS group (Miles et al., 1995), and according to the *Nomenclature Statistique des Activités Économiques dans la Communauté Européenne* (NACE Rev. 2), which has become

common in the identification of KIBS in Europe (Freel, 2006; Hipp et al., 2015; Muller & Doloreux, 2009; Chung & Tseng, 2019).

To maximise the number of observations likewise that Antonelli & Tubiana (2020), were included the activities Computer programming, Consultancy, Information service, Legal and accounting, head offices; management consultancy, Architectural and engineering; Technical testing and analysis, Scientific research and development, Advertising and market research, Other professional, scientific and technical activities, and Employment activities (NACE Rev. 2, Division 62, 63, 69, 70, 71, 72, 73, 74, 78). A random sampling procedure stratified by KIBS sub-sectors (technology and professional) and size was applied to the study population.

In administering the survey, it was specifically requested by telephone and e-mail that the questionnaire be assigned to managers with managerial positions related to strategy within the firms. This ensured that the respondents were familiar with the decisions made concerning innovation in their firms (Prajogo & Oke, 2016).

In the first instance, 741 firms were contacted by telephone, and others replaced those with the same characteristics (NACE code and size) that initially refused to participate in the study. From February to August 2019, data were collected for 2016 to 2018, through a questionnaire survey sent by e-mail to firm managers. A sample of Portuguese firms from the KIBS sector can take almost a year to achieve (Baia et al., 2020).

The valid responses were 232 firms (response rate of 31%) (Figure 1.2). In this study of innovation, process barriers were faced due to the relative importance of the subject to business performance; what is open information in a firm (*e.g.*, the organisational structure) might be proprietary in an innovative firm (Ettlie & Rosenthal, 2011).

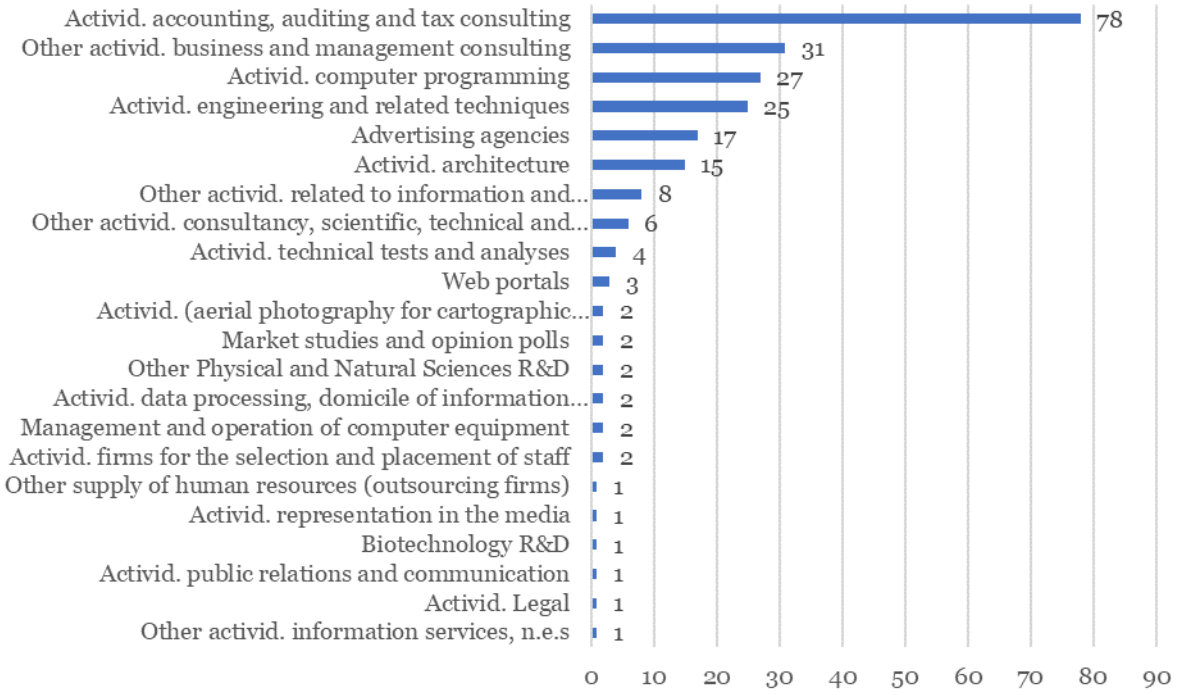

Figure 1.2 - Distribution of the sample KIBS

The correspondence of the NACE Division and size was checked to analyse whether the sample reflects the study population. This study has a smaller sample in the category 2 to 9 people=66.8% versus 80.6%, and a larger sample in the category 10 to 49 people=29.3% versus 16.5% (Table 1.2).

Table 1.2 - Distribution of the population and sample stratified by NACE and size

	Category	**Sample**		**Population**		**Dif. %**	**Type of KIBS**
		Quantity	**%**	**Quantity**	**%**		
Division	62	37	15.9	1.534	15.4	+0.5	t-KIBS
	63	6	2.6	135	1.4	+1.2	t-KIBS
	69	79	34.1	3.256	32.7	+1.4	p-KIBS
	70	32	13.8	1.445	14.5	-0.7	p-KIBS
	71	44	19	2.114	21.3	-2.3	t-KIBS
	72	3	1.3	99	1	+0.3	t-KIBS
	73	20	86	671	6.7	+1.9	p-KIBS
	74	8	3.4	557	5.6	-2.2	t-KIBS
	78	3	1.3	135	1.4	-0.1	p-KIBS
Size:	2-9	155	66.8	8.012	80.6	-13.8	
Number of	10-49	68	29.3	1.643	16.5	+12.8	
employees	50-249	9	3.9	291	2.9	+1	
Total		232	100	9.946	100		

In the study population, 44.6% are t-KIBS, and 55.4% are p-KIBS. In the sample, 42.2% are t-KIBS, and 57.8% are p-KIBS (Table 1.3).

Table 1.3 - Distribution of the population and sample by sub-sectors of KIBS

	Population		**Sample**	
	Quantity	**%**	**Quantity**	**%**
t-KIBS	4.439	44.6	98	42.2
p-KIBS	5.507	55.4	134	57.8
Total	9.946	100	232	100

1.5.4. Sample characteristics

Two hundred sixty-four firms (264) participated in the study, although 32 questionnaires were eliminated for not being duly completed. We obtained a sample of 232 firms covering 25 NACE activities.

The demographic profile of the firms is presented to provide insight into their composition. The firms' characteristics include age, size, turnover, investment in the acquisition of technology and new information management systems, and investment in in-house R&D. With regard to the characterisation of human resources, the KIBS knowledge intensity is measured by the share of graduates in the workforce (Miles et al., 2018). So, in this study, the characteristics of human resources include the qualification of managers, employees with higher education, and specialists with more than five years of experience.

The characteristics of the KIBS firms are reported in Table 1.4. The mean age of the KIBS is 15.54, the Standard Deviation (SD) (SD=8.691), the minimum age is two years, and the maximum is 43. Most of the firms belong to the category of up to 15 years, consisting of 127 firms (54.7%). The mean size of KIBS is 13.70 (SD=25.273), the minimum is two employees, and the maximum is 190; most firms fall in the range of 2-9 workers, with 155 KIBS (66.8%). The microbusinesses predominate, in the same way as in Europe (Miles et al., 2018).

The 2018 turnover of KIBS falls mostly in the €500.000 or above (44.8%). The mean of the responses is 4.4 (SD=1.698). Between 2016 and 2018, 52 KIBS (22.4%) invested between 3% and less than 5% in the acquisition of new information technology (equipment) and information management systems (software). On the other hand, 25 firms (10.8%) did not invest in new information technology and management

systems. From 2016 to 2018, 78 KIBS (33.6%) invested between 1% and 5% in-house R&D. On the other hand, 28 firms did not invest in in-house R&D (12.1%).

Table 1.4 - Characteristics of the KIBS firms

Variable	Category	KIBS			
		Frequency	%	Mean	Standard Deviation
Age (Years old)	2-15	127	54.7	15.54	8.691
	16-30	95	40.9		
	31-43	10	4.3		
Size (Nr of employees)	2-9	155	66.8	13.70	25.273
	10-49	68	29.3		
	50-249	9	3.9		
Turnover (Euros)	Less than 100.000	14	6.0	4.4	1.698
	100.000 and below 200.000	26	11.2		
	200.000 and below 300.000	39	16.8		
	300.000 and below 400.000	31	13.4		
	400.000 and below 500.000	18	7.8		
	500.000 or more	104	44.8		
Information technology and management information systems (% of turnover)	0%	25	10.8		
	More than 0% and below 1%	15	6.5		
	1% and below 3%	42	18.1		
	3% and below 5%	52	22.4		
	5% and below 10%	49	21.1		
	10% and below 30%	39	16.8		
	30% or more	10	4.3		
R&D (% of turnover)	0%	28	12.1		
	More than 0% and below 1%	47	20.3		
	1% and below 5%	78	33.6		
	5% and below 10%	42	18.1		
	10% and below 25%	26	11.2		
	25% or more	11	4.7		

The characteristics of the human resources are reported in Table 1.5. The predominant level of education of KIBS managers is higher education, 202 firms (87.1%). The mean KIBS with employees with higher education is 7.78 (SD=11.670), the minimum is 0, and the maximum is 96 employees. Most KIBS (180 firms, 77.6%) fall in the range of 1-9 persons with higher education.

The mean of firms with experts with specific activity knowledge is 6.59 (SD=9.009), the minimum is 0, and the maximum is 84 employees. Most firms fall within the range of 1-9 people with more than five years of experience, comprising 201 firms (82.6%).

Table 1.5 - Human resources characteristics

Variable	Category	KIBS			
		Frequency	%	Mean	Standard Deviation
Education of managers	Primary/Secondary Education	18	7.8		
	Higher education	202	87.1		
	Vocational training	9	3.9		
	Other	3	1.3		
Higher educated employees	0	6	2.6	7.7	11.670
	1-9	180	77.6		
	10-96	46	19.8		
Nr of experts (More than 5 years' experience)	0	2	0.9	6.59	9.009
	1-9	201	82.6		
	10-96	29	12.5		

1.5.5. Descriptive statistics of the constructs

In this subsection, the descriptive analysis and the measures of distributions skewness and kurtosis for management innovation, technology, service innovation and firm performance were examined. A guideline for examining data is an absolute skewness, and kurtosis values of greater than 1 are indicative of non-normal data (Hair et al., 2017). A diagnosis of multicollinearity and correlation analysis were performed.

Management innovation was measured in the sample's KIBS (Table 1.6). The results show that KIBS firms tend to be neutral in management innovation (Mean 2.559, SD=1.772). The highest mean of 2.82 concerns the renewal of rules and procedures during daily operations of the firm (MI1). It was found that 69 firms did not innovate in management, continuing the trend that, in Europe, many firms do not introduce management innovation (Sakowski et al., 2019). The skewness and kurtosis statistics across the items indicate non-normal data.

Table 1.6 - Statistical values and testing for normality of the management innovation

Items	Mean	Standard Deviation	Skewness Statistic	Kurtosis Statistic
MI1	2.82	1.950	-0.570	-1.347
MI2	2.46	1.806	-0.330	-1.441
MI3	2.78	1.941	-0.522	-1.375
MI4	2.43	1.873	-0.169	-1.516
MI5	2.50	1.847	-0.297	-1.439
MI6	2.38	1.781	-0.227	-1.414

Note: MI – Management Innovation. The items are described in Table 4.1. Standard Error of 0.160 (Skewness). Standard Error of 0.318 (Kurtosis), n=232.

Firms invest in information technology to improve their technological capability (Hsieh & Chou, 2018), so Table 1.7 is intended to know the extent to which the firm has used the technologies (equipment and software) compared to competitors. Comparing with competitors is relevant because a common source of dissatisfaction that leads to innovation is the emergence of new competitors (Birkinshaw & Mol, 2006). The sample firms use technologies highly (Mean 3.466, SD=1.393). The highest mean of 3.66 concerns improving service quality (TEC4). The technology construct was analysed for skewness and kurtosis and indicated non-normal data.

Table 1.7 - Statistical values and testing for normality of the technology indicators

Items	Mean	Standard Deviation	Skewness Statistic	Kurtosis Statistic
TEC1	3.44	1.530	-1.156	0.347
TEC2	3.45	1.508	-1.176	0.486
TEC3	3.52	1.471	-1.322	0.976
TEC4	3.66	1.468	-1.538	1.536
TEC5	3.27	1.489	-1.015	0.158

Note: TEC - Technology. The items are described in Table 4.1. Standard Error of 0.160 (Skewness). Standard Error of 0.318 (Kurtosis), n=232.

Measuring output indicators in service firms is challenging, particularly in intangible services (Taques et al., 2021), such as KIBS. Specifically, Korean KIBS hardly focus on service concept innovation (Ryu & Lee, 2016). However, it is intended to find out the Portuguese KIBS firms that innovate in their services. Table 1.8 indicates that these sample firms tend to be neutral on customer service innovation (Mean 2.515, SD=1.448). The highest mean, 3.08, refers to the new service complementing a current service line (SI3). There were 48 KIBS that did not innovate in customer services; this may reflect ignorance of the market, i.e., customer requests do not require innovations that demand much specific knowledge (Bumberová & Milichovskỳ, 2020). The analyses of skewness and kurtosis across the items indicate non-normal data.

Table 1.8 - Statistical values and testing for normality of the service innovation

Items	Mean	Standard Deviation	Skewness Statistic	Kurtosis Statistic
SI1	2.28	1.529	-0.144	-1.016
SI2	2.36	1.589	-0.192	-1.152
SI3	3.08	1.808	-0.748	-0.860
SI4	2.50	1.646	-0.278	-1.123
SI5	2.46	1.667	-0.235	-1.293
SI6	2.51	1.683	-0.292	-1.292
SI7	2.41	1.654	-0.169	-1.264

Note: SI – Service Innovation. The items are described in Table 4.1. Standard Error of 0.160 (Skewness). Standard Error of 0.318 (Kurtosis), n=232.

Regarding firm performance, firms tend to agree with the performance resulting from innovation (Mean 3.462, (SD=0.688). The highest mean of 3.82 refers to the services that positively impacted the firm's image (FP2) (Table 1.9). The firm performance construct was assessed for normality using the skewness and kurtosis values, showing that the statistics are within the acceptable range. The only exception is the FP3 item, which has a kurtosis of 1.087 and thus exhibits a slight degree of non-normality; however, the degree is not severe.

Table 1.9 - Statistical values and testing for normality of the performance values

Items	Mean	Standard Deviation	Skewness Statistic	Kurtosis Statistic
NFP1	3.78	0.879	-0.550	0.442
NFP2	3.75	0.974	-0.767	0.547
NFP3	3.38	1.017	-0.453	-0.063
NFP4	3.04	0.968	-0.165	-0.047
NFP5	3.10	0.970	-0.266	-0.088
FP1	3.09	0.926	-0.206	0.145
FP2	3.82	0.823	-0.499	0.594
FP3	3.78	0.866	-0.818	1.087
FP4	3.43	0.951	-0.501	0.097
FP5	3.21	0.982	-0.407	0.038
FP6	3.69	0.852	-0.416	0.248

Note: NFP – Non Financial Performance. FP – Financial Performance. The items are described in Table 4.1. Standard Error of 0.160 (Skewness). Standard Error of 0.318 (Kurtosis), n=232.

Spearman correlations of constructs are presented in Table 1.10. The highest correlation occurs between non financial performance and financial performance (rho=0.635). The other variables present frequencies lowest than 0.5.

Table 1.10 – Spearman correlations between constructs

Construct	1	2	3	4	5
1 – Management innovation	1.000				
2 - Technology	0.339**	1.000			
3 – Service innovation	0.230**	0.282**	1.000		
4 – Non financial performance	0.216**	0.359**	0.425**	1.000	
5 – Financial performance	0.186**	0.190**	0.328**	0.635**	1.000

Note: $^{**}p<0.01$

Finally, a multicollinearity diagnosis was performed using the Variance Inflation Factor (VIF) analysis. In the diagnosis of multicollinearity, it is found that the VIF of each indicator is between 1 and 2, being lower than the tolerance value 5 (Hair et al., 2017). SPSS software (version 26) was used to perform all the analyses.

1.5.6. Approaches in chapters

Five studies were developed, attending to evaluate how the introduction of management innovation determines innovation and firm performance.

In Chapter 2, "Intellectual structure of management innovation: bibliometric analysis"

A systematic literature review is carried out, using bibliometric methods, on management innovation to map the research lines, their interconnection, evolution and key contributions. This bibliometric analysis focuses on scientific publications between 1960 and 2018. According to the previously defined protocol, three research questions are formulated; the search in the indexed database of the Main Collection of the *Web of Science* was carried out, which resulted in a sample of 206 articles. The analysis was conducted through descriptive analysis and cluster analysis. The *VOSviewer software* version 1.6.11. (van Eck & Waltman, 2010) was used to perform the bibliometric analysis because it enables to visualise the intellectual structure of the management innovation research.

Chapter 3 “Management innovation and business performance in services: economic and social potential”.

This literature review presents the motivation for adopting management innovation through a theoretical framework that integrates rational and institutional perspectives. From these perspectives, potential economic and social gains can motivate the adoption of management innovation in service firms.

Chapter 4 “Relations between innovation and organisational performance: evidence in knowledge-intensive business services”.

The main purpose of this chapter is to explore the relationship between innovation type on the different aspects of firm performance, non-financial and financial performance based on an empirical study covering 232 KIBS in Portugal. When the research objective is exploratory research, the partial least squares for modelling structural equation models is the preferred method (Hair et al., 2017). Thus, the SmartPLS 3.0 software was used in the data analysis.

Chapter 5 “The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology”

From one of the perspectives that the realisation of management innovation mainly precedes the adoption of technological innovation (Hollen et al., 2013), it suggests that innovation can be driven by innovation in its social system. While research acknowledges that management innovation increases the probability of obtaining successful product and process innovations (Anzola-Román et al., 2018; Ozturk & Ozen, 2021), the role of this type of innovation deserves more research. Using a sample of KIBS, this study examines how management innovation impacts firm performance following two routes: technology use and service innovation. In the data analysis, the SmartPLS 3.3.6 software was used for modelling through structural equation method using the partial Least squares. The method was used since the structural model of the study is complex with multiple mediations (Hair et al., 2019; Nitzl et al., 2016); following exploratory research, this study tends to probe for possible explanations and hypotheses (Henseler, 2018).

Chapter 6, “The impact of technology on service innovation and firm performance: the mediating role of management innovation”, aims at examining the influence of management innovation on innovation and performance in the services sector. Management innovation as a capacity for innovation and its complementary relationship with the firm’s resources is highlighted (Arranz et al., 2019). To investigate the complementary role of management innovation with firm’s resources, a structural equation modeling technique was performed. This study illustrates the complementary effect analysis in the context of partial least squares structural equation modeling, as this type of relationships between constructs often occurs in partial least squares path modeling (Nitzl et al., 2016). The statistical analyses were performed using SmartPLS (v3.3.9) software.

Finally, Chapter 7, "General Conclusions", aims to make an overall assessment of the previous chapters, interconnecting them and presenting the conclusions of this thesis, as well as the implications and general limitations of the study.

1.6. Research contribution

This thesis contributes to the management innovation field, by reinforcing the importance of considering a service sector context approach.

Chapter 2, “Intellectual structure of management innovation: bibliometric analysis”.

The fragmentation of management innovation limits understanding this type of innovation (Volberda et al., 2014). Regardless of the increased number of studies

referring to management innovation, there is a lack of review of this body of knowledge (Khosravi et al., 2019). Therefore it was necessary to know how management innovation research has evolved, which key articles have influenced this field and their relationship.

The citation analysis reveals the relevant works, top contributing authors, and most relevant journals. Additionally, to understand the intellectual structure of management innovation, the co-occurrence of articles during the whole period of 1960–2018 and the two periods, 2009–2013 and 2014–2018, were analysed. The evolution of the management innovation field was discussed in future focus areas and key developments.

One area of focus is the cross-cutting difficulty in researching the measurement of management innovation. The development of management innovation is measured based on its attributes, given that management innovation is *ad hoc* (Hamel, 2006), system-dependent, tacit (Birkinshaw et al., 2008), and typically incremental (Mol & Birkinshaw, 2009), conditioning its measurement. At the firm level, the topics of management innovation antecedents and performance outcomes remain highly relevant (Khosravi et al., 2019).

At the individual level, a key development to capture management innovation is the relevant role of employees in pairing with top managers in pursuing management innovation (Heyden et al., 2018). Additionally, a focus on the inter-organisational context in adopting management innovation (Hollen et al., 2013) enables a broader recognition of the effect of open innovation as a key development in this process. Finally, the influence of management innovation on the firm's results was pointed out. In line with this last research line, the following three empirical studies show the role of management innovation on service innovation and performance in service firms. This chapter originated the publication of one article in the Management Review Quarterly. Simao, L. B., Carvalho, L. C., & Madeira, M. J. (2021). Intellectual structure of management innovation: bibliometric analysis. Management Review Quarterly. 71, 651-677. https://doi.org/10.1007/s11301-020-00196-4.

Chapter 3, "Management innovation and business performance in services: economic and social potential".

Uncovering the fragmentation of the management innovation field, this work documents the most used theories in management innovation adoption research. This

literature review articulates the relationship between technological and management innovation through a theoretical framework that integrates the rational and institutional perspectives that motivate the potential economic and social effects in the service sector. This study also contributes to a more comprehensive understanding of the motivation to adopt innovation in service firms and suggests future research directions. This chapter is included in the book: Advances in Electronic Government, Digital Divide, and Regional Development. Global Campaigning Initiatives for Socio-Economic Development. Simao, L. B., Madeira, M. J., & Carvalho, L. C. (2019). Management Innovation and Business Performance in Services: Economic and Social Potential. In L. Carvalho & M. Madeira (Eds.), Global Campaigning Initiatives for Socio-Economic Development (pp. 11-32). IGI Global. https://doi.org/10.4018/978-1-5225-7937-3.ch002.

Chapter 4 "Relations between innovation and organisational performance: evidence in knowledge-intensive business services"

The performance of a KIBS firm with strong technology use, management and service innovations might be high. Including types of innovation that received less attention in previous research – management innovation - is a relevant contribution to previous empirical research. KIBS also depends on management innovation for the firm's image, improved customer loyalty, increased profitability of other services, attracting new customers, and contributing to the competitive advantage. The findings of this study prescribe this is an effective way to build positive firm performance. This chapter was presented at the XXXI Jornadas Hispano-lusas de Gestión Científica – En la era de la digitalización y la sostenibilidad: Toledo, España, 2nd to 5th February 2022.

Chapter 5 "The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology".

The objective was to analyse management innovation's direct and indirect influence on the performance of KIBS firms in a peripheral country. In KIBS, management innovation contributes directly to firm performance. Additionally, the study shows the existence of two significant indirect relationships. Management innovation indirectly influences firm performance through its effect on technology use and service innovation. Technology use and service innovation are complementary mediators between management innovation and firm performance. This chapter was accepted in the International Journal of Innovation Science. Simao, L. B., Carvalho, L. C., & Madeira, M. J. (2022). The influence of management innovation on the organisational

performance of KIBS: the mediating role of service innovation and technology. International Journal of Innovation Science. https://doi.org/10.1108/IJIS-01-2022-0007.

Chapter 6, “The impact of technology on service innovation and firm performance: the mediating role of management innovation”

This study contributes to a better understanding of technology use in service firms, through the analysis of the effect of management innovation on service innovation and firm performance. The management innovation's role in the service sector is not entirely clear (González-Blanco et al., 2019; Saunila, 2020; Walker et al., 2015). This study contributes in particular to analyse this people-oriented innovation (Janka et al., 2020) in KIBS, which are highly reliant on expert knowledge professionals (Miles et al., 2018). This study expands on the research revealing the indirect effect between the technology utilisation in service innovation of KIBS via management innovation.

1.7. Structure of the thesis

This thesis is structured into seven chapters and elaborated in the form of articles with a theoretical and empirical approach. The first chapter is a "General Introduction" where the problem statement under study is framed, and the importance of the subject at a theoretical and practical level is justified and highlighted. It is then followed by the research objectives, study context, conceptual model, research design and methodology, research contribution and finally, the structure of the thesis. The second chapter comprises a Systematic Literature Review that summarises the previously discussed evolution of the management innovation field in focus areas and key developments. Chapter 3 concerns a theoretical discourse on the motivation for adopting management innovation. Chapters 4, 5, and 6 include three empirical studies on management innovation-driven innovation and a combined effect to increase the firm performance. The last chapter is devoted to the final considerations drawn from this thesis and its implications, limitations, and future lines of research.

Chapter 2– Intellectual structure of management innovation: bibliometric analysis

2.1. Introduction

Most research on innovation has been devoted to understanding how firms can promote technological innovation (Crossan & Apaydin, 2010) and this type of innovation's role in economic development (Nelson & Winter, 1982). Challenging the perspective that the firm's performance results mainly from adopting technological innovation, Damanpour and Aravind (2012) advise investing in management innovation.

Management innovation refers to new management practices, processes, structures or techniques (Birkinshaw et al., 2008) which aim to improve organisational functioning (Volberda et al., 2014). Despite a greater understanding of the concept of management innovation, as well as the different theoretical approaches (Birkinshaw et al., 2008; Volberda et al., 2014), the fragmentation of this field is well-known, limiting a comprehensive understanding of this type of innovation (Volberda et al., 2014).

Several questions remain unanswered, such as how has management innovation research evolved? Which subjects are addressed jointly with management innovation? Which key articles have influenced management innovation, and what is their relationship?

This article addresses these questions and complements the existing literature by using a quantitative review of the research on management innovation. Thus, this study aims to achieve the following objectives:

1. Identification of relevant works in the management innovation field;
2. Identification of the most productive authors;
3. Identification of the journals with the largest number of publications;
4. Understanding the evolution of the management innovation field, identifying the linkages between the key documents and their temporal evolution;
5. To discover the linkages among research subjects and trace their conceptual structure.

By addressing these objectives, we seek to contribute to the management innovation field, understanding the management innovation knowledge epistemology, using citation analysis and considering the frequency of citations in papers, authors and journals. Construing networks and clusters reveal patterns and themes in the management innovation research and, possibly, furthers this field's theoretical, conceptual and empirical development. It may enable the possibility of relating the management innovation construct with other concepts.

The bibliometric analysis provides important insights regarding the research objectives (Block & Fisch, 2020). Therefore, to achieve the above objectives, a quantitative approach associated with bibliometric analysis is developed, the citation, co-citation and co-word analyses of 206 articles, with 20.271 citations. In the citation analysis, the most cited articles are identified, the co-citation analysis shows the groups that constitute the intellectual structure, and the co-word analysis finds connections among concepts (Zupic & Čater, 2015) of the management innovation field. The added value of this work resides in tracing the evolution of the intellectual structure of management innovation research during the 1960-2018 period.

This study is organised as follows: Section 2.2. presents the data and methodology adopted. Then, the results of the empirical analysis are presented. In the following section, the discussion and future research directions. Subsequently, the key conclusions on the management innovation research and, finally, the limitations.

2.2. Methodology

This bibliometric analysis followed a four-step process (Figure 2.1), in accordance with van Oorschot, Hofman and Halman's (2018) bibliometric review.

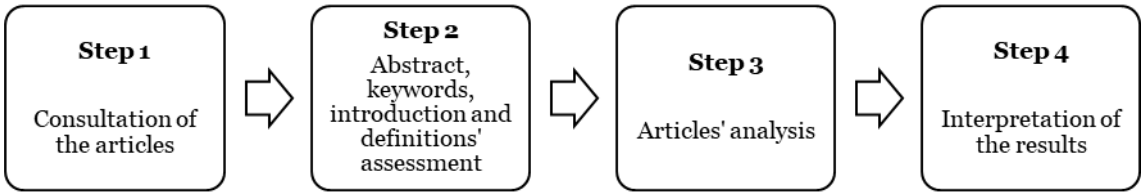

Figure 2.1 - Bibliometric analysis process

Similar to other bibliometric studies (Černe et al., 2016; van Oorschot et al., 2018), the Web of Science's Main Collection's indexed online database was used to identify articles on management innovation. In 2018, this database included 1.4 billion cited references, dating back to 1900, containing a set of associated indexes, *Science Citation Index*

Expanded (SCI-EXPANDED), *Social Sciences Citation Index* (SSCI), *Emerging Sources Citation Index* (ESCI).

First, was searched the subject (title, keywords or abstract), using the terms *"administrative innovat*" OR "innovat* manage* practice*" OR "manage* innovat*" OR "organi?ational innovat*"*, *(innovat* = innovation, innovativeness, innovating), (manage* = management, managerial)*. These terms were identified in previous studies on management innovation research (Birkinshaw et al., 2008; Damanpour & Aravind, 2012; Volberda et al., 2014; Walker et al., 2015). The period 1960 to 2018 was chosen because the innovation's antecedents, processes and consequences in organisations have been studied since the 1960s (Walker et al., 2015).

In the first and second steps, the selection criteria (Table 2.1) were defined in the bibliometric analysis process (Figure 2.1).

Table 2.1 - Selection criteria

Inclusion criteria
Search terms included in the article's title, keywords or abstract
Articles in the English language
Articles published in peer-reviewed journals
Areas: Management, Business, Economics, Psychology and Sociology
Exclusion criteria
Books, book chapters, conference proceedings, working papers and reports
Different interpretations of the "organizational innovation" expression, not associated with the object of study

Similar to previous studies on the creation and performance of management innovation (Mol & Birkinshaw, 2014; Walker et al., 2015), English articles published in peer-reviewed journals were included. Additionally, to guarantee the homogeneity of the sample, books, book chapters, conference proceedings, working papers and reports are not considered in the analysis, with 2.611 articles remaining. Since the research on innovation has expanded into many fields of inquiry, including Sociology, Psychology, and Business Administration (Damanpour & Aravind, 2012), and therefore, to obtain a comprehensive sample, the search was refined by introducing key areas: *Management, Business, Economics, Psychology and Sociology* (Web of Science Categories). The application of these selection criteria resulted in 1.625 articles.

Second, after reading the abstract, keywords, introduction, and definitions, the articles which included the expression "organizational innovation" in their title, abstract or

keywords but whose definition was not associated with the object of study were removed. The articles were removed due to different interpretations of the "organizational innovation" expression (*e.g.,* Crossan & Apaydin, 2010) and the lack of a widely accepted definition (*e.g.,* Armbruster et al., 2008; Lam, 2004). The articles that adopted the organizational and marketing innovations defined by the Oslo Manual (OECD, 2005) were considered, as well as those that introduced new management practices or management innovation, as defined by Birkinshaw et al. (2008). These articles were included given that the definitions of organizational, administrative and management innovation overlap (Černe et al., 2016; Damanpour & Aravind, 2012; Kraśnicka et al., 2018). Applying the above selection criteria resulted in a sample of 206 articles in the bibliometric review.

Third was collected data from the citations and co-citations of the *Web of Science*'s Main Collection from the 206 articles (Figure 2.2).

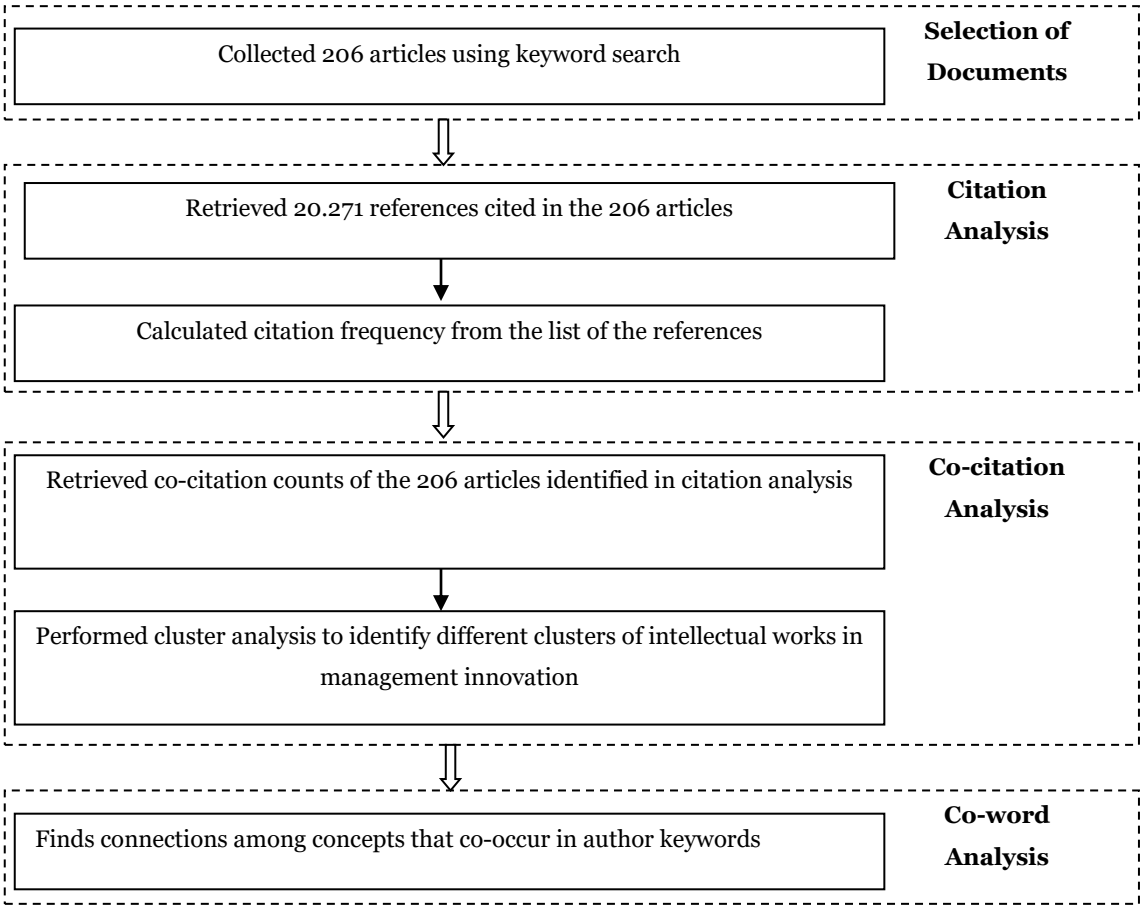

Figure 2.2 - Design of the empirical study

These 206 articles were imported and analysed in *Bibexcel* software (Persson et al., 2009), given its efficiency (Zupic & Čater, 2015), obtaining the citation and co-citation

analysis results. In the fourth and last step, the results of the citation and co-citation analyses are interpreted (Figure 2.1).

The following section presents the analysis of the results of the citations, documents' co-citation and the visualisation of the intellectual structure of the management innovation field, using *VOSviewer* software version 1.6.11.

2.3. Results

A descriptive analysis of the 206 articles was performed, using mainly graphical methods, frequency tables and descriptive measures; these are also methods used in citation analysis by other authors (*e.g.*, van Oorschot et al. (2018)).

The distribution of the 206 documents can be divided into two distinct phases (Figure 2.3). From the beginning, in the "domain formation phase" until 2008, an average of one article was published yearly. In the "emerging phase", from 2008 onwards, there was an exponential increase in the number of publications, clearly signalling the growing interest in management innovation research.

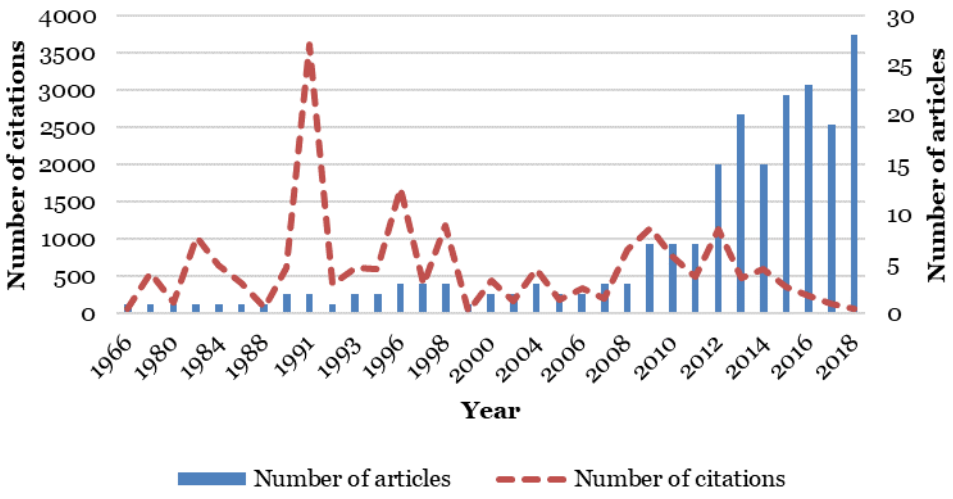

Figure 2.3 - Annual distribution of the number of published articles and citations

Table 2.2 presents the 206 articles per period, contributing 20.271 citations (an average of 98 citations per article).

Table 2.2 - Number of published articles and citations per period

Period	Number of articles	Number of citations
Until 2008	43 (20,8%)	14.807 (73,0%)
2009-2018	163 (79,2%)	5.464 (27,0%)
Total	206 (100,0%)	20.271 (100,0%)

Studies investigating management innovation have increased since 2009, revealing greater academic attention.

2.4. Citations analysis

2.4.1. Fundamental literature

The first objective is addressed by citation analysis. Citations are used as a measure of influence (Zupic & Čater, 2015). Descriptive statistics are presented in Table 2.3 with the most cited articles on research throughout the study.

Table 2.3 - Most cited articles

No.	Author	Title	Citations
1	Damanpour (1991)	Organizational innovation - a meta-analysis of effects of determinants and moderators	2705
2	Han, Kim and Srivastava (1998)	Market orientation and organizational performance: is innovation a missing link?	1121
3	Kimberly and Evanisko (1981)	Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations	1030
4	Abrahamson (1991)	Managerial fads and fashions: the diffusion and rejection of innovations	898
5	Abrahamson (1996)	Management fashion	889
6	Damanpour and Evan (1984)	Organizational innovation and performance: the problem of "organizational lag"	644
7	Daft (1978)	Dual-core model of organizational innovation	540
8	Ibarra (1993)	Network centrality, power, and innovation involvement - determinants of technical and administrative roles	532
9	Wolfe (1994)	Organizational innovation - review, critique and suggested research directions	520
10	Birkinshaw et al. (2008)	Management innovation	511

Damanpour's (1991) meta-analysis offered a holistic analysis of the determinants and moderators of innovation relationships for organizational innovation. This author emphasised that the professionalism of the organizational members facilitates administrative innovation. Administrative innovation is indirectly related to the basic work activities of an organization, and it is more directly related to its management. Technical innovation, related to basic work activities, can concern either product or process. Han, Kim and Srivastava (1998) found that administrative innovation has a

positive, direct impact on performance, and technical innovation is associated with a synergistic impact on performance. Another study by Kimberly and Evanisko (1981) identified that organizational level variables (size in particular) were the best predictors of both types of innovation. These three papers served as the basis for further research in the field. Notably, the technical and administrative innovation typology was introduced in organization management.

The second most influential papers have been contributions by Abrahamson (1991, 1996). The presence of these articles in the top ten most cited articles demonstrates the importance of the fashion perspective in the study of management innovation. In adopting management innovation, organizations under uncertainty about the efficiency of this innovation are influenced by the behaviour of other organizations (Abrahamson, 1991). This perspective highlights the role of market-knowledge sources as the main driver of disseminating management innovation.

Other influential contributions in the most cited articles' list include Daft (1978), who proposed the conceptualisation of organizations as having two major centres, administrative and technical cores, which are associated with administrative and technical innovations. Administrative innovations often affect the technical core (Daft, 1978). Damanpour and Evan (1984), affected by Daft's (1978) work on the innovation's dual-core model, argued that a balanced implementation of administrative and technical innovations would help maintain a balance between the social and technical systems, in turn, would lead to high performance. Ibarra (1993) examined the determinants of technical and administrative innovations. Based on actual interaction patterns and resource exchanges, network centrality is a significant predictor of administrative innovation (Ibarra, 1993).

The classification of the first ten most cited articles reveals, on the one hand, nine articles from the last two decades of the twentieth century, as well as one more recent by Birkinshaw et al. (2008), with 511 citations. This article was instrumental in defining the concept, the process of generating and implementing management innovation at the organizational level. This article's authors highlight the institutional, fashion, cultural and rational perspectives that influence the direction of the management innovation field.

It is important to note that since Damanpour's (1991) article, few influential studies, exclusively on management innovation, have been published (*e.g.*, Abrahamson (1991),

Abrahamson (1996), Birkinshaw et al. (2008)), but always, associated with technological innovation.

2.4.2. Author analysis

The top contributing authors in the field were analysed to meet the second objective. Authors (first author only) who worked on more than four articles and the respective number of citations are in Table 2.4.

Table 2.4 - Relevant authors

Authors	Total publications	Citations
Damanpour F.	14	6086
Hervas-Oliver, J. L.	8	129
Volberda, H.	6	386
Birkinshaw, J.	5	897
Mol, M.	5	894
Camisón, C.	5	659
Mothe, C.	5	63

Damanpour F. is ranked one in terms of the most productive and influential author. His scholarly work extended the scope of management innovation research from a technological innovation context to a non-technological one (managerial innovation literature). This author assumes that management innovation, similar to other types of innovation, maintains or improves organizational performance and effectiveness. Hervas-Oliver mainly has analysed the consequences of joint adoption of technological and management innovations (or organizational innovation) on performance. Volberda's research has expanded the theories which contributed to the management innovation evolution and developed an integrative framework of the different fields of management innovation research (*e.g.*, typology, process steps, management innovation analysis levels, the role of change agents).

This author analysis also identifies the influential individual works in terms of the number of citations. Damanpour F., Birkinshaw J., and Mol, M., the three most influential authors, have focused on the conceptual development, generation and adoption processes, antecedents, influences, key change agents and perspectives of management innovation on organizational conduct.

2.4.3. Journal with the largest number of publications

The most relevant journals on management innovation research were analysed. The third objective was addressed in two modes. The top contributing journals in this field

were analysed by the number of articles published and the total citations per journal. Table 2.5 shows that management innovation research is published in many journals. They ranged from business research (*e.g., Journal of Business Research*) and management (*e.g., Journal of Management Studies*, *Management Decision*), innovation, management, technology (*e.g., Research Policy*, *Technology Analysis & Strategic Management*), organizational studies (*e.g., Organization Studies*), management in private, public and non-profit organizations *(e.g., European Management Review*), economics, management, sociology, economic geography (*e.g., Industry and Innovation*), technological innovation (*e.g., Technovation*), among other research fields. Interestingly, it was found that journals with a lower number of publications have a higher number of citations.

Table 2.5 - Top ten journals (largest number of publications and total citations)

Journal	Articles	Percentage (%)	Total citations
Journal of Business Research	15	7.28	687
Research Policy	10	4.85	885
Organization Studies	8	3.88	814
Journal of Management Studies	7	3.40	1381
Technology Analysis & Strategic Management	7	3.40	96
European Management Review	6	2.91	222
Technovation	5	2.43	474
Management Decision	5	2.43	57
Industry and Innovation	5	2.43	32
Academy of Management Journal	4	1.94	4807
Other journals	48	65.05	10816
Total	206	100	20.271

A journal analysis shows that management journals comprise the most significant group regarding the number of citations; however, one can also observe the importance of other journals focused on technology, strategy, and innovation. Contributions to management innovation appear in the top ten journals in this sample, which can be considered important research sources.

2.5. Document co-citations analysis

This section provides the temporal development of the management innovation research topic from 1960 to 2018. The co-occurrence of articles in the whole sample period of 1960–2018 was analysed. Additionally, the articles' co-occurrence was studied in two 5-year periods (2009–2013, 2014–2018). However, until 2008, the

analysis was not performed due to the smaller number of documents. For a clear understanding from co-citation analysis, cut-off points for each period were established to select the most influential papers (Zupic & Čater, 2015). Co-citation analysis was conducted for each period based on clustering technique items to gain a deeper understanding of the intellectual structure of management innovation (van Eck & Waltman, 2010).

2.5.1. Intellectual structure of management innovation (1960-2018)

Co-citation is not performed on the core documents (i.e., the 206 articles) but the documents cited by these. The overall analysis focuses on the articles published until 2018, with at least 20 citations. In total, 35 publications are used in this co-citation analysis (Table 2.6).

Table 2.6 - Publications with the number of cited references

Frequency of the cited references	First author, year and publication
72	Birkinshaw J, 2008, Acad Manage Rev
61	Damanpour F, 1991, Acad Manage J
59	Mol M, 2009, J Bus Res
57	Damanpour F, 1984, Admin Sci Quart
54	Damanpour F, 2009, J Manage Stud
51	Kimberly J, 1981, Acad Manage J
49	Daft R, 1978, Acad Manage J
46	Armbruster H, 2008, Technovation
44	Hamel G, 2006, Harvard Bus Rev
43	Damanpour F, 2012, Manage Organ Rev
42	Cohen W, 1990, Admin Sci Quart
39	Damanpour F, 1987, J Management
35	Vaccaro I, 2012, J Manage Stud
34	Barney J, 1991, J Management
34	Evangelista R, 2010, Res Policy
30	Oecd, 2005, Osl Man Guid Coll Inter Innov Data
29	Camison C, 2014, J Bus Res
29	Battisti G, 2010, Brit J Manage
29	Zaltman G, 1973, Innovations Org
28	Birkinshaw J, 2006, Mit Sloan Manage Rev
28	Nelson R, 1982, Evolutionary Theory
25	Schumpeter J, 1934, Theory Ec Dev
23	Edquist C, 2001, Innovation Employmen
23	Pavitt K, 1984, Res Policy
23	Damanpour F, 1989, J Manage Stud
22	Crossan M, 2010, J Manage Stud
22	Volberda H, 2013, Eur Manag Ver
22	Abrahamson E, 1996, Acad Manage Rev

Frequency of the cited references	First author, year and publication
21	Lam A, 2005, Oxford Hdb Innovatio
21	Teece D, 1986, Res Policy
21	Teece D, 1997, Strategic Manage J
21	Laursen K, 2006, Strategic Manage J
21	Gallouj F, 1997, Res Policy
20	Teece D, 1980, Manage Sci
20	Walker R, 2011, J Publ Adm Res Theor

Identifying the intellectual structure of the papers (fourth objective) is done through co-citation network analysis. The highest co-citations frequencies (Table 2.7), noting that the articles showing the highest number of co-citations are: (1) Birkinshaw et al. (2008) and Mol and Birkinshaw (2009); (2) Birkinshaw et al. (2008) and Hamel (2006); (3) Birkinshaw et al. (2008) and Damanpour et al. (2009).

Table 2.7 - Top of co-citations (1960-2018)

Co-citations	Citation 1 (First author, year and publication)	Citation 2 (First author, year and publication)
45	Birkinshaw J, 2008, Acad Manage Rev	Mol M, 2009, J Bus Res
39	Birkinshaw J, 2008, Acad Manage Rev	Hamel G, 2006, Harvard Bus Rev
36	Birkinshaw J, 2008, Acad Manage Rev	Damanpour F, 2009, J Manage Stud
33	Hamel G, 2006, Harvard Bus Rev	Mol M, 2009, J Bus Res
33	Birkinshaw J, 2008, Acad Manage Rev	Damanpour F, 2012, Manage Organ Rev
33	Birkinshaw J, 2008, Acad Manage Rev	Vaccaro I, 2012, J Manage Stud
32	Daft R, 1978, Acad Manage J	Damanpour F, 1984, Admin Sci Quart
31	Daft R, 1978, Acad Manage J	Kimberly J, 1981, Acad Manage J
29	Damanpour F, 1984, Admin Sci Quart	Kimberly J, 1981, Acad Manage J
29	Birkinshaw J, 2008, Acad Manage Rev	Damanpour F, 1984, Admin Sci Quart
29	Damanpour F, 2009, J Manage Stud	Mol M, 2009, J Bus Res

The article by Birkinshaw et al. (2008) plays a central role in research on management innovation, as this article was the most cited in the whole period. Other articles also with a major role in the research on this subject are the investigations by Mol and Birkinshaw (2009) and Damanpour and Evan (1984).

The co-citations per document analysis allow the identification of groups in management innovation research and their relationship. The *Visualization of Similarities* (VOS) (van Eck & Waltman, 2010) mapping technique was used to identify and visualise these groups. The *VOSviewer* software enables visualising the intellectual structure of the management innovation research. Three clusters are highlighted:

cluster 1 (red colour, left cluster), cluster 2 (blue colour, top cluster), and cluster 3 (green colour, right cluster) (Figure 2.4). Each cluster represents a theme/field of study in management innovation.

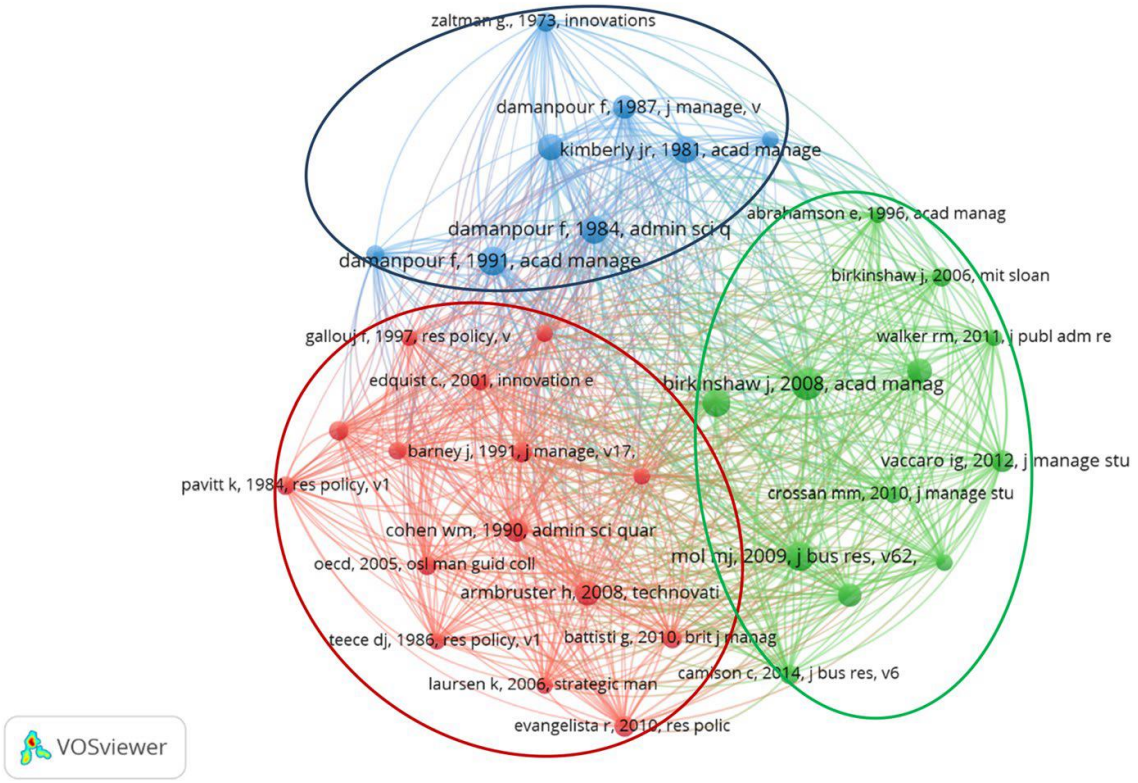

Figure 2.4 - Intellectual structure of the management innovation research

Cluster 1 indicates the theoretical fundamentals of management innovation. The key influencers of innovation, in general, and of the management innovation subfield are the same. The concept of innovation as a consequence is present in Schumpeter & Backhaus (2003) theory of economic development, wherein he states that innovation is a consequence of development. Furthermore, Nelson and Winter (1982) addressed the role of the large firm in technological change, arguing that the technical use of the term "innovation" involves a change in routine. The definition of innovation as a new or better product or production process, commercialised or used, is present in Pavitt's (1984) taxonomy and theory. We can verify that the literature on management innovation initially accompanied the technological organisational change.

The management innovation field was initially based on theories focusing mainly on technological innovation and strategic management. The role that *complementary assets* (Teece, 1986) play in the technological innovation outcomes; the *absorptive capacity theories* (W. M. Cohen & Levinthal, 1990; Laursen & Salter, 2006) in technical capability, and also as the role of open innovation in explaining the technological

innovation performance (Laursen & Salter, 2006); the firm's *RBV* (Barney, 1991) and sustained competitive advantage; *dynamic capabilities* (Teece et al., 1997) and strategic management.

In services firms, the synthesis approach considers technological and non-technological innovation (Gallouj & Weinstein, 1997). Battisti and Stoneman (2010), Evangelista and Vezzani (2010), using firm-level data provided by the Community Innovation Survey (based on the OECD (2005)), found that technological and organisational innovation are interlinked, that is, performance is not restricted to technology, but organisational innovation also matters.

The analysis of cluster 2 reveals the domain formation of management innovation. The administrative innovation as a standalone phenomenon was adopted by Daft (1978). Kimberly and Evanisko (1981), Damanpour and Evan (1984), Damanpour (1987), Damanpour et al. (1989), and Damanpour (1991), all of them in the context of public sector organisations (Buchheim et al., 2019). Administrative innovation primarily affects the organisation's management systems (social system) (Damanpour et al., 1989; Damanpour & Evan, 1984), which indicates that administrative innovation research was the initial development of the domain.

In addition, all articles included in cluster 2 focus on the joint adoption of technological and administrative innovations. Technological innovation is directly related to the organisation's main activity and produces changes in its operating systems (technical system) (Damanpour et al., 1989; Damanpour & Evan, 1984). The organisations are comprised of two systems, with technological innovation representing changes in the technical system and administrative innovation changes in the social system. In the relationship between the adoption of administrative and technical innovations, Damanpour et al. (1989) showed that changes in the social structure lead to changes in the technical system.

Damanpour (1987) argues that the distinction between types of innovations is necessary to identify the organisational characteristics that facilitate or hinder innovation adoption. Daft's (1978) "dual-core" model posits that the adoption of administrative innovation follows a top-down process and technical innovations pursue a bottom-up process. Damanpour and Evan (1984) and Damanpour et al. (1989) discuss the interconnection between administrative and technological innovation in business performance. A balanced rate of adoption of administrative and technical innovations is more effective in helping organisations maintain or improve their level

of performance (Damanpour & Evan, 1984) in the form of technical or efficiency gains (*e.g.,* Teece (1980)).

Based on the evidence that these studies are central to the knowledge network, the most influential investigations in management innovation have been related to administrative innovation and its interconnection with technological innovation. Management innovation as a research paradigm took shape in the innovation literature.

Cluster 3 includes 12 published articles, mostly after 2008, a period in which research on management innovation grew steadily. The research in this cluster encompasses the concept, antecedents, generation (creation) or adoption (application), and performance consequences of management innovation.

Abrahamson (1996) emphasised that managers adopt management fashions to learn about management techniques that help them in organisational performance gaps. The fashion perspective focuses on how management innovations emerge.

Birkinshaw and Mol (2006) and Birkinshaw et al. (2008) identified four phases for generating management innovations. According to Hamel (2006), management innovation changes how managers do what they do. Hamel (2006) and Birkinshaw et al. (2008) contributed to the expression “management innovation” becoming relevant in the organisational management literature. Vaccaro et al. (2012) findings related to the antecedents of management innovation show that leadership behaviours contribute to this type of innovation. Mol and Birkinshaw (2009) found that management innovation is a consequence of a firm's internal context and the external search for new knowledge and is positively associated with the firm's performance. In public organisations, the influence of management innovation on organisational performance is not direct, according to Walker, Damanpour and Devece (2011), nevertheless, it is mediated by performance management (organisational process). Damanpour et al. (2009) emphasised that in effective organisations, the technical and social systems operate in balance; adopting technological and management innovations is equally important. Management innovation and technological innovation are complementary (Camisón & Villar-López, 2014; Volberda et al., 2013).

Summing up this interval, the key influencers of management innovation are, firstly, the same as innovation in general. Next, based on the top of co-citations, the studies by Daft (1978) and Kimberly and Evanisko (1981) are the oldest and belong to the domain

formation. This indicates that the management innovation research dates from the beginning of the second half of the twentieth century and is related to organisational innovation (technological innovation *versus* administrative innovation). Subsequently, Birkinshaw et al.'s (2008) article plays a central role in management innovation research, resulting in many new studies exclusively on the management innovation area.

2.5.2. Intellectual structure of management innovation (2009-2013)

To further clarify the intellectual development of the management innovation field, the co-citation analysis, with at least 17 citations, was also performed for the 2009-2013 period (Figure 2.5).

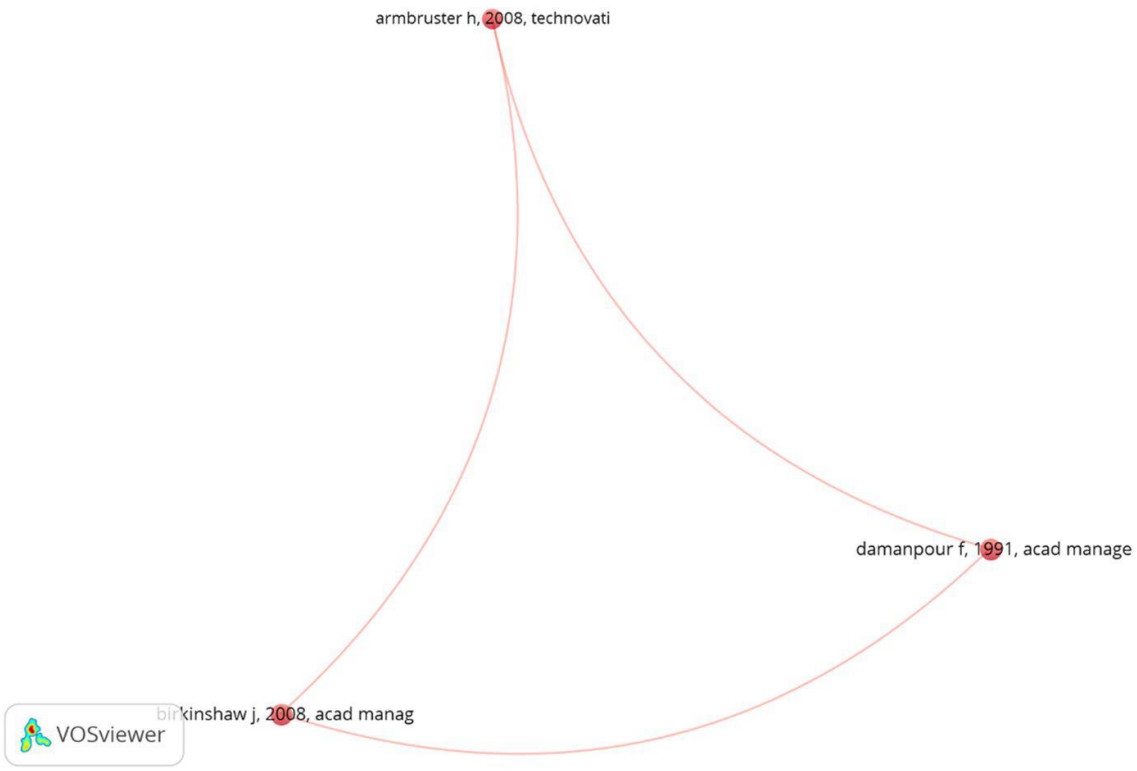

Figure 2.5 - Intellectual structure of the management innovation research (2009-2013)

The co-citation analyses reveal one cluster with weaker linkages among studies. Damanpour (1991) remains critical concerning innovation research over time. To Damanpour (1991), organisational innovation encompasses administrative and technical innovations. Armbruster et al. (2008) argue that organisational innovations (management innovations) comprise changes in the organisation's structure and processes due to implementing new managerial and working concepts and practices. Simultaneously, Birkinshaw et al. (2008) define management innovation as the invention and implementation of management practice, process, structure, or

technique intended to further organisational goals. Management innovation was being recognized as having the potential to contribute to organisational performance (Armbruster et al., 2008; Birkinshaw et al., 2008); so there is also an ongoing discussion about the typologies, concepts (Birkinshaw et al., 2008) and methodological approaches for monitoring management innovation (Armbruster et al., 2008).

2.5.3. Intellectual structure of management innovation (2014-2018)

To provide a systematic examination of the development of the management innovation research, the co-citation analysis, with at least 20 citations, was also performed for the 2014-2018 period (Figure 2.6).

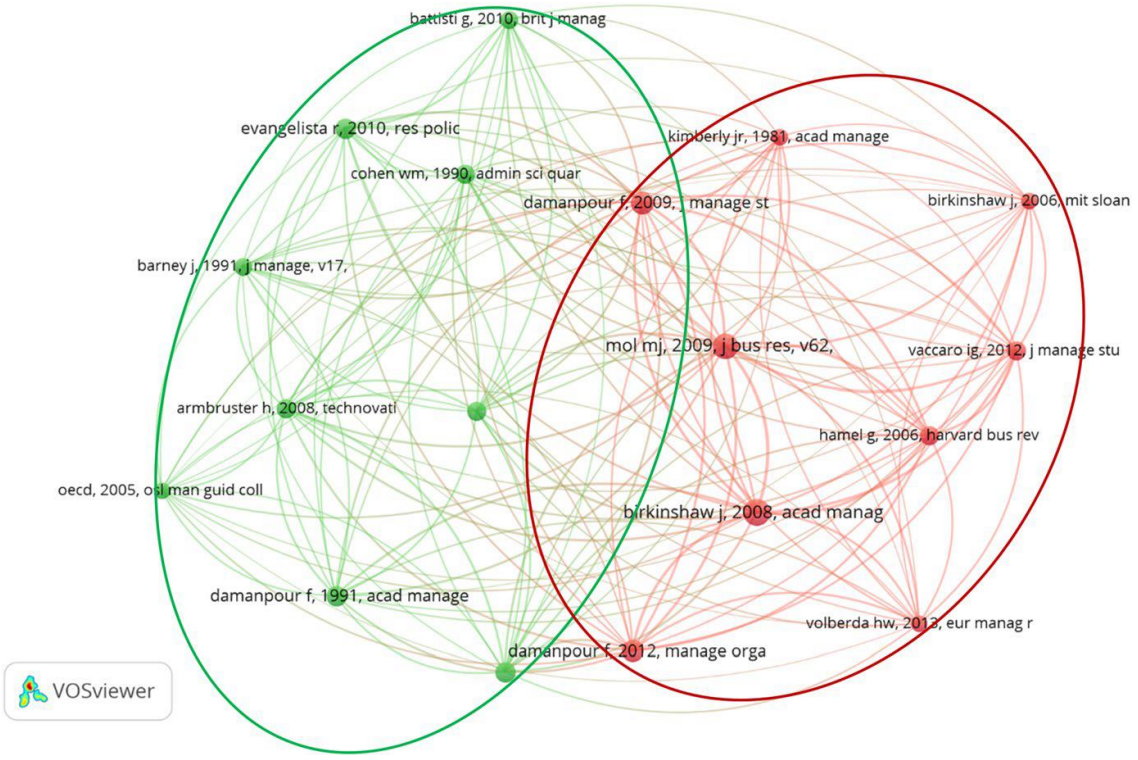

Figure 2.6 - Intellectual structure of the management innovation research (2014-2018)

Cluster 1 (green colour cluster, left cluster) and cluster 2 (red colour cluster, right cluster) reveal two research lines (Table 2.8).

Table 2.8 - List of the publications in the clusters (2014-2018)

Clusters	Authors	Citations
Cluster 1	Damanpour (1991)	32
	Camisón and Villar-López (2014)	30
	Evangelista and Vezzani (2010)	30
	Armbruster et al. (2008)	29
	W. M. Cohen & Levinthal (1990)	27
	Damanpour and Evan (1984)	27

Clusters	Authors	Citations
	Barney (1991)	23
	Battisti and Stoneman (2010)	23
	OECD (2005)	22
Cluster 2	Birkinshaw et al. (2008)	52
	Mol and Birkinshaw (2009)	47
	Damanpour et al. (2009)	39
	Damanpour and Aravind (2012)	36
	Hamel (2006)	29
	Vaccaro et al. (2012)	29
	Volberda et al. (2013)	22
	Birkinshaw and Mol (2006)	20
	Kimberly and Evanisko (1981)	20

Cluster 1 relates to administrative or organisational innovation (complementary to technological innovation) based on absorptive capacity and RBV.

Firstly, the articles were on administrative innovation (Damanpour, 1991; Damanpour & Evan, 1984), an innovation in the organisational structure and administrative processes directly related to the organisation's management. Afterwards, articles refer to organisational innovation, jointly introduced with technological innovation (Battisti & Stoneman, 2010; Evangelista & Vezzani, 2010), following the Oslo Manual definition (OECD, 2005). Organisational innovation is defined as implementing an organisational method (in business practices, workplace organisation or external relations) (OECD, 2005). This term also encompasses the change in structures and processes from implementing new organisational concepts and working practices (Armbruster et al., 2008). After the publication of the Oslo Manual (OECD, 2005), its innovation classification was adopted. In sum, the influential studies on management innovation were mainly related to organisational innovation (the Oslo Manual definition) and its complementary role with technological innovation.

As Table 2.8 shows in cluster 1, absorptive capacity affects innovation. Absorptive capacity (W. M. Cohen & Levinthal, 1990) indicates the influence of people, their knowledge and skills on innovation. Additionally, the most commonly used theory is the RBV (Barney, 1991) which suggests that the sources of sustainable competitive advantage are the firm's valuable, rare, imperfectly inimitable and non-substitutable resources. Firms with such resources will often be strategic innovators (Barney, 1991).

Cluster 2 comprises nine articles, most of which derive from cluster 3 (the whole period). These articles are more recent than those in cluster 1 and are oriented to the management innovation topic. Several studies in this cluster discuss the theoretical perspectives, concepts, and typologies; processes (generation, adoption) and attributes; measurements and datasets, antecedents, and consequences of management innovation in the organisations, indicating the field's development.

Kimberly and Evanisko (1981) employed the concept of administrative innovation related to the organisation's management. According to Birkinshaw et al. (2008), management innovation comprises the generation and implementation of management practices, processes, structures, or techniques intended to further organisational goals. In general, changing traditional management principles, processes and practices significantly alter how firms are managed (Hamel, 2006). Mol and Birkinshaw (2009) advanced research on management innovation and defined the introduction of management practices to enhance firm performance. Vaccaro et al. (2012) generated a complementary construct of management innovation (i.e. management practices, processes, or structures). As these studies demonstrate, all the above management innovation typologies occur in-house (within organisations).

Management innovation range from generation (new to state of the art) until adoption (developed in another organization). Birkinshaw and Mol (2006) revealed the process for generating management innovation in four stages: (1) dissatisfaction with the status quo, (2) inspiration from other sources, (3) invention, and (4) internal and external validation. Birkinshaw et al. (2008) also defined a systematic process for generating management innovation at the firm level: (1) motivation, (2) invention, (3) implementation, and (4) theorization and labelling. To Damanpour and Aravind (2012), adopting management innovation (from another organisation) and organizational change are closely linked.

In most firms, management innovation is *ad hoc* (Hamel, 2006), system-dependent, tacit (Birkinshaw et al., 2008), typically incremental (Mol & Birkinshaw, 2009) and emerges without a dedicated infrastructure (Vaccaro et al., 2012). These attributes difficult the measurement of management innovation. Vaccaro et al. (2012) developed the first measure for management innovation at the organizational level. It is a three-dimensional construct: new management practices, processes, or structures.

Based on the papers, among the antecedents, the micro-level characteristics of leaders, such as their attitude to change and level of education, are the micro-foundations of

management innovation. These studies argued that the manager's characteristics, such as educational level and the favourable attitude to change, positively affect management innovation (Damanpour & Aravind, 2012; Kimberly & Evanisko, 1981). Internal change agents (*e.g.*, employees) and external change agents (management intellectuals, such as consultants and academics) influence the emergence of management innovation (Birkinshaw et al., 2008).

Transformational leadership and transactional leadership behaviours influence management innovation (Vaccaro et al., 2012). Transformational leaders inspire the team and develop relationships of trust and respect based on common goals (Vaccaro et al., 2012). Transactional leaders seek commitment from the subordinates by agreeing on the conditions and rewards that result from meeting the defined requirements (Vaccaro et al., 2012). Additionally, the antecedents related to management (leadership) and intra-organizational antecedents (diagnostic and implementation capability, educated workforce and internal change agents), as well as inter-organizational antecedents (obtaining knowledge from external sources, partnerships) (Mol & Birkinshaw, 2009; Volberda et al., 2013) precedes management innovation.

The consequences of management innovation activities are also assessed. Evidence points to the positive effect of adopting management innovation, such as increased productivity (Mol & Birkinshaw, 2009), maintenance or improved effectiveness (Damanpour & Aravind, 2012), and improved performance (Vaccaro et al., 2012). The management innovations are considered economically (*e.g.*, financial goals) and socially (*e.g.*,. employee satisfaction) important (Birkinshaw et al., 2008; Volberda et al., 2013). Damanpour et al. (2009) demonstrate that the joint adoption of service, technological processes and management innovations influences organisational performance in public service organisations. These works emphasise the importance of management innovation in performance as an independent phenomenon or a complement to technological innovation.

The research on management innovation performance adopted mainly the rational perspective, which assumes that management innovation intends to further the organisation's goals (*e.g.,* Damanpour and Aravind (2012), Vaccaro et al. (2012), Damanpour et al. (2009), Mol and Birkinshaw (2009), Birkinshaw et al. (2008)). However, other perspectives in studying management innovation include institutional, fashion, cultural (Birkinshaw et al., 2008), behavioural theory of the firm (Mol & Birkinshaw, 2009) and network (Damanpour & Aravind, 2012). All these perspectives influence the direction of future research on management innovation.

In summary, the co-citation results from 2014 to 2018 show a high connection between articles focused on the importance of organisational (management) and technological innovation, emphasising their interrelationship (see the left side of Figure 2.6). On the other hand, we verify that management innovation constitutes its field, focused on research in its theoretical perspectives, concepts, typologies, processes, attributes, measurements, antecedents, and outcomes (see right side of Figure 2.6).

2.6. Co-occurrence of the author keywords

Co-occurrence of the author keywords gave insights about the main research themes in management innovation knowledge. Discovering the linkages among subjects in the research field and tracing its conceptual structure (objective five) is researched by studying the thematic flow of knowledge via author keywords analysis. The co-occurrence network of the author keywords shows which author keywords frequently occur together in the same publications. Semantic maps (i.e., co-word analyses) can represent a field's cognitive structure (Block & Fisch, 2020).

From the 206 articles, author keywords were extracted. A threshold of 5 minimum co-occurrences of a keyword was chosen to get analytical results. Of the 510 keywords, 18 keywords meet the threshold. Keywords used more often are marked with larger circles, and those used less often are marked with smaller circles, and the distance between two items reflects the strength of the relation between the items (van Eck & Waltman, 2010).

Keywords “innovation” (43 occurrences) and “organisational innovation” (43 occurrences) are the most used author's keywords, followed by “management innovation” (38 occurrences). One cannot be certain about the term “organisational innovation” meaning. Confusingly, this term often includes product, process, and marketing innovations; however, organisational innovation reflects management innovation equally often.

This analysis indicates that the author keywords network has five distinct clusters: cluster 1 (red colour, right side of the network), cluster 2 (green colour, left side, horizontally opposite to cluster 1), cluster 3 (blue colour, right upper side), cluster 4 (yellow colour, middle and slightly on the lower side of the network) and cluster 5 (violet colour, on top) (Figure 2.7).

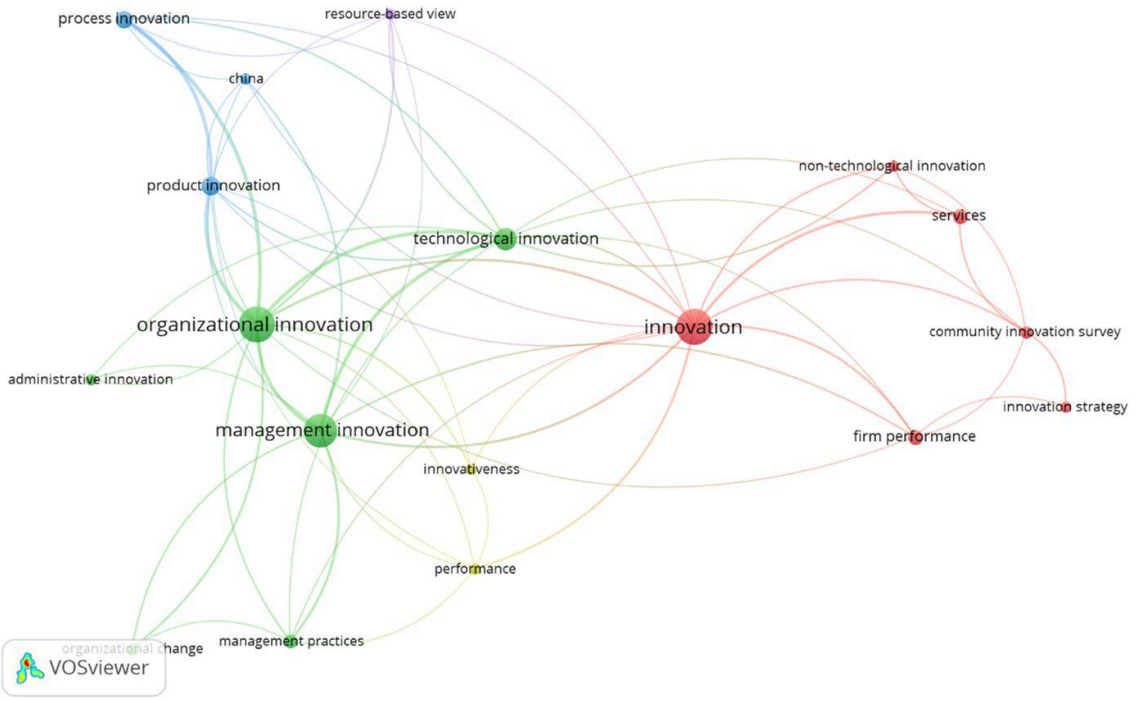

Figure 2.7 - Co-occurrence of the author keywords

Cluster 1 (red colour) includes six keywords: Community Innovation Survey, firm performance, innovation, innovation strategy, non-technological innovation and services. This analysis indicates that this cluster includes publications that focus on an innovation subfield related to non-technological innovation in the context of services (public services) and their performance and innovation strategy. In this cluster, innovation has been measured the firm's innovation performance and innovative strategies with large-scale surveys (Community Innovation Survey).

Cluster 2 (green colour) includes six keywords. The keywords in this cluster are administrative innovation, management innovation, management practices, organisational change, and organisational and technological innovations. This cluster indicates that the term organisational innovation is used and management innovation (related terms to management innovation are management practices and administrative innovation), with technological innovation. This might show the adoption of technological and management innovation.

The keywords in cluster 3 (blue colour) are China, process innovation and product innovation. China, evidencing an extremely high rate of change, is a great place to study experiences with innovation. The keywords in cluster 4 (yellow colour) are performance and innovativeness. The research in this cluster focuses on the sequential effect between innovativeness and performance. Cluster 5 (violet colour) includes the

keyword RBV, showing that Barney's approach remains influential in research on innovation.

In conclusion, the co-occurrence of the author's keywords reveals that the themes identified do not differ from those identified in the co-citation analysis. The five clusters continue to focus more on innovation in general and technological innovation but also show the term management innovation has emerged as relevant.

2.7. Discussion and future research directions

2.7.1. Discussion

This study aimed to explore the evolution of the intellectual structure of management innovation research. The methodology applied is based on bibliometric analysis of citations, co-citations and co-occurrence of the author keywords. This analysis includes 206 scientific publications on management innovation from 1960 to 2018. This study's findings contribute to the development of the management innovation field by: (1) identifying the main academic contributions and their interconnections, (2) tracing the evolution over time, and (3) investigating the management innovation field. To achieve these findings, we performed a bibliometric analysis. First, by examining the most influential research work, productive authors, and relevant journals through citations analysis. Second, the intellectual structure, through document co-citations analysis. Thirty, the knowledge evolved by examining the use of author keywords.

The citations' analysis reveals few influential studies exclusively on management innovation. They have always been published with technological innovation, confirming that the research on the evolution of innovation within organizations followed mainly a "technological imperative" (Damanpour et al., 2009; Walker et al., 2015).

The findings of this study identify the most productive and influential individual works. Understanding the author's contributions to developing management innovation research helps others select and follow a line of research. The most productive authors (Damanpour F., Hervas-Oliver J. L. and Volberda H.) distinguished between management and technological innovation and their impact on the firm's performance. On the other hand, the influential authors (Damanpour F., Birkinshaw J., and Mol, M.) focus more on discussing management innovation as a discipline on its own. This is consistent with other literature reviews on technological and management innovation on firm performance (*e.g.,* Walker, Chen, & Aravind, 2015) and non-technological innovation research (*e.g.,* Černe et al., 2016).

The journals' analysis shows the most relevant publications that could be useful to researchers seeking to conduct future studies in management innovation. The most cited journal was management-focused *(Academy of Management Journal*, followed by *Journal of Management Studies, Research Policy* and *Organization Studies)*. The citations from management-focused journals outnumbered those which were innovation-focused. This is clearly because the term management innovation has gained currency in the organisation's management literature (Damanpour & Aravind, 2012).

Co-citation analysis identified the clusters of publications that are frequently cited together. In the period analysed as a whole, the main body of knowledge of management innovation derives from the innovation field. The authors focused their analysis mainly on the pair of administrative and technological innovations. However, Birkinshaw et al.'s (2008) article was a starting point for new studies on management innovation because it is widely cited individually and often "co-cited", revealing the core of an influential community of researchers. Birkinshaw et al.'s (2008) article represents a basis for management innovation development when defining its theoretical perspectives, concept and generation process.

The 2009-2018 period was analysed in two sub-periods 2009-2013, and 2014-2018, to gain a more in-depth understanding. Damanpour (1991), Armbruster et al. (2008) and Birkinshaw et al. (2008), which appeared in the entire period, appeared in 2009-2013 as well, demonstrating their importance in the intellectual structure in management innovation research. The weaker linkages among these studies show the tendency towards fragmentation of the knowledge domain in the next period, 2014-2018.

Several conclusions can be drawn from the 2014-2018 period. First, the absorptive capacity and the RBV remain dominant approaches. According to Černe et al.'s (2016) review of non-technological innovation, these perspectives are also connected to management innovation. The Oslo Manual (OECD, 2005) and the Community Innovation Survey data were used in studies on management innovation (organisational innovation, with or without marketing innovation) and its relationship with technology. This appears in line with Camisón and Villar-López's (2014) conclusion that management and technological innovations positively affect firm performance.

Second, studies that form the knowledge base of the management innovation field as a standalone phenomenon are evident, i.e., with its theoretical foundations, conceptual

development, measurement issues, antecedents and consequences. This concept aligns with previous studies, highlighting the dominance of management innovation (*e.g.,* Černe et al. (2016) and Volberda et al. (2014)). Institutional, fashion, cultural, and behavioural theories of the firm and network are important perspectives in creating, adopting, and disseminating management innovations. The management innovation typologies, such as new management practices, processes, or structures, occur within firms, but their measurement is difficult, because they are *ad hoc*, system-dependent, tacit, and usually incremental. Also, research evidence suggests that managerial, internal and external sources of information/knowledge are antecedents of management innovation.

Third, the co-citation analysis reflects management innovation in the firm's management function, revealing the connections between this type of innovation research and top management and leadership, which lie in the individual level of management innovation. Therefore, "to explain why and how organizations introduce management innovations, we must look at the individuals" (Volberda et al., 2014).

The findings of the co-citation analysis are consistent with the co-occurrence author keywords analysis. The author's keywords analysis, with ambiguous and overlapping definitions, evidenced conceptual confusion. However, the term management innovation gained the researchers' interest. Table 2.9 summarises the previously discussed evolution of the management innovation field in focus areas and key developments. The "After 2019" (Table 9) timescale captures the future research directions.

Table 2.9 - Evolution of the management innovation field

	Before 2009	**2009-2018**	**After 2019**
Focus areas	- Analysis of the pair of administrative and technological innovations	- Interdependence of organizational innovation (based on the Oslo Manual definition) and technological innovation - Management innovation as an independent field (at the firm level)	- Measurement of management innovation - Management innovation antecedents and performance outcomes

	Before 2009	2009-2018	After 2019
Key developments	- The literature was based on theories that focus mainly on technological innovation and strategic management - Overlapping of the terms administrative, organizational and management innovation - The generation and adoption of innovation mainly covers the technological innovation subfield - Antecedents of administrative innovation *versus* technological innovation - Organizational performance based on technological innovation attributes	- Identification of the theoretical approaches to management innovation - Definition of management innovation - Management innovation processes (generation and adoption) and key agents - The antecedents of management innovation are a combination of the firm's internal and external knowledge sources - Management innovation performance is associated with economic/financial and non-economic performance	- Development of management innovation measures based on its attributes - Individual level of management innovation research - Effect of the open innovation in the generation or adoption of management innovation - Influence of management on the firm's results, whether these are in the form of potential economic gains or gains in social approval

2.7.2. Future research directions

The opportunities for future research that can be identified from this analysis lie mostly in three focus areas: management innovation measurement, antecedents, and performance outcomes.

The domain of management innovation is difficult to measure due to its attributes. Thus the management innovation attributes (*e.g., ad hoc*, system-dependent, tacit, incremental nature) may influence its adoption. This demonstrates the need for more focused research on development measures based on management innovation characteristics.

Management innovation mainly affects the organization's social systems, and its adoption depends on human actions. First, this adoption involves not only the top managers of a firm but all the employees engaged in implementing management innovation; therefore, the roles of the non-managers should be considered, besides those of top managers. The research on the individual level of management innovation may be an important outlook for the field's future development. Second, innovation cannot occur only with the firm's internal knowledge; a firm's openness is crucial.

External sources of knowledge to generate or adopt management innovations are also important. Fruitful areas for future research should expand on open innovation based on absorptive capacity to generate or adopt management innovation.

Birkinshaw et al. (2008) and Volberda et al. (2013) distinguished economically and socially outcomes of management innovations. Camisón and Villar-López (2014) used a firm performance measure based on the objective/subjective items of the measure; however, to these authors, more complex relationships may emerge when considering only objective data. Walker et al. (2015) suggest that construct measurement (innovation and performance) can significantly affect the results of a study. Therefore, more research is needed on the influence of management innovation on a firm's results, whether in the form of potential economic gains or gains in social approval.

2.8. Conclusions

Research on management innovation has gained the interest of researchers over the period because of its effects on firm competitive advantage and performance. Based on this analysis, the number of articles was 43 until 2008 and increased to 163 between 2009 and 2018. Regardless of the increasing number of management innovation studies, there is a lack of research that identifies the main academic contributions, their interconnections and evolution over time.

The findings of this study have identified the relevant works, prominent scholars, and publication sources in management innovation research. This analysis will help identify who influenced domain knowledge's growth and evolution in management innovation.

From the co-citation analyses, the key influencers of management innovation are the same as innovation in general. Its domain formation is related to the organizational innovation sub-domains (technological innovation *versus* administrative innovation). In recent years, management innovation studies have increased in two research lines. The first focuses on both management and technological innovations and emphasises their interrelationship; on par with management innovation research as an independent field with its theoretical perspectives, concepts, typologies, processes, attributes, measurements, antecedents, and consequences. In addition, the author's co-occurring keywords provided helpful insights about the main research themes in management innovation knowledge.

This study offers the following contributions to the management innovation domain. First, it identified the most influential studies, authors and journals through citation

analysis. Second, it mapped the intellectual structure of this area, and it identified the most prominent themes, using co-citation and co-occurrence analysis. Last, this review recommends future research directions in measurements, antecedents, and outcomes on this specific type of innovation that has been reviewed.

2.9. Limitations

This study is not free from limitations. First, some limitations result from the nature of the bibliographic databases and the bibliometric technique *per se*. The bibliometric analysis was restricted to data from *Clarivate Analytics*-Web of Science's Main Collection, because it provides the information required. The weakness of the bibliometric co-citation analysis results in evidence from frequently cited articles, while less frequently cited documents may have less impact on the research. Second, only articles from peer-reviewed journals were included in this study, thus potentially restricting access to other results. Finally, five-year subperiods were considered to analyse the field's evolution; if these subperiods are extended or limited, the findings could change.

Chapter 3 - Management innovation and business performance in services: economic and social potential

3.1. Introduction

For experts, policymakers, and business executives, innovation is crucial in organisational performance (Prange & Schlegelmilch, 2016), economic growth (Gunday et al., 2011), and sectoral changes (Tidd & Thuriaux-Alemán, 2016) and business competitiveness (Gallego et al., 2013).

Organisations innovate due to the external environment's competitive and institutional pressure by adopting new services/products and practices attending to the internal organisational options (Damanpour et al., 2009). The innovative challenge of the firms is not only to offer new products or new forms of production but also to change organisational practices, processes, and structures (Birkinshaw et al., 2008; Hecker & Ganter, 2013; Vaccaro et al., 2012), premeditated and focused on the economic or social potential of the firm (Walker et al., 2015).

Organisations to achieve and maintain distinctive competencies that allow them to function continuously (Damanpour et al., 2009) integrate technological and management innovation to create complex higher-level capabilities and positive complementarities that enhance performance (Hervas-Oliver, Boronat-Moll, et al., 2016).

This work articulates the relationship between technological and management innovation through a theoretical framework that integrates two different but interrelated perspectives relevant to studying the potential effects of the joint adoption of technological and management innovation in the service sector: rational and institutional.

The studies about the relationship between management innovation and performance have focused on the industrial sector (Walker et al., 2015). However, researchers emphasized the importance of developing innovative models for services, suitable for both goods and services, without neglecting the peculiarities of the services, considering technological and non-technological innovation (Gallouj & Weinstein,

1997; Vergori, 2014). The effective way to gain a competitive advantage in the service sector is to move away from the technology-based approach to innovation and adopt more complex strategies (Evangelista & Vezzani, 2010).

Management innovations are abstract and intangible, which makes them potentially complex and ambiguous (Vaccaro et al., 2012) and often unique to the firms that adopt them, making them difficult to replicate (Birkinshaw & Mol, 2006). These characteristics make management innovation one source of competitive advantage (Mol & Birkinshaw, 2009; Volberda et al., 2013). This type of innovation remains a poorly researched subject (Hollen et al., 2013); however, within the services sector, it plays a relevant role (Aas & Pedersen, 2011; Gallego et al., 2013).

In summary, this study proposes that in the services sector: (1) the management innovation adoption benefits the service firms; (2) a possible complementarity between management and technological innovation improves the organisational performance of services firms.

This chapter is structured as follows: the next section provides a theoretical overview of management innovation, starting from the prevailing rational and institutional theoretical perspectives. The following section approaches innovation and performance in service firms, and the next section the conclusions. Finally, the future research directions.

3.2. Management innovation and firm performance from rational and institutional perspectives

3.2.1. Management innovation

According to Birkinshaw et al. (2008), management innovation consists of creating and implementing management practices, processes, structures, or techniques new to the "state of the art" to reach organisational purposes. For example, the divisional structure, Toyota's production system, total quality management, the costing based on activities, the modern assembly line, the balanced scorecard, and quality of work life. As these examples suggest, management innovation is a multidimensional construction that includes structural, operational and administrative processes based mainly on non-technological factors. This type of innovation involves relevant changes in processes (strategic planning, project management and performance assessment), practices (setting objectives, organising tasks and functions, developing talent, and responding to stakeholder demands), structures (arranging the communication,

attribution of responsibility), and techniques (procedures for completing a task or goal) (Volberda et al., 2013).

This study it is used the definition of Birkinshaw et al. (2008) with two modifications, as well as Walker et al. (2011) and Vaccaro et al. (2012): focus on the adoption of innovation (not on the creation) and it is an innovation in the adopting organisation (not in state of the art). This distinction is convenient because the management innovations are mainly incremental; and additionally, service organisations frequently adopt innovations developed in other sectors of activity (Barras, 1990; Walker et al., 2011) and adapt themselves to the firm's specific context (Ansari & Zajac, 2010).

Management innovation encompasses changes in "how" and "what" managers do when they define guidelines, make decisions, coordinate activities, and motivate people (Hamel, 2006), implemented by transformational leaders (Vaccaro et al., 2012). These changes are context-specific (Mol & Birkinshaw, 2009), ambiguous and difficult to replicate (Birkinshaw & Mol, 2006). Management innovation adoption is determined by the firm's specific context (Ansari & Zajac, 2010). It cannot be imitated without significant modifications that make them compatible with the organisation's structure, culture, and adopting systems (Damanpour & Gopalakrishnan, 2001). These characteristics make it a source of competitive advantage (Birkinshaw & Mol, 2006; Hamel, 2006).

Different typologies of management innovation have been analysed. For example, Armbruster et al. (2008) differentiate it into an intra-organisational structure and an intra-organisational process. Examples of the intra-organisational structure are the multifunctional teams and decentralisation of planning functions. The intra-organisational process can be teamwork in production and the continuous improvement process. Hollen et al (2013) distinguish management activities associated with goal setting, employee motivation, activity coordination, and decision-making, which are intended to support achieving organisational goals. As these examples demonstrate, the typologies of management innovation are dispersed, and there is no commonly accepted one, differing in their conceptualisation and measurement (Damanpour, 2014).

Part of the research on management innovation has focused on its determinants and, in parallel, on the management innovation outcomes (Khosravi et al., 2019) (Table 3.1).

Table 3.1 - Management innovation determinants and consequences

Factors	Sources
Management innovation determinants	
Internal context of firms and external knowledge demand	Mol & Birkinshaw (2009)
Human resources qualifications	Orfila-Sintes & Mattsson (2009)
Organisational memory and learning capabilities	Camisón & Villar-López (2011)
Transformational and transactional leadership	Vaccaro et al. (2012)
The human resources system is based on commitment	Ceylan (2013)
Internal sharing of knowledge	Černe et al. (2013)
Management innovation consequences	
Improves corporate reputation	Staw & Epstein (2000)
Contributes to increased productivity	Mol & Birkinshaw (2009)
Allows to achieve sustainable competitive advantage	Camisón & Villar-López (2011)
Power the development of dynamic capabilities	Gebauer (2011)
Supports process innovation and marketing activities	Ceylan (2013)
Favours the development of technological innovation capabilities	Camisón & Villar-López (2014)
Favours the introduction of learning capability/product innovation	Nieves (2016)
Increases export performance	Azar & Ciabuschi (2017)

Further related to the innovation outcomes, management innovation acts as a mechanism of support that helps to create a favourable environment (Gunday et al., 2011) for the development of technological innovation (Khanagha et al., 2013; Pino et al., 2016). Technological innovation encompasses product and process innovation (Mothe & Nguyen Thi, 2012). Product innovation is new products or services introduced to the market to meet customer needs; and process innovation is new elements introduced into the firm's production or service operation to produce a product or provide a service (Walker et al., 2015). Management innovations have a crucial role in the changing process of organisations, facilitating the organisational adaptation to the external environment (Walker et al., 2011) and on the probability of obtaining successful product and process innovations (Anzola-Román et al., 2018).

There are several explanations for adopting management innovation (Birkinshaw et al., 2008; Sturdy, 2004; Volberda et al., 2014). However, the rational and institutional approaches are the most used in management innovation adoption research (Birkinshaw et al., 2008; Damanpour, 2014; Kennedy & Fiss, 2009; Walker et al., 2015). Therefore, these theories are addressed in this study.

3.2.2. A rational perspective on the adoption of management innovation

The rational perspective (Alänge et al., 1998; Lieberman & Montgomery, 1988) is based on the premise that management innovations (new practices, processes or structures) (Birkinshaw et al., 2008) are deliberately introduced by key individuals to make organisations more effective (Vaccaro et al., 2012). Decisions leading to management innovation are made rationally, based on cost-benefit analysis and the prospects for greater efficiency and effectiveness (Volberda et al., 2014; Walker et al., 2015).

Management innovations positively affect sales growth (Evangelista & Vezzani, 2010), increase productivity (Mol & Birkinshaw, 2009), and promote organisational purposes (Birkinshaw et al., 2008). These purposes may include traditional development aspects (*e.g.*, financial purposes) and other more flexible (*e.g.*, workers satisfaction) (Birkinshaw et al., 2008).

Although in this perspective, the adoption of management innovation is associated with immediate economic performance (profitability, productivity, growth, and competitive advantage) (Walker et al., 2015), however, not all management innovations are well successful (Birkinshaw et al., 2008). Regardless of the expected or unexpected results, the purpose of introducing management innovation is to enable the organisation to perform. This perspective introduces management innovation as a way to maintain or improve organisational performance or efficiency (Damanpour & Aravind, 2012).

3.2.3. An institutional perspective on the adoption of management innovation

The institutional perspective enhances that the adoption of organisational practices is shaped by institutional factors such as the mentality of the local organisations' elites; the professional and educational network; State (*e.g.*, regulator) (Sturdy, 2004).

In adopting management innovations, organisations are influenced by the behaviour of other organisations (Abrahamson, 1991). The organisational practices are adopted for symbolic reasons – seeking to obtain legitimacy of partners and capital holders, regardless of the efficiency or control results (Sturdy, 2004). The focus is on imitative behaviour (Dimaggio & Powell, 1983) for legitimation purposes (*e.g.,* to improve firms' reputation (Staw & Epstein, 2000)).

Staw & Epstein (2000) argue that organisations introduce innovations based on approval or social legitimacy instead of objective criteria. This theory became dominant

in organisational studies (Sturdy, 2004) and provides an alternative theoretical explanation, which distinguishes the influence of management innovation from the technological in firms' performance (Walker et al., 2015). This perspective has been applied mainly to management innovations because, compared with technological innovations, those are intangible, operationally more complex and easier to modify (Armbruster et al., 2008; Damanpour & Aravind, 2012; Walker et al., 2015). This innovation's process of change and outcome is based on progressive changes in management ideology and/or practice, sometimes toward more effective working methods (Birkinshaw et al., 2008).

In summary, the adoption of management innovation, both rational and institutional perspectives explain the decisions for adopting innovation under different conditions (Ansari & Zajac, 2010); they contribute to the organisational behaviour and the results (Kennedy & Fiss, 2009; Walker et al., 2015); and to the evolution of management innovation (Volberda et al., 2014).

3.3. Innovation and performance in service firms

3.3.1. Service innovation research

Studies on service innovation are categorised into three groups: assimilation/technological, demarcation/service-oriented and synthesis/integration (Drejer, 2004; Gallouj, 1998). These approachs are suitable for analysing and classifying the literature on service innovation (Witell et al., 2016).

In services, the approach of assimilation/technologists with a higher number of studies (Gallouj, 1998) considers services from a manufacturing perspective. It focuses on the impact of technology on services (*e.g.*, Evangelista (2000)). In the past, services have been considered as users of technology "supplier-dominated firms" (Pavitt, 1984) rather than innovators.

In the demarcation approach, the services are distinctly different from manufacturing firms, from products (Edvardsson & Olsson, 1996; Sundbo, 1997), and service innovation has characteristics which call for new theories (Gadrey et al., 1995; Sundbo, 1997; Van Der Aa & Elfring, 2002).

The foundations of the integrating or synthesis perspective comprehend products and specificities of service activities (Table 3.2) and apply them to technological and non-technological innovation (Gallouj & Weinstein, 1997). The research moved forward with the perception that innovation is not merely technological (product or process)

(Drejer, 2004; Hipp & Grupp, 2005). In other words, management innovations (*e.g.,* inter-functional integration (Perks & Riihela, 2004)) have come to integrate services innovation (Carlborg et al., 2014), turning it multidimensional (Amara et al., 2009; Rubalcaba et al., 2010). The success of the organisation of services depends on adopting technological and non-technological innovations (Damanpour et al., 2009), reflecting a synthesis perspective (Gago & Rubalcaba, 2007).

Table 3.2 - Characteristics of specific innovations for services

Characteristics	**Studies**
The importance of the co-production role of customers in innovation processes	Drejer (2004); Gadrey et al. (1995)
The peculiarities of production and services, such as their intangible nature, the integration of customers and organisational aspects	Hipp & Grupp (2005)
The importance of interactive models of innovation about the linear model of innovation The difficulty in protecting innovations	Drejer (2004); Gadrey et al. (1995)
The difficulty in distinguishing between radical and incremental innovation because changes in services can be the result of evolution, variation, disappearance, emergence, association and disassociation	Gallouj & Weinstein (1997); Sundbo (1997)
The importance of the non-technological characteristics of innovation	Drejer (2004; Faridah & Gallouj (2001)
Difficulty in distinguishing between product and process because services are actions or processes rather than products	Gallouj & Weinstein (1997)

From the synthesis perspective, innovation refers to skills in developing new services (Witell et al., 2016). In this context, the social skills and knowledge related to social sciences are extremely important in integrating and efficiently using new technologies (Gallouj et al., 2015). In this perspective, the value creation to one of the actors is emphasized (Witell et al., 2016). It can influence the organisation's performance to improve quality, range, easiness for using services, quickness of production and the delivery of service, as well as to provide services (Hipp et al., 2003) and economical positive performance (Cainelli et al., 2006).

This study is under the premise of the synthesis approach. This is because it aims to investigate the impact of types of innovation (service, technological process, and management) on the service's performance.

3.3.2. Type of performance

The link between innovation and growth is often indirect, complex, and varies according to specific characteristics at the firm level and business model (Cabigiosu & Campagnolo, 2019; Corrocher et al., 2013). In management innovation, these shortcomings are exacerbated because they are not quantifiable (Damanpour & Aravind, 2012), the level of adaptations to the organisation's specific context is high, and its result may be uncertain (Birkinshaw et al., 2008).

From the rational point of view, the indicators of performance, usually used in management innovation measurement, are potential economic gains such as profitability, productivity, growth, and competitive advantage (Walker et al., 2015).

From the institutional perspective, social gains (Kennedy & Fiss, 2009), such as the workers retaining, client satisfaction, relation with the stakeholders, environmental impact (Volberda et al., 2013), reduction of time of response to clients and suppliers, improvement in the quality of services (Evangelista & Vezzani, 2010), justify the adoption of management innovation (Staw & Epstein, 2000) and contribute to its performance (Hervas-Oliver, Boronat-Moll, et al., 2016).

The economic and social gains aren't mutually exclusive; they may exist in parallel and even reinforce themselves; that is, the economic performance may increase the social gains and vice versa (Kennedy & Fiss, 2009). It can be anticipated that, should the rational perspective influence the adoption of management innovation, the economic performance is affected; if the institutional approach is dominant, the social results initially precede the economic performance benefits (Walker et al., 2015).

Usually, a period may pass until the positive impacts of the innovations in the firm's performance are observed (Damanpour & Evan, 1984). For this reason, the impacts of the innovation performance are firstly associated with the non-financial aspects of the organisational performance, which later will lead to financial returns (Gunday et al., 2011).

3.3.3. Management and technological innovation and performance

Applying the resource-based view of the firm (Barney, 1991; Peteraf, 1993) to the innovation activity enhances the complementary role of the types of innovation and its gathered influence in the organisational result (Damanpour & Aravind, 2012). The complementary introduction of management and technological innovation (Battisti & Stoneman, 2010; Camisón & Villar-López, 2014) improves the technological

performance of innovating firms (Hervas-Oliver, Ripoll-Sempere, et al., 2016). From the resource-based view, the socially complex resources can be an importante basis for competitive advantage (Peteraf, 1993).

The difference between technological and management innovations is related to the broader distinction between technology and social structure (Evan, 1966). At the entrepreneurial level, technological innovations are associated with the organisation's technological core or technical system, and management innovations are associated with the social system (Daft, 1978; Damanpour & Aravind, 2012). The perspective of the different types of innovation is supported by the theory of socio-technical systems (Trist & Bamforth, 1951). The socio-technical system theory postulates that the social and technical system must form a single integrated system. The concept of the socio-technical system enhances the interrelation of the social and technical subsystems constituted by people and technology (Trist & Bamforth, 1951) that are optimised together and are the key factor in the general performance of the system (Pasmore & Khalsa, 1993). Thus, a synchronised adoption of management and technological innovation is needed to reinforce the organisations' interdependent capacities in the social and technical systems, seeking results (Evangelista & Vezzani, 2010; Hervas-Oliver, Ripoll-Sempere, et al., 2016; Walker et al., 2015). The firms developing complex and integrated systems of innovation capacities can obtain higher incomes that come from the complementarity of capacities of technological and management innovations (Hervas-Oliver, Ripoll-Sempere, et al., 2016). With a focus on rational decisions about introducing management innovation to improve organisational performance, considers the interaction with other types of innovation such as technological innovation (Volberda et al., 2014).

Although the scarce empirical evidence of the interactive or combined effects of management innovation (Walker et al., 2015), the literature has underlined the importance of management and technological innovation in the competitive advantage (Evangelista & Vezzani, 2010). These combined innovations promote organisational purposes (Battisti & Stoneman, 2010; Camisón & Villar-López, 2014) and further increase productivity in the service sector (González-Blanco et al., 2019).

3.4. Conclusion

This introductory chapter focuses on the rational and institutional perspectives of research and the theoretical fundaments of the joint adoption of different types of innovation, which generates organisational capabilities and affects organisational results. It aims to integrate different perspectives of management that approach

performance as economic and social gains and depending on the adoption of technological and non-technological innovations in the firms' services.

The characteristics of management innovation, such as intangibility, complexity and ambiguity, make its imitation difficult, turning this kind of innovation into one source of competitive advantage for firms. The joint adoption of this innovation and technological innovation promotes organisational goals, maximising firms' performance.

From the resource-based view, the capability of service firms to integrate different kinds of innovation is unique and rare, obtaining distinctive competencies and high sustainable performance. The joint adoption of technological and management innovation capabilities allows the integration of several assets, building a coherent system of interlinked activities which reinforce themselves mutually, promoting the organisational goals, maximizing the performance and enabling the organisations in the service delivery to clients.

The research and the development of synchronised innovation facilitate understanding the balance between management and technological innovation in organisational conduct and its results. The interplay of technological and management innovations to obtain the sustained competitive advantage of firms results in socioeconomic gains. It contributes to a better understanding of the resources and the complementary capabilities when technological and management innovations are adopted together.

3.5. Future research directions

Special issues on management innovation provide ideas and directions for future research. Such research is important because the rational and institutional approaches can explain the adoption of management innovation and its economic and social gains.

The consequences of management innovation are complex (Khosravi et al., 2019) because so many different stakeholders are potentially affected (Birkinshaw et al., 2008). So, it is necessary to separate the impact of management innovation on various performance metrics inside the innovating firm. The studies can use a range of overall performance measures, including the rational goal model (*e.g.*, productivity, market share and relationship with stakeholders, innovation performance, and financial performance). The institutional perspective enhances that institutional factors shape the adoption of organisational practices. Thus, for example, how do changes in the professional regulatory associations motivate managers to respond to developing new

management practices? What is the management innovation role in internally adopting new process technologies in established firms with their rules and regulations? Answering these questions can help understand how firms adapt management practices to their specific context.

Chapter 4 – Relations between innovation and organisational performance: evidence in knowledge-intensive business services

4.1. Introduction

Innovation in the service sector generally employs new knowledge and technologies or new combinations of existing knowledge and technologies (Martin-Rios & Ciobanu, 2019), playing a critical role in the outcomes of the service firms (Le Anh et al., 2021; Rajapathirana & Hui, 2018).

KIBS can combine different types of knowledge and transform it into economic solutions (Content et al., 2022). These firms positively affect industrial firms' economic contribution (Vaillant et al., 2021). Besides transferring knowledge in the economy, KIBS influence the creation of innovation in the firms they advise (Figueiredo & de Matos Ferreira, 2020), as they are also innovative (Chichkanov et al., 2021). KIBS firms, as one of the most innovative segments of the services sector (Carmona-Lavado et al., 2020), are also innovation intermediaries, supporting business processes in other firms (Chichkanov et al., 2021). KIBS innovate in technological and non-technological fields in a coordinated manner to improve customer performance and competitiveness (Santos-Vijande et al., 2013).

The discussion on innovation in services has only recently been taken up and is a result of the wider manufacturing sector investigations (Moreira et al., 2020). One innovation typology is the technical-management typology (Damanpour & Aravind, 2012). Technological innovation is directly related to the organisation’s core business and produces changes mainly in operational systems; management innovations are indirectly related to the organisation's core business and mainly affects management systems (Damanpour & Aravind, 2012). In line with this typology, this study adopts a three-dimensional model of innovation related to the service sector (Damanpour et al., 2009; Le Anh et al., 2021). These dimensions of innovation are technology use (a type of process innovation), management innovation, and service innovation.

In the context of KIBS innovation, increasing the use of knowledge embodied in managerial practices and advanced technologies contribute to increase the likelihood of developing product innovation (Amara et al., 2016). KIBS are major users of the full

range of technology (Doloreux & Frigon, 2020) and have dramatically changed how services are designed, developed and delivered (Ryu & Lee, 2018).

Management innovation is a social and people-oriented innovation (Janka et al., 2020) and involves management practices, processes and structures aimed at promoting organisational objectives (Birkinshaw et al., 2008; Vaccaro et al., 2012). In addition, management innovation helps the organisation to achieve high performance by integrating various practices in new ways (Y. Zhang et al., 2019). Management innovations are often complementary to information technology and technological innovation (van Oorschot et al., 2018), adopting an integrative approach (González-Blanco et al., 2019).

Service innovation is a long-term investment that firms should consider at the strategic level (Feng et al., 2021). Service innovation refers to developing and introducing a new service (Martin-Rios & Ciobanu, 2019) that can significantly and positively impact firm performance (Feng et al., 2021). This type of innovation emerges in service provision based on clients' needs (Toivonen & Tuominen, 2009).

Firm performance is the external manifestation of the comprehensive strength of the firm (Feng et al., 2021), such as its new service market performance (Santos-Vijande et al., 2021; Taghizadeh et al., 2020), market share, customer satisfaction, sales (Rajapathirana & Hui, 2018). Additionally, from the firm's perspective, it makes little sense to develop a service without considering the financial result (Gustafsson et al., 2020).

In manufacturing firms, management and technological innovation complement the firm's performance (Arranz et al., 2019). However, there is a lack of empirical research on the relationship between different innovation types in the services sector (González-Blanco et al., 2019). This study aims to investigate the relationship between innovation efforts and service firm's performance. Specifically, using a direct effect model, an analysis is conducted to investigate the combined effect of technology use, management innovation and service innovation on service firm's performance. This integrative view considers that the simultaneous use of different types of innovation enables firms to improve their innovative results (Damanpour & Aravind, 2012; González-Blanco et al., 2019).

Consistent with the arguments discussed above, this study aims to measure the performance of firms from both non-financial and financial perspectives. This research

aims to contribute to the literature by including management innovation that received less attention in previous research. This study aims to make practical contributions to the current literature by empirically investigating technology use, management innovation, and service innovation in the business performance of Portuguese KIBS.

This study is structured as follows: first, a review of the innovation and business performance literature is presented, and the hypotheses are formulated. Subsequently, the research methodology is explained, which includes the sample, data collection, measures and data analysis procedure. Finally, the results, discussion, and conclusions are reported.

4.2. Theoretical framework

This study is grounded in Barney's RBV (Barney, 1991). According to RBV, performance is induced by the synergy of the organisation's internal resources. RBV asserts a significant positive relationship between a firm's unique resources and performance (Y. Zhang et al., 2019).

4.2.1. Innovation and firm performance

Innovation represents the development and implementation of new ideas by an institution's people, which lead to improved products, services and business processes that potentially lead to greater financial gains, relevant competitive positioning, and increased value for stakeholders (Ringberg et al., 2019). This definition is broad enough to encompass the technological and management innovations associated with the view of organisations as socio-technical systems (Alexiev et al., 2018; Damanpour & Aravind, 2012; Trist & Bamforth, 1951). The social system refers to the people working in the organisation and their relationships; the technical system consists of techniques, procedures or knowledge used by the social system to achieve organisational goals (Trist & Bamforth, 1951). At the enterprise level, technological innovations are associated with the technical system of the organisation and management innovations are associated with the social system (Damanpour & Aravind, 2012). Technological and management innovation activities reinforce each other, and firms benefit from implementing and harmonising a complex set of practices to optimise the results of their innovation processes (Anzola-Román et al., 2018). Based on the socio-technical systems theory, this study considers management innovation, service innovation and the use of technology on the performance impact of KIBS firms.

4.2.1.1 Management innovation and non-financial performance

The study by Birkinshaw et al. (2008) was instrumental in defining the concept and the process of creating and implementing management innovation at the organisational level. Some of the subsequent literature on management innovation is based on this study (Volberda et al., 2014). Birkinshaw et al. (2008) defined management innovation as the creation and implementation of management practices, processes, structures or techniques that are new to the state of the art and are intended to achieve organisational objectives. In line with this definition, management innovation focuses on what managers do, how they do it, and the organisational context in which the work is performed (Vaccaro et al., 2012).

Management innovation in organisations, although necessary, can be scarce (Sakowski et al., 2019; Su & Baird, 2018), and it isn't easy to implement (Gobble, 2018). Its tacit nature and the relative difficulty in observing it facilitate subjective interpretation by the potential user (Birkinshaw et al., 2008). Furthermore, most management innovation practices are context-specific (Tidd & Thuriaux-Alemán, 2016).

An organisation's ability to achieve positive performance is linked to innovation (Khosravi et al., 2019). Namely, management innovation aims to maintain or improve performance (Damanpour & Aravind, 2012). In light of the rational perspective, management innovation is intended to promote the organisation's objectives, which may be financial (*e.g.,* labour and business productivity, sales growth) and non-financial (*e.g.,* employee satisfaction) (Birkinshaw et al., 2008; Walker et al., 2015). This approach assumes that key individuals within organisations deliberately introduce new practices, processes or structures to improve their performance (Vaccaro et al., 2012). Management innovation can help motivate the workforce and prepare them for change, positively influencing organisational performance (Khosravi et al., 2019).

Not all management innovations ultimately lead to the planned outcome (Birkinshaw et al., 2008). In the systematic review and meta-analysis of the literature on management innovation, Khosravi et al. (2019) found that the link between management innovation and financial performance is inconsistent. According to Walker et al. (2015), if the rational perspective prevails, management innovation will influence economic performance (*e.g.,* labour and business productivity, sales growth). He also states that if the institutional approach prevails, non-economic performance (customer satisfaction, employee retention and relationship development with partners, distributors and suppliers) may take precedence initially but will be replaced over time by economic performance. Magnier-Watanabe & Benton (2017), in the study

of Japanese manufacturing and service firms, found that there was no direct effect of management innovation on performance compared to competitors, nor on productivity and financial performance compared to other firms. In audit service firms, Le Anh et al. (2021) state that management innovation positively influences organisational performance, which includes financial results, improved work efficiency, increased reputation and sustained development of the firm.

On the one hand, the results of the effect of management innovation on performance are inconsistent; on the other hand, this type of innovation is intended to achieve non-financial organisational objectives. In this study, the following hypothesis is proposed:

H1. Management innovation has a positive and significant effect on non-financial performance.

4.2.1.2 Technology and non-financial performance

This thesis focuses on the services sector, so the product and process differentiation in it is complex, depending on the case, which is why some authors claim that this distinction is meaningless (Gallouj & Weinstein, 1997; González-Blanco et al., 2019). A process innovation is the implementation of a new or significantly improved production or delivery method (Karlsson & Tavassoli, 2016). This type of innovation is associated with investments that create technical changes in the firm (Alexiev et al., 2018). In this study, technology use is adopted as a type of process innovation.

The use of production/service delivery technologies and information and communication technology (Corrocher et al., 2013) includes business software (Engelstätter & Sarbu, 2013), office machinery and equipment (data processing, communication), communication services and software (Taques et al., 2021), data storage and management, or operations based on artificial intelligence (Michalakopoulou et al., 2021).

Technological changes support knowledge creation and sharing (Tomo et al., 2019), facilitating the flow of information among departments (Hsieh & Chou, 2018). For example, technologies, such as cloud services, mobile internet and social media, reshape how knowledge is disseminated, how workers intercommunicate (Gallouj et al., 2015) and communicate with customers (Li et al., 2020; Ryu & Lee, 2018), creating and sharing knowledge (Tomo et al., 2020). The use of information technology allows individual knowledge to become a collective and integrated system (Nieves & Osorio, 2018). In addition, the flow of information among departments, facilitated by the setup

of information tecnology, helps firms find the most suitable approach to dealing with the market and therefore increasing their market adaptability (Hsieh & Chou, 2018). In fact, even the least innovative firms adopt some technology to keep up with a minimum level of innovation and adjust their service offerings to be able to cope with ongoing technological and market changes (Gaskin et al., 2018). These arguments lead to the following hypothesis:

H2. Technology use has a positive and significant influence on non-financial performance.

4.2.1.3 Service innovation and non-financial performance

Innovation follows a *continuum*, ranging from small incremental changes to radical innovations (Kahn, 2018), highlighting the outcome of a development process (Gustafsson et al., 2020), with the continuous and complex interaction between many actors (Toivonen & Tuominen, 2009). This differentiation has been used in research on service innovation (Bumberová & Milichovskỳ, 2020; Snyder et al., 2016). They start with small, often practice-based, adjustments in services, which in the long run gradually lead to more important changes, as well as intentional and planned changes, which are more abrupt and rare (Sørensen et al., 2013). It seeks to increase benefits and reevaluate the current service model to determine whether there is room for improvement (Hsieh & Chou, 2018). Particularly, professional services firms are involved in a continuous innovation process, aiming to differentiate themselves from competitors (Gardner & Bryson, 2021).

As innovation ranges from incremental to radical offerings, different types of service innovation are possible. Incremental innovation is a modification, revision, or repositioning of the firms' current services (Bumberová & Milichovskỳ, 2020). Radical innovation is predominantly associated with developing new services (Hopp et al., 2018) or new lines of existing services, i.e. new features/options added to an existing offering (Kahn, 2018). Incremental service innovation creates value by adding current values, while radical service innovation creates new value through innovative concepts (Cheng & Krumwiede, 2012).

Service innovation creates a unique service through improvements in existing service or develops a new one (Hsieh & Chou, 2018). According to Toivonen e Tuominen (2009), service innovation benefits the organisation that developed it. Indeed, service innovation aims to exploit new opportunities or develop existing capacity (Martin-Rios & Parga-Dans, 2016; Tsai & Wang, 2017). Developing existing capacity seeks to

increase benefits and re-evaluate the current service model, analysing whether there is scope for improvement (Hsieh & Chou, 2018). Exploit new opportunities or developing existing capacity contributes to the business development as a whole (Storey et al., 2016). Firms adapt by specialising in the existing service or launching a new one. For example, in the Italian firm accounting sector, the main reasons for innovating were to improve the quality of service or to develop a new niche (Tomo et al., 2020).

The outcomes of service innovation may be intangible and more based on tacit knowledge (Storey & Perks, 2015), such as new knowledge, processes and methods (Li et al., 2019) that the customer cannot experience *a priori* (Storey et al., 2016). However, among services, the degree of tangibility can vary considerably; i.e. service innovation can also be tangible when the services offered are linked to the physical product (Alexiev et al., 2018). Services have their specific characteristics, and this perception hinders conceptual understanding (Taques et al., 2021).

Research has shown a positive association between service innovation and business performance. According to Feng et al. (2021), the effect of service innovation on non-financial performance is more significant than on financial performance. The new service advantage influences the market performance, as reported by Santos-Vijande et al. (2021). As per Prajogo & Oke (2016) the ability to offer superior value services leads to new niche markets, which are beneficial for firms, enabling them to attract more customers, leading to increased market share, revenues and improved performance. Following these lines of logic regarding the relationship between service innovation and non-financial performance, the following hypothesis is proposed in the context of KIBS firms:

H3. Service innovation has a positive and significant influence on non-financial performance.

4.2.1.4 Non-financial performance and financial performance

Firm performance reflects the extent to which the firm achieves its market, growth and financial objectives in a given period (Feng et al., 2021). Firm performance can be financial and non-financial (Feng et al., 2021; Khosravi et al., 2019; Walker et al., 2015). Firm performance obtained incrementally may be realised over time (Wu & Chen, 2014) and is differentiated across sectors (Martin-Rios & Ciobanu, 2019).

Among the consequences of introducing innovations are the economic effects on the firms that introduce them (Janger et al., 2017), which represents the market acceptance

of the innovation (Storey et al., 2016). Financial performance can be measured, for example, through profit, return on sales, return on investment and assets (Khosravi et al., 2019). Although financial measures are objective, their selection depends on the willingness of firms to disclose confidential financial information (Magnier-Watanabe & Benton, 2017; Rajapathirana & Hui, 2018; Tsai & Wang, 2017). Non-financial performance covers more indicators than financial performance (Feng et al., 2021). It may include, for example, corporate image, customer loyalty and satisfaction, attracting new customers, achieving competitive advantage by the organisation and meeting long-term objectives (Rajapathirana & Hui, 2018; Ribeiro-Navarrete et al., 2021; Storey et al., 2016). In service firms, the success of innovation activities is more likely to directly affect their non-financial performance and only indirectly affect their financial performance (Ryu & Lee, 2016). Therefore, the hypothesis is formulated:

H4. Non-financial performance has a positive impact on financial performance.

The research model is proposed considering the theoretical framework and the previously formulated research hypotheses (Figure 4.1).

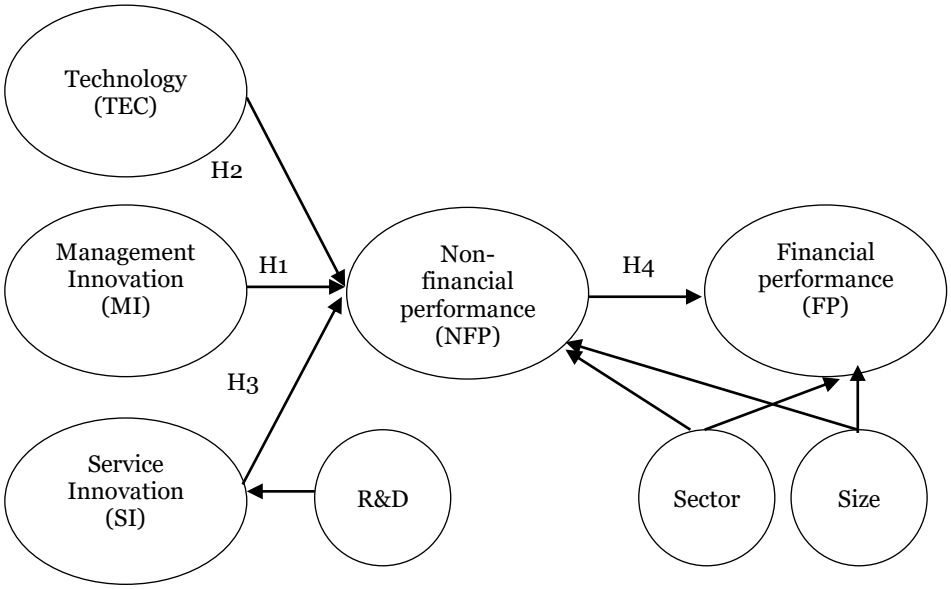

Figure 4.1 - Research model

4.3.Methodology

4.3.1. Population, sample and data collection

The empirical research was conducted with a database of Portuguese KIBS. A stratified random sampling procedure was applied to the study population by subsectors of

technology KIBS (t-KIBS) and professional KIBS (p-KIBS) (Miles et al., 1995). A total of 741 firms were contacted, and the valid answers were 232 firms (response rate of 31%). The respondents were the managers that occupy positions of responsibility, which gives them a global view of the firm.

4.3.2. Measures

This study adapted 29 measurement indicators from other investigations (Table 4.1). A five-point *Likert* scale was used in the questionnaire, ranged from "strongly disagree (1) to strongly agree (5).

Table 4.1 - Study variables

Construct	Variables	Sources
Management innovation (MI)	MI1 - Renewal of firm rules and procedures during the firm's daily operations; MI2 - Changes in workers' tasks and functions during the firm's daily operations; MI3 - Implementation of new management systems during the firm's daily operations; MI4 - Change in the policy for rewarding workers in the last three years; MI5 - Restructuring of the firm's intra and inter-departmental communication structure in the firm's daily operations; MI6 - Changing the organisational structure during the firm's daily operations.	Alexiev et al. (2018), Vaccaro et al., (2012)
Technology (TEC)	TEC1 - Use technologies in the creation, simulation and testing of new services/products; TEC2 - Use technologies to reduce delivery time; TEC3 - Use technologies that facilitate communication and cooperation with workers and customers; TEC4 - Use technologies to improve the quality of the service/product; TEC5 - Use technologies to monitor and track the delivery process to effectively manage the service/product delivery process.	Ryu & Lee, (2016)
Service innovation (SI)	SI1 - The service is completely new to the firm; SI2 - The service allows the firm to enter a new market for the first time; SI3 - The service completes an existing line of services/products; SI4 - The service creates a new service/product line in the firm; SI5 - The service is a modification of another existing service/product of the firm; SI6 - The service is a review of another existing service/product of the firm; SI7 - The service is a repositioning of another existing service/product.	Avlonitis et al., (2001), Cheng & Krumwiede, (2012), Hsu et al., (2018)
Non-financial performance	NFP1 - The services/products had a greater positive impact on the firm's image; NFP2 - Services/products have improved customer loyalty;	Avlonitis et al., (2001), Storey et al., (2016)

Construct	Variables	Sources
(NFP)	NFP3 - The introduction of services/products has increased the profitability of other services/products of the firm; NFP4 - The services/products attracted a significant number of new customers; NFP5 - The services/products contributed to the competitive advantage.	
Financial performance (FP)	FP1 - The services/products were profitable; FP2 - Total sales of services/products increased; FP3 - Services/products achieved greater market share; FP4 - Services/products have exceeded profit targets; FP5 - Services/products exceeded sales targets; FP6 - Services/products exceeded market share targets.	Avlonitis et al., (2001), Carmona-Lavado et al., (2013), Storey et al., (2016)

4.3.3. Control variables

The control variables internal Research and Development (R&D), activity sector (t-KIBS and p-KIBS) and firm size (number of employees) were used. In KIBS firms, product innovations are particularly influenced by internal R&D activities (Anzola-Román et al., 2018; Cainelli et al., 2020). A dummy variable was created to act as the control for the potential sector-related biasing effect on results (the value is one if the sector is t-KIBS, two if it is p-KIBS) to avoid sector effects (Bocquet et al., 2016). Firm size is expressed by the number of employees (measured by the natural logarithm of the number of employees). A larger KIBS firm is likely to have higher possibilities to grow compared to a smaller one (Cabigiosu & Campagnolo, 2019), and most firms in this sample are micro.

4.3.4. Data analysis procedure

This study is quantitative and *cross-sectional* because it involves observing a representative sample at a particular time. It aims to explore the non-financial performance associated with technology use, management innovation, service innovation and, ultimately, the financial performance of KIBS.

Specifically, research on management innovation has focused little on its outcomes (Khosravi et al., 2019), and research on this phenomenon is relatively new. Thus, Partial Least Squares Structural Equation Modeling (PLS-SEM) is the preferred method when the research objective is exploratory research (Henseler, 2018). There is no need for the dataset to have a normal distribution since PLS-SEM is a non-parametric method (Hair et al., 2019). SEMs evaluate in a single analysis the structural model - the causality between a set of dependent and independent constructs - and the measurement model - observed item loadings (indicators) on their latent variables

(constructs) (Gefen et al., 2000). The SmartPLS 3.0 software was used in the data analysis.

4.4. Data analysis and results

4.4.1. Measurement model assessment

As in the model under study, the indicators are reflective and the following aspects should be analysed: (1) the reliability of the indicators; (2) internal consistency; (3) convergent validity; and (4) discriminant validity (Hair et al., 2017; Ringle et al., 2020).

Regarding the indicators, 29 indicators were initially included in the model. As stated by Hair et al. (2017), indicators with external loadings between 0.40 and 0.70 should generally be considered for removal from the scale only when the exclusion of the indicator leads to an increase in composite reliability or Average Variance Extracted (AVE). In the measurement model analysis, the indicators with low external factorial loadings were removed (IS3, IS5, IS6), and the model was re-run with every factor loadings above 0.65. Consequently, 26 items were included in the final measurement model. Internal consistency is analysed using Cronbach's alpha and composite reliability, and both measures should be above 0.70 and below 0.95 (Hair et al., 2017). In assessing the reflective constructs, convergent validity, the indicators' external loadings and the AVE were considered (Hair et al., 2017). AVE with a value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators (Chin, 1998). The results presented in Table 4.2 show that the internal consistency and convergent validity are in line with the reference literature.

Table 4.2 - Convergent validity and reliability

Construct	Item	Loading	Cronbach's alpha	FC	AVE
MI	MI1	0.748	0.823	0.870	0.527
	MI2	0.672			
	MI3	0.781			
	MI4	0.683			
	MI5	0.756			
	MI6	0.710			
TEC	TEC1	0.682	0.856	0.897	0.637
	TEC2	0.855			
	TEC3	0.807			
	TEC4	0.823			
	TEC5	0.814			
SI	IS1	0.704	0.751	0.842	0.577
	IS2	0.830			

Construct	Item	Loading	Cronbach's alpha	FC	AVE
	IS4	0.836			
	IS7	0.651			
NFP	NFP1	0.768	0.860	0.900	0.644
	NFP2	0.833			
	NFP3	0.843			
	NFP4	0.785			
	NFP5	0.707			
FP	FP1	0.693	0.896	0.921	0.661
	FP2	0.793			
	FP3	0.837			
	FP4	0.867			
	FP5	0.869			
	FP6	0.807			

Note: MI: Management Innovation; TEC: Technology; SI: Service Innovation; NFP: Non Financial Performance; FP: Financial Performance; n=232.

Discriminant validity was assessed resorting to the Heterotrait-monotrait (HTMT) criterion, with threshold values below 0.90 (Henseler et al., 2015). All values are below 0.90, attesting to the discriminant validity of the variables included in the study (Table 4.3).

Table 4.3 - Discriminant validity with Heterotrait-Monotrait criteria

	FP	NFP	MI	SI	TEC
FP					
NFP	0.778				
MI	0.327	0.386			
SI	0.413	0.436	0.242		
TEC	0.368	0.540	0.397	0.206	

Note: MI: Management Innovation; TEC: Technology; SI: Service Innovation; NFP: Non Financial Performance; FP: Financial Performance; n=232.

4.4.2. Structural model assessment

Following the evaluation of the measurement model, the structural model analysis was conducted. The effects of management innovation, technology use, and service innovation on the firm's non-financial performance were tested. In point of fact, the effect of non-financial performance on financial performance was equally analysed. In evaluating the significance of the effects, the *bootstrapping* technique was used in 10.000 samples (Streukens & Leroi-Werelds, 2016). Table 4.4 presents the results of the hypotheses tests of the effects. H1 assesses whether management innovation positively and significantly affects non-financial performance. The results reveal that

management innovation positively and significantly influences non-financial performance (β=0.164, t=2.806, p<0.05), supporting H1. These results reveal a significant impact of technology use (β=0.372, t=7.005, p<0.001) and service innovation (β=0.261, t=4.763, p<0.001) on non-financial performance, supporting H2 and H3, with technology use exerting the strongest influence. Finally, the results illustrate that non-financial performance has a positive and significant impact on financial performance (β=0.684, t=16.751, p<0.001), thus, H4 is also accepted. The control variable, internal R&D, had a positive and significant influence on service innovation. The R^2 shows that management innovation, technology use, and service innovation explain 31.2% of the variance of non-financial performance, and the non-financial performance of KIBS explains 46.6% of financial performance variance. The overall evidence from the results suggests that management and technological innovation effort has a significant and positive impact on non-financial performance and, ultimately, greater financial performance.

Table 4.4 - Results of the coefficient of the relations of the structural model

Hypotheses	**Structural links**	**Coefficient**	**Standard Deviation**	***t-value***	***p-value***	**[2.5%; 97.5%]**	**Supported (Y/N)**
H1	MI->NFP	0.164	0.058	2.806	0.005	[0.055; 0.284]	Yes
H2	TEC->NFP	0.372	0.053	7.005	0.000	[0.268; 0.476]	Yes
H3	SI->NFP	0.261	0.055	4.763	0.000	[0.154; 0.370]	Yes
H4	NFP->FP	0.684	0.041	16.751	0.000	[0.602; 0.762]	Yes
	R&D->SI	0.221	0.063	3.537	0.000	[0.098; 0.345]	
	Sector->NFP	-0.118	0.052	2.277	0.023	[-0.218; -0.016]	
	Sector->FP	-0.006	0.046	0.131	0.896	[-0.097; 0.083]	
	Size->NFP	0.013	0.045	0.285	0.775	[-0.077; 0.100]	
	Size->FP	-0.107	0.049	2.187	0.029	[-0.207; -0.017]	
R^2 NFP	0.321						
R^2 FP	0.466						
Q^2 NFP	0.197						
Q^2 FP	0.298						

Note: Y: Yes; N: No; MI: Management Innovation; TEC: Technology; SI: Service Innovation; R&D: Research and Development; Size: Firm size; NFP: Non-Financial Performance; FP: Financial Performance; n=232.

4.4.3. Discussion

This study proposed a model that would allow to analyse the impact of the efforts of using technology, management innovation and service innovation on non-financial performance and its influence on the financial performance of firms.

Focusing on KIBS, research was conducted on the relevance of the use of technology, management and service innovation on non-financial performance, namely on the firm's image, customer loyalty and acquisition, increased profitability of other firm's services/products, and competitive advantage.

The results confirmed that technology use, management innovation and service innovation have significant differentiated roles in non-financial performance. In this case, management innovation demostrated the weakest influence. Management innovation, although necessary, is difficult to implement (Gobble, 2018) and not all management innovation leads to the planned result (Birkinshaw et al., 2008).

The use of technology showed the strongest influence on non-financial performance. This result agrees with Wu & Chen's (2014) perspective, according to which the use of information and communication technology initially leads to performance in learning, growth, and internal process. Also, Yunis et al. (2018) found that appropriate use of information technology leads to higher growth and sustained competitive advantage.

In this research, service innovation is believed to also being associated with non-financial performance in KIBS. Santos-Vijande et al. (2021) ultimately found the new service advantage influencing market performance.

Another result of this research is the relationship between non-financial performance and financial performance. The results reveal that this relationship is positive and significant, confirming that financial performance is often the ultimate goal of an organisation, as advocated by Walker et al. (2015) and Wu & Chen (2014).

4.5. Conclusions

This study aims to investigate and understand the effect of innovation on the performance of Portuguese KIBS. In the light of RBT theory, the impact of technology use, management innovation and service innovation on non-financial and financial performance was researched. The results of this inquiry support most of the findings in the literature. An important contribution of this study is to highlight the joint role of innovation in the performance of KIBS. The evidence from the study suggested that if a KIBS firm is supported by strong technology use, management and service innovations, the non financial performance might be high. The findings of this study prescribe this is an effective way to build positive firm performance.

In summary, to achieve their non-financial objectives, KIBS firms need to use technology in new services and improve their production processes or the delivery of their services/products. KIBS firms will surely attract and retain new customers by investing in new services. The development of management innovation can help motivate the workforce and prepare them for adopting change, positively influencing the non-financial performance of KIBS firms. Finally, the evidence from the study suggests that the non-financial objectives achieved by KIBS facilitate their financial results.

4.6. Practical implications

Technology use, management and service innovations are continuously relevant in the non-financial performance of KIBS firms. The managers of these firms should adopt technology, management and service innovations, specifically aimed at presenting their firm's image, retaining and attracting new clients, or increasing the profitability of the firm's services/products or its competitive advantage.

It is recommended that the managers of KIBS firms, when strategically planning for non-financial performance, pay attention to developing new services, the technology use, and innovate in management practices, processes, and organisational structures. Thence, non-financial results are reflected in KIBS firms' profitability and sales of services/products and profit.

4.7. Limitations and future research lines

This study has certain limitations that highlight new lines for future research. This analysis is limited to the perspective of managers as the main respondents. Future studies will benefit from multiple respondents to the questionnaire or a temporal hiatus in data collection for the independent and dependent variables.

It would be interesting to analyse the subsectors of professional or technology KIBS because comparing the effectiveness of innovation on the performance of these subsectors may have different non financial performance.

A generic concept of management innovation was used, and no differentiation was made between specific types of new management innovation practices. Future research results may vary according to the type of management innovation used. This study equally identified the role of technology use in KIBS firms at a general level. Thus, this study can be extended by considering the effects of specific technology applications on non-financial performance.

This study was conducted in Portugal, classified as a moderate innovator in the European Union average (Commission, 2021). The results are not generalisable to countries classified as leading, strong, or modest innovators. It would be encouraging to replicate this study in other moderate innovation European countries and validate the results obtained in this research.

Chapter 5 - The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology

5.1. Introduction

The adoption of innovation in knowledge-intensive firms may start in management (Michalakopoulou et al., 2021) since better managed firms increase their ability to innovate, which will improve their profitability (Nemlioglu and Mallick, 2021). Management innovation (MI) is a type of social and people-oriented innovation (Janka et al., 2020) and involves management practices, processes and structures designed to further organisational goals (Birkinshaw et al., 2008; Vaccaro et al., 2012). These MI activities influence the day-to-day work of the firms, regarding their operational and strategic spheres (Roehrich et al., 2019). MI encompasses changes in 'how' and 'what' managers do when they set directions, make decisions, coordinate activities and motivate people (Hamel, 2006). However, the contribution of MI to the firms' performance offers inconsistent results (*e.g.,* Kraśnicka *et al.*, 2018; Le Anh *et al.*, 2021; Magnier-Watanabe and Benton, 2017; Zhang *et al.*, 2019).

Empirical studies analysing MI and firms performance have mainly focused on the manufacturing industry (*e.g.*, Camisón and Villar-López, 2014) or used several industries (e.g., Zhang *et al.*, 2019). Few studies approach is analysed in the services sector (Walker et al., 2015). The contradictory empirical results and the few empirical studies focusing on services firms suggest that there is still a conceptual debate happening (Geldes et al., 2017; Khosravi et al., 2019).

To address the inconsistencies of MI on organizational performance (OP), this study theoretically articulates the relationship between MI and technological innovation, integrating the interconnected ideas derived from the socio-technological perspective (Trist and Bamforth, 1951) and the RBV (Barney, 1991).

In the socio-technological approach (Trist and Bamforth, 1951), the development of new social practices related to organisational and human resources management, and their integration with technical systems, maximise the potential results in firms.

Specifically, MI complements other types of innovation, such as technological innovation capabilities (Chen et al., 2020), product and process innovations (Anzola-Román et al., 2018; Ozturk & Ozen, 2021).

MI generally arises without an associated infrastructure (Vaccaro et al., 2012), being systemic and difficult to observe and replicate (Su and Baird, 2018). Accordingly to the RBV, these characteristics may enable strategic change in management practices, processes and structures in order to foster the development of the ability to perform a technical function (Ozturk and Ozen, 2021).

In previous works, Damanpour, Walker and Avellaneda (2009) and Damanpour and Aravind (2012) developed a theoretical model in which MI is combined with service innovation (SI) and technological process innovation, indicating that there are strong relationships between MI and the other two innovation types on OP. The firms that change management practices are better positioned to develop new products and processes (Ozturk and Ozen, 2021).

Empirical evidence has emphasised that MI may continue to support technological process innovation (Bas et al., 2015; Ozturk & Ozen, 2021), which is primarily associated with information technology in services organisations (Damanpour et al., 2009). In this setting, Chen, Wang and Huang (2020) suggest that MI enables to achieve superior performance goals by leveraging the information and communication technologies of the firms. However, the researchers have not examined the role of the use of technology in explaining the relationship between MI and OP in services firms.

In addition, SI in professional services firms may be a mediating variable, given that the management capabilities are incorporated into customers services (Bello et al., 2016). Also, regarding the relationship between MI and OP, the joint introduction of technological and management innovations is positive up to a certain point (Hervas-Oliver, Sempere-Ripoll, Boronat-Moll, et al., 2018). Thus, further research is required to explore if implementing SI will mediate the relationship between organisational factors and OP (Singh et al., 2020). In doing so, this study aims to investigate the effects of MI on OP by analysing the mediating impact of technology (TEC) use and SI in a peripheral country.

Furthermore, most existing literature has focused on MI in developed and industrialised countries (Montalván-Burbano et al., 2020), which is low in other countries (Khosravi et al., 2019). In European peripheral regions, innovating requires

more effort than in central regions, whose environments are more conducive to developing new knowledge and technologies due to their greater organisational and institutional density (Martínez-Román et al., 2020). Specifically the business adopt MI to answer a precise problem or to create new opportunities (Gebauer et al., 2017). Accordingly, undertaking strategic changes in management practices, processes, and organisational structures is particularly important in peripheral countries' firms, therefore, there is still a conceptual debate about the consequences of MI from the perspective of these firms.

In sum, this study develops a set of arguments about the effect of MI that, combined with other innovation activities, will allow services firms to make an important contribution to their OP. This study uses a sample of 163 Portuguese KIBS to test the hypotheses.

In intensive knowledge firms, TEC aims to increase efficiency, minimising work replication and the standardisation procedures involving some degree of repetition (Michalakopoulou et al., 2021). TEC improves the effectiveness and efficiency of innovation in the provision of services and it contributes to innovation in customer interaction (Ryu and Lee, 2016). KIBS implement technological systems in their continuously changing internal organisation and customer interactions (Miles et al., 2021). Consequently, in a sector where the human factor is particularly significant (Sheehan et al., 2021), managers should emphasise the development of MI, which may improve the capacity of organisations to adopt new technologies (Khosravi et al., 2019).

KIBS' services are characterised by the combination of tacit versus explicit knowledge (Gallouj et al., 2015), but they mainly exchange tacit knowledge with customers (Landry et al., 2012; Santos-Vijande et al., 2021; Yacoub et al., 2020). The shared knowledge should be integrated into the firm (Malik et al., 2020) and MI influences firms' exchange and application of tacit and explicit knowledge (Magnier-Watanabe and Benton, 2017), thus, in knowledge-intensive activities, the introduction of MI will probably favour SI.

The objective of this study is to analyse the direct and indirect influence of MI on the performance of KIBS. Specifically, this study aims to answer the following research questions:

1. Is there a direct influence of MI on the OP?

2. Does TEC use mediate the relationship between MI and OP?

3. Does the use of SI mediate the relationship between MI and OP?

This article is structured as follows: first, the literature review is performed, the hypotheses are formulated, and the research framework is developed. Subsequently, the research methodology is explained. Then the data are analysed, the results are reported, followed by the discussion, conclusion and practical implications. Finally, the limitations and future lines of research are presented.

5.2. Literature review, hypothesis development and research framework

5.2.1. Management innovation and organisational performance

MI is defined as the invention and implementation of management practices, processes, structures or techniques intended to further organisational goals (Birkinshaw et al., 2008). It focuses on what managers do, how they do it, as well as the organisational context in which the work is performed (Vaccaro et al., 2012).

In light of the rational perspective, MI is deliberately introduced by key individuals within organisations to improve their performance (Vaccaro et al., 2012; Walker et al., 2015). This approach assumes that new practices, processes or structures are intended to promote the organisation's objectives (Janka et al., 2020), which may be financial (*e.g.* labour and/or organisational productivity, sales growth) and/or non-financial (*e.g.* employee satisfaction) (Birkinshaw et al., 2008; Walker et al., 2015).

Although the connection between MI and business performance may seem obvious, the results are inconsistent; thus, more research is required (Magnier-Watanabe and Benton, 2017), particularly in the services sector (González-Blanco et al., 2019). The new management practices vary between sectors (Mol and Birkinshaw, 2009). Walker *et al.* (2015) found that the positive impact of MI on economic/non-economic performance is weaker in services than in manufacturing. Nieves (2016) states that MI does not influence the financial performance of services businesses. According to Magnier-Watanabe and Benton (2017), there was no direct effect of MI on the performance of Japanese firms in manufacturing and services. In Polish commercial, manufacturing and services firms, Kraśnicka *et al.* (2018) found a weak positive effect between MI and financial performance. According to Mol and Birkinshaw (2009), introducing new management practices is positively associated with increased manufacturing, construction and services productivity. Zhang *et al.* (2019) reported that integrating various management practices in new ways helps the organisation

achieve high performance in manufacturing, construction and services. Le Anh et al. (2021) concluded that MI significantly influences OP in audit firms.

We can conclude that the results of the effect of MI on performance are inconsistent, nonetheless, this type of innovation is intended to achieve organisational goals, so, particularly in KIBS, the following hypothesis is proposed:

H1. MI has a direct positive and significant effect on OP.

5.2.2. The mediating role of technology

Based on the RBV by Barney (1991), firms with valuable and rare organisational resources are often innovative because they are able to create and/or implement strategies. In services organisations, in a strategic combinative adoption of innovation types, the technological process innovations are associated with information technology (Damanpour et al., 2009), which represents strategic leverage for innovating and differentiating from competitors (Chen et al., 2020; Ribeiro-Navarrete et al., 2021; Tomo et al., 2020).

In addition, in KIBS, although TEC has been considered a critical factor in innovation efforts (Miles et al., 1995; Ribeiro-Navarrete et al., 2021), a considerable body of research still emphasises process innovation (Amara et al., 2016; Bumberová & Milichovskỳ, 2020; Karlsson & Tavassoli, 2016). This study seeks to expand the previous innovation research by including TEC use.

MI constitutes as a complement to the implementation of new technology (Hervas-Oliver, Sempere-Ripoll, Boronat-Moll, et al., 2018). Therefore, MI improves the firm's existing routines and operations and allows it to acquire, exploit, and assimilate new technologies and capabilities in technologically based innovation activities (Chen et al., 2020). Khosravi, Newton and Rezvani (2019) and c assert that MI can provide unique work practices and organisational structures that can enhance the ability of organisations to adopt new technologies. According to Michalakopoulou *et al.* (2021) technology facilitates modernisation, simplification, and more flexible channels of internal and external communication and interaction. The adoption of MI, such as the decentralised organisational structure, motivates lower-level employees to be more involved in the decisions and actions to implement new technologies, facilitating their integration and diffusion in the firm (Giotopoulos et al., 2017). The information and communication technology systems support MI functions such as planning, control, coordination, and decision-making (Gemünden et al., 2018). For example, computer

communication facilitates information processing of the decentralised decision structure (Giotopoulos et al., 2017). The following hypothesis is, then, proposed:

H2. MI has a positive and significant influence on the use of TEC.

In the influence of TEC in the OP, positive and differentiated effects are found (Chae et al., 2018; Mamonov & Peterson, 2021). Using information and communication technologies leads to performance in learning, growth and internal process (Wu and Chen, 2014). The significant changes in techniques, equipment and/or software can reduce unit production or service costs (Karlsson and Tavassoli, 2016). The introduction of TEC, therefore, reduces knowledge costs in specialised knowledge services firms (Antonelli & Tubiana, 2020). At the same time, using information and communication technologies contributes to a better performance than competitors, to high levels of efficiency in operations and productivity (Yunis et al., 2018).

New technologies have been relevant in KIBS (Miles et al., 1995). In this context, digitalisation contributes to their financial performance (Ribeiro-Navarrete et al., 2021). It is believed that the adoption of TEC only is important if it leads to performance improvements (Yunis et al., 2018), so the following hypothesis is proposed:

H3. TEC use has a positive and significant influence on OP.

The mediating role of TEC use in the relationship between the MI and OP explains how MI is ultimately translated into performance in the innovativeness of the firms (Chen et al., 2020). Drawing on Daft (1978), MI begins at the top of the hierarchy and propagates in the organisation; thus, top managers have the overall vision of the firm's performance and can provide the appropriate conditions for using the TEC innovation. Managers seek to align the resources with business objectives, that is, to allocate TEC in achieving the firm’s objectives, explicitly linking it to the processes or changes of the business model (Tidd and Thuriaux-Alemán, 2016). According to Damanpour and Aravind (2012), adopting new technologies' potential and benefits are obtained when they operate harmoniously with the new processes and management systems. Effective information technology systems and management processes that reward and encourage innovative thinking lead to sales of new services (Bourke et al., 2020). Therefore, the mediating role of TEC use in the relationship between MI and performance in KIBS is analysed:

H4. TEC use has a mediating effect on the relationship between MI and OP.

5.2.3. The mediating role of service innovation

SI consists of creating a unique service through improvements in existing services or developing a completely different service of high value to customers (Hsieh and Chou, 2018). Some authors have addressed the role of MI in creating product innovation (Anzola-Román et al., 2018; Nieves, 2016; Ozturk and Ozen, 2021). Following the current literature, MI increases flexibility and creativity, facilitating technological innovation development (Anzola-Román et al., 2018). This view, however, lacks more research (Khosravi et al., 2019).

In KIBS, innovation outcomes include SI (newness to the firm and market) and service modifications (Bumberová and Milichovskỳ, 2020), but the strategies of innovation are risky (Kahn and Candi, 2021). Employees' degree of risk aversion will influence the implementation of SI (Bello et al., 2016; Feng et al., 2021). However, human resources management practices, such as training and remuneration management processes, adjusted to create new ideas, may encourage workers to innovate (Fu et al., 2015; Mazzei et al., 2016). In KIBS, the implementation of organisational structures increases when perceived adverse conditions regarding the access to skilled employees to develop SI (Bumberová & Milichovskỳ, 2020).

Firms can develop systematic coding and routing systems for the new service ideas by adapting the different organisational SI development structures (Chung and Tseng, 2019). In turn, professional business services are, by nature, tacit services (Landry et al., 2012; Santos-Vijande et al., 2021; Yacoub et al., 2020) and dependent on the flow of knowledge (Chung and Tseng, 2019). Firms use this knowledge to feed the introduction of SI (Antonelli & Tubiana, 2020), thus, managers can encourage the exchange of knowledge and facilitate communication flows to better match the needs of the new service project and the resources available in the firm (Santos-Vijande et al., 2021).

In addition, in services firms, SI is easily reproduced by competitors (Feng et al., 2021; Prajogo and Oke, 2016). Hence, implementing MI provides access to exclusive knowledge of the firm, reducing the risk of imitation and increasing the possibility of developing innovations (Ozturk and Ozen, 2021). The following hypothesis is, therefore, proposed:

H5. MI has a positive and significant influence on SI.

This study also intends to investigate the effect of SI on OP. Previous studies have shown the importance of SI in achieving higher performance levels (Hsieh & Chou,

2018; Kahn & Candi, 2021; Taghizadeh et al., 2020). However, there is a risk that competitors easily imitate SI (Prajogo and Oke, 2016); therefore, improving the performance of SI isn't so obvious (Feng et al., 2021).

In KIBS, the results of innovation, such as new knowledge, processes and methods (Li et al., 2019), are often intangible (Amara et al., 2016), and it is still necessary to meet the customers' expectations (Biege et al., 2013; Jin & Choi, 2019), so the performance may not be direct (Chung and Tseng, 2019). However, from a business perspective, it makes little sense to develop a service without considering its financial and non-financial results (Feng et al., 2021; Gustafsson et al., 2020); therefore, this study proposes the existence of a direct positive relationship.

H6. SI has a positive and significant influence on OP.

Furthermore, this study intends to explore the mediating role of SI on the MI and OP relationship. Nieves (2016) noted that, in hotel firms, product innovation significantly mediated MI and financial performance. Bello *et al.* (2016) find that the mediating role of SI capability between management capabilities and financial performance indicates that management is crucial to develop competitive services in professional services firms. Cheng and Krumwiede (2012) suggested that a radical SI is a partial mediator between cross-functional coordination and performance. Therefore, MI activities provide a stimulus for creating new services that, in turn, affect OP.

As noted before, MI is new knowledge and processes that can be explicit or tacit (Magnier-Watanabe & Benton, 2017), hence, MI is particularly appropriate for the KIBS and it becomes a source of SI (Chung & Tseng, 2019; Jordá-Borrell et al., 2015) in the firms' innovation strategy. In other words, aligning innovation in management practices, processes and structures with knowledge-based service (Antonelli & Tubiana, 2020) enhanced the OP of KIBS firms. Following these lines, the following hypothesis is proposed in the context of KIBS firms.

H7. SI has a mediating effect on the relationship between MI and OP.

Taking into account the literature review, the research questions and hypotheses previously formulated, the research model, presented in Figure 5.1, is proposed as follows.

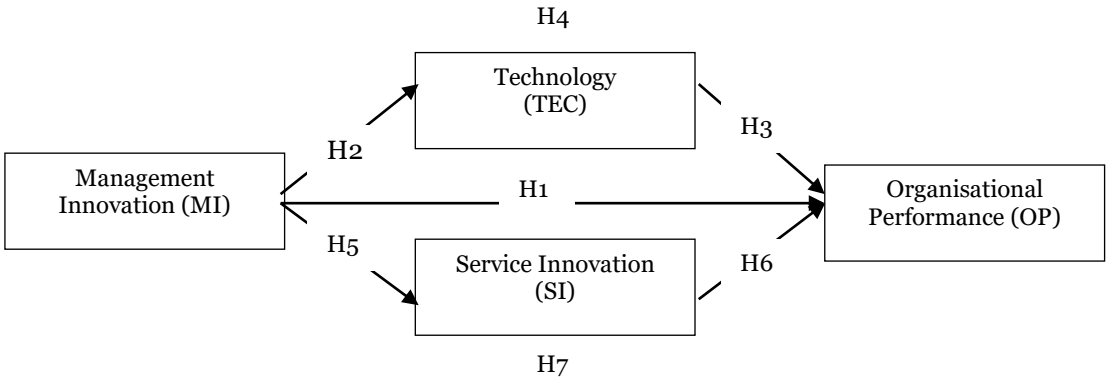

Figure 5.1 - Research model with hypothesis

5.3.Methodology

5.3.1. Sample and data collection

The empirical research was completed from a database of Portuguese KIBS using questionnaires. A stratified random sampling procedure was applied to the study population by subsectors of technology KIBS and professional KIBS (Miles et al., 1995). A total of 741 firms were contacted, and those that initially refused to participate in the study were replaced by others with the same characteristics, such as those perrtaining to the Statistical classification of economic activities in the European Community, and size. The time interval of data collection was from February to August 2019. Valid responses were obtained from 163 firms (response rate of 22%).

Common method variance was controlled by procedural and statistical remedies (Podsakoff et al., 2012). First, the anonymity and confidentiality of the respondents were guaranteed; it was emphasised that there were no right or wrong answers. Second, to check that the study had no problems with common method bias in PLS-SEM, a full collinearity test was fulfilled under PLS-SEM (Kock, 2015; Kock & Lynn, 2012). It was confirmed that all Variance Inflation Factors for all the latent variables in the structural model were lower than 3.3. The model could, then, be considered free of common method bias (Kock, 2015).

5.3.2. Measures

This research used an independent variable, “MI”, one dependent variable named OP, and two mediators, TEC use and SI. For the independent variable, ‘MI’, it was decided to use a six item scale developed by Vaccaro *et al.* (2012). Five items from the prior study by Ryu & Lee, (2016) were adopted to measure TEC use and, to measure SI, seven items were selected, as used by Avlonitis *et al.* (2001), Cheng and Krumwiede (2012)

and Hsu *et al.* (2018). As this study aims to measure the OP from both financial and non-financial perspectives, eleven items were used from Avlonitis *et al.* (2001), Carmona-Lavado *et al.* (2013) and Storey *et al.* (2016). In this regard, a five-point *Likert* scale ranged from 'strongly disagree' (1) to 'strongly agree' (5).

5.3.3. Data analysis

Data analysis used the SmartPLS 3.3.6 (Ringle et al., 2015) software for modelling through SEM, using the *Partial Least Squares* (PLS) method (PLS-SEM). There were two reasons for taking this approach: first, the structural model of the study is complex with multiple mediations (Hair et al., 2019; Nitzl et al., 2016); and second, following exploratory research, this study tends to probe for possible explanations and hypotheses (Henseler, 2018). Finally, the methodological guidelines suggested by Hair et al. (2017) and Ringle et al. (2020) were followed to assess the results of the measurement and the structural models.

5.4. Results

5.4.1. Measurement model assessment

As in the model under study, the indicators are reflective, and the following should be analysed: (1) the reliability of the indicators; (2) internal consistency; (3) convergent validity; and (4) discriminant validity (Hair et al., 2017; Ringle et al., 2020). In the model, 29 indicators were initially included.

In the analysis of the measurement model, three SIs indicators with low external factor loadings were removed (Hair et al., 2017), and the model was re-run, with all factor loadings above 0.67. Internal consistency is analysed through Cronbach's alpha and composite reliability (CR), and both measures should be higher than 0.70 and lower than 0.95. In order to assess the convergent validity, the external loadings of the indicators and Average Variance Extracted (AVE) are considered (Hair et al., 2017). AVE with a value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators (Chin, 1998). The results in Table 5.1 show the internal consistency and convergent validity.

Table 5.1 - Convergent validity and reliability

Construct	Item	Loading	Cronbach's alpha	CR	AVE
MI	MI1	0.749	0.823	0.870	0.529
	MI2	0.693			
	MI3	0.788			
	MI4	0.681			

Construct	Item	Loading	Cronbach's alpha	CR	AVE
	MI5	0.767			
	MI6	0.679			
TEC	TEC1	0.698	0.848	0.892	0.624
	TEC2	0.827			
	TEC3	0.826			
	TEC4	0.824			
	TEC5	0.767			
SI	SI1	0.710	0.761	0.845	0.578
	SI2	0.796			
	SI3	0.720			
	SI4	0.837			
OP	OP1	0.694	0.919	0.931	0.550
	OP2	0.725			
	OP3	0.750			
	OP4	0.768			
	OP5	0.744			
	OP6	0.727			
	OP7	0.778			
	OP8	0.755			
	OP9	0.728			
	OP10	0.721			
	OP11	0.767			

Discriminant validity was assessed with the Heterotrait-monotrait (HTMT) ratio, with threshold values below 0.90 (Henseler et al., 2015). All values are below 0.90, attesting to the discriminant validity of the variables included (Table 5.2).

Table 5.2 - Heterotrait-Monotrait Ratio

	Original sample (O)	Average sample (M)	2.5%	97.5%
MI -> OP	0.448	0.453	0.295	0.613
SI -> OP	0.443	0.454	0.292	0.621
SI -> MI	0.352	0.368	0.227	0.530
TEC -> OP	0.541	0.540	0.385	0.679
TEC -> MI	0.513	0.513	0.342	0.681
TEC -> SI	0.325	0.341	0.195	0.501

5.4.2. Structural model assessment

In evaluating the structural model (Table 3), the estimates of the path coefficient, its significance, the effect sizes (f^2), and the coefficient of determination (R^2) should be analysed (Benitez et al., 2020). The f^2 values for the hypothesised relationships range from 0.040 to 0.240 (small to medium) (J. Cohen, 1988). The R^2 was calculated, and all three variables together explained 35% of the variance for the dependent variable OP. In the structural model, Q^2 values larger than zero for a specific reflective endogenous latent variable indicate the path model's predictive relevance for a particular dependent construct (Hair et al., 2017). The results show that there is significance in the prediction of the constructs. Furthermore, the model fit was assessed using standardised root mean square residual (SRMR) (Henseler et al., 2014). With a cutoff value close to 0.08 for SRMR, there is a relatively good fit between the hypothesised model and the observed data (Hu and Bentler, 1998), but this threshold is likely too low for PLS-SEM (Hair et al., 2017). In this study, the value of SRMR was 0.085.

The direct effects of the model were analysed (Table 5.3). To assess the significance of the effects, the *bootstrapping* technique was used with 10,000 samples (Streukens and Leroi-Werelds, 2016). H1 assesses whether MI has a positive and significant effect on OP. The results reveal that MI positively and significantly influences OP (β=0.182, t=2.260, p<0.05), supporting H1. MI is found to impact TEC utilisation substantially (β=0.440, t=6.063, p<0.001), and SI (β=0.294, t=4.104, p<0.001), supporting H2 and H5. The results reveal a significant impact of TEC use (β=0.349, t=4.989, p<0.001) and SI (β=0.260, t=3.223, p=0.001) on OP, supporting H3 and H6, with TEC use exerting a stronger influence on OP. R^2 shows that MI, TEC use, and SI explain 35,5% of the variance in KIBS' performance. The use of TEC in KIBS firms was more important in their performance than the SI. The contribution of MI was greater in the use of TEC, next in SI, and lastly in the performance of the firms.

Table 5.3 - Results of the coefficient of structural model relations (direct effects)

Hypotheses	Coefficient	SD	*t*-value	*p*-value	[2.5%; 97.5%]	Decision
H1: MI->OP	0.182	0.080	2.260	0.024	[0.018; 0.336]	Supported
H2: MI->TEC	0.440	0.073	6.063	0.000	[0.303; 0.588]	Supported
H3: TEC->OP	0.349	0.070	4.989	0.000	[0.212; 0.483]	Supported
H5: MI->SI	0.294	0.072	4.104	0.000	[0.164; 0.444]	Supported
H6: SI->OP	0.260	0.081	3.223	0.001	[0.108; 0.425]	Supported
R^2 TEC=0.194	Q^2 TEC=0.113					
R^2 IS=0.086	Q^2 IS=0.044					
R^2 OP=0.355	Q^2 OP=0.173					

Hypotheses	Coefficient	SD	*t*-value	*p*-value	[2.5%; 97.5%]	Decision
f^2 effect size						
H1: MI->OP	0.040					
H2: MI->TEC	0.240					
H3: TEC->OP	0.149					
H5: MI->SI	0.095					
H6: SI->OP	0.094					

Note: SD: Standard Deviation.

5.4.3. PLSpredict in model assessment

Mediation analysis could play an important role in prediction (Shmueli et al., 2016). Shmueli et al. (2016) developed PLSpredict to evaluate the predictive power of the model outside the sample. A small divergence between the real and the predicted values of the cases outside the sample suggests that the model has high predictive power (Shmueli et al., 2019). Using PLSpredict, the relevant criteria are the number of sub-samples (folds), the number of repetitions, and the selection of appropriate predictive statistics to quantify the degree of error of the prevision (Shmueli et al., 2019). In general, it is recommended that the minimum size of the retention sample be n=30 (Hair et al., 2020). With a sample of 163 firms, it was divided into five sub-samples (k=5), satisfying the minimum sample of n=30. The number of repetitions is r=10 (Shmueli et al., 2019). When the distribution of the prediction errors is symmetrical, which is the case in this study, root mean squared error RMSE should be used, and for items with $Q^2_{\_predict}$>0, the RMSE values should be compared with the linear regression model (LM) (Shmueli et al., 2019). As most indicators in PLS-SEM analysis produces smaller prevision errors compared to the linear regression model LM, this indicates a medium predictive power of the model (Hair et al., 2019; Shmueli et al., 2019) (Table 5.4). This model is efficient in explaining the OP of KIBS.

Table 5.4 - PLSpredict assessment of manifest variables

	PLS-SEM		LM	PLS-LM
Iten	RMSE	Q^2_predict	RMSE	RMSE
OP1	0.822	0.146	0.847	-0.025
OP2	0.905	0.085	0.928	-0.023
OP3	1.006	0.075	1.036	-0.03
OP4	0.937	0.052	0.939	-0.002
OP5	0.933	0.050	0.929	0.004
OP6	0.927	0.020	0.962	-0.035
OP7	0.808	0.097	0.836	-0.028
OP8	0.864	0.066	0.905	-0.041
OP9	0.928	0.044	0.964	-0.036
OP10	0.918	0.088	0.95	-0.032

	PLS-SEM		LM	PLS-LM
Iten	**RMSE**	**Q²_predict**	**RMSE**	**RMSE**
OP11	0.81	0.125	0.807	0.003
SI1	1.036	0.015	1.075	-0.039
SI2	1.06	0.031	1.072	-0.012
SI3	0.925	0.049	0.957	-0.032
SI4	1.038	0.051	1.042	-0.004
TEC1	0.847	0.149	0.858	-0.011
TEC2	0.831	0.065	0.851	-0.02
TEC3	0.74	0.136	0.781	-0.041
TEC4	0.735	0.089	0.734	0.001
TEC5	0.887	0.116	0.939	-0.052

5.4.4. Mediation analysis

In the analysis of the mediation of TEC use and SI, the methods of Preacher and Hayes (2008) were followed, and the *p-values* of the specific indirect effects were obtained using the *bootstrapping* technique with 10,000 samples (Streukens and Leroi-Werelds, 2016). The mediating role of TEC use and SI was assessed. The results (Table 5.5) revealed partially significant mediating roles of TEC use (β=0.153, t=3.496, p<0.001) and SI (β=0.077, t=2.191, p<0.05), supporting H4 and H7. In this study, TEC use and SI partially mediated the relationship between MI and OP. To further substantiate the type of partial mediation, the product of the direct and indirect effects was computed (Nitzl et al., 2016). Since the direct and indirect effects are both positive, the sign of their product is also positive (TEC use: 0.182*0.153=0.03; SI: 0.182*0.077=0.01). Hence, it was concluded that TEC use and SI represent complementary mediation of the relationship from MI to OP.

Table 5.5 - Mediation analysis

Total effect	**Direct effect**	**Specific indirect effects**					
β	***β***		***B***	***SD***	***t-value***	**[2.5%; 97.5%]**	**Decision**
MI-OP: 0.412***	MI-OP: 0.182**	H4: MI>TEC>OP	0.153***	[0.044]	3.496	[0.081; 0.252]	Supported
		H7: MI->SI->OP	0.077**	[0.035]	2.191	[0.026; 0.160]	Supported

Note: SD: Standard Deviation. *** p<0.001, ** p<0.01 (two-sided test)

5.5. Discussion, conclusions, implications, limitations and future research lines

5.5.1. Discussion

In this research, the objective was to analyse MI's direct and indirect influence on the performance of KIBS firms in a peripheral country. This study departs from previous studies focusing on developed and industrialised countries, such as the United States, China, United Kingdom (Montalván-Burbano et al., 2020); our findings assume that the benefits of MI on OP also account for a peripheral country. The results show that, in services firms, MI contributes to OP. In terms of the application of new practices and management processes or the adaptation of organisational structures, managers adopt MI to ensure that the employees' decisions and behaviour are consistent with the organisation's objectives (Janka et al., 2020).

The results of this research validate a positive and significant influence of MI on the use of TEC in KIBS. Overall, in this study, it is established that, in the light of RBV, performance is induced by the synergy of internal resources (Barney, 1991), which are managerial and technological knowledge. Similarly, findings of the current study, performance in KIBS firms can result from the influence of management practices and processes and organisational structures on the use of TEC (*e.g.* Giotopoulos *et al.*, 2017; Michalakopoulou *et al.*, 2021). Businesses that dedicate resources to management practices or new forms of organisation are in a better position to use new technologies effectively.

The results of this research validate TEC's positive and significant influence on OP. KIBS has always been based on technology or technologies' users (Miles et al., 1995), and at present, KIBS digitalisation plays a significant role in its performance (Ribeiro-Navarrete et al., 2021). Karlsson and Tavassoli (2016) and Antonelli and Tubiana (2020) assure that implementing process innovation strategies based on technologies that lead to cost reduction contributes to OP.

Aligned with the view of organisations as socio-technical systems (Trist and Bamforth, 1951), firms develop MI and use TEC to achieve organisational goals. In this context, the results of this study provide empirical insight into the indirect influence of MI on OP through the partial mediation of TEC use. One possible explanation for this finding concerns the different types of firms and the role of TEC use. It is to be noted that different types of firms may have significant differences in applications of TEC (*e.g.* audit sector (Le Anh et al., 2021), legal services firms (Michalakopoulou et al., 2021)).

The effect of MI on SI was confirmed in this study, corroborating the results from Nieves (2016) on hotel firms' product innovation. Nieves (2016) suggests that MI activities favour the development of new knowledge. This seems logical since, within KIBS, the knowledge characterises the services (Chung & Tseng, 2019; Jordá-Borrell et al., 2015). KIBS depend on tacit and complex knowledge (Yacoub et al., 2020), and managers develop knowledge management systems and practices that ensure knowledge transfer between the different organisational development structures of the new services (Jaakkola and Hallin, 2018). Still, the management processes of remuneration adjusted to the creation of new ideas encourage workers to innovate, assuming their share of responsibility for the risks inherent in developing new ideas (Mazzei et al., 2016).

Furthermore, the results show that SI significantly influences OP. The SI of KIBS is based on knowledge outputs, which in turn are based on knowledge inputs such as MI (Magnier-Watanabe and Benton, 2017). Prajogo and Oke (2016) state that a firm that introduces innovations to increase its current services will be able to attract more customers, resulting in a revenue increase. KIBS incorporate knowledge in services development (Chung and Tseng, 2019) to serve their customers, and it is acceptable to get a positive effect on the OP.

The model developed shows a significant positive and indirect effect of MI on OP through SI and this study empirically shows that, in KIBS firms, innovations introduced in management practices, processes, and structures favour SI, with the potential to influence OP. The comparison of this result with the findings by Nieves (2016), also in this study, shows MI enables the creation of SI, which indirectly affects OP's achievement. In other words, MI is new knowledge that provides a stimulus for creating knowledge-based services that, in turn, affects OP.

5.5.2. Conclusion

The direct link between MI and OP in services sectors has not been examined in KIBS in a peripheral country, nor the mediating roles of TEC use and SI have been analysed.

The model developed shows the existence of two significant indirect relationships. MI indirectly influences OP through its effect on TEC use and on SI. TEC use and SI serve as complementary mediators in the relationship between MI and OP. MI increase OP directly but also TEC use and SI, leading to OP. Hence, in KIBS, some MI effects on OP are explained by TEC use and SI.

This study draws attention to the relevance of MI in driving the performance of KIBS, highlighting that the use of TEC and SI facilitates this contribution. In KIBS, innovations in management practices, processes and organisational structures stimulate the creation of new services and TEC use, which, in turn, influence OP.

5.5.3. Practical implications

The results of this study exemplify that, in KIBS firms, management practices and processes and organisational structures promote the use of TEC as also the SI, leading to OP. Managers of KIBS firms should pay attention to the development of MI in firms or in various departments because this significantly stimulates the use of TEC, the development of SI, and contributes to OP.

This study provides suggestions for policymakers in peripheral countries to manage MI. They should develop policies to ease implementation management practices, processes and structures undertaken in organisations. Furthermore, this knowledge can provide policymakers with an important indicator for improving the design of the innovation policies to promote innovation in knowledge-intensive firms, especially when the coexistence of MI, TEC and SI exists. In other words, the importance of promoting MI in knowledge-intensive firms triggers implementing different types of innovation and improves OP.

5.5.4. Limitations and future lines of research

There are limitations to this study, which consequently suggest potential future research directions. The firm-level data survey in this study was employed in a moderate innovator country. As such, the findings are not easily generalizable to other contexts. Further research into the mediating roles of TEC and SI in service performance in other moderate innovator countries may be fruitful. For future research, a qualitative research design and applying multiple case study strategies to explore the role of MI in KIBS performance.

Chapter 6 – The impact of technology on service innovation and firm performance: the mediating role of management innovation

6.1. Introduction

Professional services firms engage in continuous innovation, aiming to differentiate themselves from competitors (Gardner & Bryson, 2021). In this respect, technologies can be one main driver of continuous developments (Ringberg et al., 2019). A key gap in the literature is the lack of consideration of the joint effects of organisational and technology-related factors on innovation (Mamonov & Peterson, 2021). Accordingly, if well managed and supported, technology innovation can contribute to higher levels of economic output and help create and develop new goods and services (Yunis et al., 2018).

Research typically investigates innovative processes from either a technology perspective or a management mindset, but rarely both (Ringberg et al., 2019). Most previous studies have focused on technological innovations operationalised through new processes and/or new products, with less emphasis on management innovation (Su & Baird, 2018). The few scholars (e.g., Arranz et al. (2019) Černe et al. (2015) Camisón & López (2010)) who have empirically assessed the mediate effect of management innovation on firm performance have typically looked at the manufacturing sector. The considerable heterogeneity of operations across services complicates the study of how service firms innovate and capture the resulting value (Desyllas et al., 2018). In this way, as management innovation involves a complex type of change in how management work is carried out, it enables service firms to access knowledge unique to the firm, thereby increasing opportunities to develop new products and processes (Ozturk & Ozen, 2021).

In a holistic context, this study integrates the impact of technology on service innovation and firm performance, taking into account the role of management innovation in these relationships. Therefore, the objective of this study is to analyse if and how, the firm's management innovation influences the results in innovation and firms performance. With the purpose above, the research question of this study is as follows: to what extent does management innovation influence the relationships between the use of technology and service innovation and firm performance?

The theoretical frameworks are the resource-based view (RBV) and dynamic capabilities (DC). The RBV conceives the highest levels of performance in the firm, resulting from the efficient exploitation of the advantages of its human, organisational and physical capital resources (Barney, 1991). The DC approach (Teece et al., 1997) guides managers toward creating distinctive advantages difficult for customers and competitors to imitate. In this integrative view of management innovation, it is argued that this type of innovation mediates resources and firm innovation and performance. In other words, resources work through management innovation in management practices, processes and structures to help achieve innovation and performance in service firms. Using this integrated view, a better understanding of the complementarities of management innovation and technological innovation on innovation and performance in the service sector is advanced.

In response to calls to develop a far greater understanding of how the implementation of new administrative practices, organisational structures, or management techniques affect in tandem technological innovation capabilities and firm performance (Henao-Garcia & Cardona Montoya, 2021), this study used a sample of knowledge-intensive business service firms (KIBS) located in Portugal.

This article is structured as follows: first, the literature review is performed, the hypotheses are formulated, and the research framework is developed. Subsequently, the research methodology is explained. Then the data are analysed, the results are reported, followed by the discussion, conclusion and practical implications. Finally, the limitations and future lines of research are presented.

6.2. Literature review on innovation complementarity

Empirical evidence suggests innovation is critical in enhancing service firm performance (González-Blanco et al., 2019; Le Anh et al., 2021) and ideed it takes a multitude of types (Kahn, 2018). Hence, service innovation is characterised by developing new or significantly improved products/services (Zieba et al., 2017).

Alternatively, process innovation in services refers to the implementation of new or improved procedures in service delivery (applied to human resources, working methods, equipment, or combinations thereof) (Taques et al., 2021). Firms carry out process innovation, such as improving data analysis methods, customer communication and service delivery (Li et al., 2020). Process innovations in firms can be technological process innovations (associated with a technical system) or

management process innovations (associated with a social system) (Damanpour & Aravind, 2012).

In this sense, technological process innovations are new elements introduced into a firm's service operation for rendering its services to clients (Damanpour et al., 2009) and they largely introduce machines in which new knowledge and technologies are incorporated (Karlsson & Tavassoli, 2016).

On the other hand, a management process innovation introduces new systemic practice, process, procedure or structure in an organisation to continuously stimulate and sustainably improve management (Janka et al., 2020). This type of innovation can occur in the organisation's structure, in new forms of management and work environments (Kahn, 2018). Management innovation changes the way managers do their jobs, e.g. managers set objectives and draw up plans; motivate and align staff efforts; coordinate and control; accumulate and allocate resources; acquire and apply knowledge; build and nurture relationships; identify and develop talented people; meet stakeholder requests (Hamel, 2006).

The research has found that firms tend to undertake certain innovation practices that are linked simultaneously. Garcia-Piqueres et al. (2020), using the Spanish Community Innovation Survey covering the period 2006-2014, found that one of the most commonly used innovation strategies is the combination of any process, management and marketing innovations in the presence of product innovation. The paper by Sakowski et al. (2019) exploits the Community Innovation Survey 2008, 2010 and 2012 and uses firm-level innovation data from 12 countries. They emphasised the correlation between management innovation and process and product innovations. Martin-Rios & Ciobanu (2019) observed that KIBS pursue complex innovation strategies in which combinations of product, process, management, and marketing innovations are complementary. These studies therefore show that management innovation is linked to other types of innovation.

Innovation is not an end unto itself (Cheng & Krumwiede, 2012), and can be transformed into performance via different channels (Rajapathirana & Hui, 2018). Complementarities in performance explore the effects on the performance of using different practices in combination (Ballot et al., 2015). The simultaneous adoption of different types of innovation could derive synergies to firms in the service sector (González-Blanco et al., 2019).

To this end, this study is based on the RBV and DC theories. This theoretical model supports the view that the highest performance levels are due to the efficient exploitation of the firm's resource advantages (Barney, 1991). Specifically, the DC approach guides managers toward creating distinctive, difficult-to-imitate advantages (Teece et al., 1997). KIBS can achieve a competitive advantage, using the resources and capabilities they possess, provided they are combined and integrated into processes that are difficult to imitate (Baia et al., 2020). The internal capabilities management and innovation capability improve the resources of the innovation process (Molden & Clausen, 2021). Similarly, management innovation as an ability for innovation and its complementary relationship with the firm's resources is highlighted (Arranz et al., 2019). In this regard, technology utilisation will produce results in conjunction with developing innovative capabilities. This study explores complementarities in innovation and performance, employing management innovation combinations with technology utilisation.

6.3. Theoretical background and hypotheses development

6.3.1. The use of technology and service innovation

Technology refers to an innovation process intended to acquire and employ sophisticated technologies to develop new products and services (Ryu & Lee, 2018). Technology can include using new information technology equipment, services and software (Taques et al., 2021). Technology can be used to develop new products and services (Ryu & Lee, 2018; Yunis et al., 2018) and it also possesses an antecedent role in encouraging and leveraging service innovation (Ryu & Lee, 2018). Therefore, technology adoption is inherently valuable to the extent that top management support facilitates its effect on service innovation (Hsu et al., 2018). When it is well managed and supported, the innovative use of technology helps to create and develop new services (Yunis et al., 2018). When technology is integrated into services, the services development and delivery change dramatically (Ryu & Lee, 2018).

Second, as Martínez-Román et al. (2020) state, the degree of novelty achieved in the development of the service is directly related to the firm's ability to adopt new technologies. For example, the computer-aided design enables the firm to develop innovation (Ortiz de Guinea & Raymond, 2020). Mainardes et al. (2017), in turn, have shown that computer technology positively affects non-routine analytical tasks, such as planning and research. Gallouj et al. (2015) asserted that technologies, such as cloud services, mobile internet, and social networks, encourage open service innovations and

reshape the way knowledge is created. Yunis et al. (2018) stress that the innovative use of technology differentiates competitive from non-competitive firms.

In term of KIBS, they particularly emerged alongside an interest in service innovation (Miles et al., 2018). In technology-driven KIBS, the technological charge plays a vital role in service production. Li et al. (2020) found that these firms prefer exploiting existing technologies as an efficient way of launching new services. Particularly in KIBS, Amara et al. (2016) infered that the number of advanced technologies used is significant and positively affects product innovation. Pina & Tether (2016) implied that information technology use was associated with product/service innovation in the KIBS knowledge bases. Thus, the following hypothesis is suggested:

H1. The use of technology positively and significantly influences service innovation.

6.3.2. The use of technology and firm performance

Technology contributes to different levels of impact on business, depending on the firm sector (Chae et al., 2018). In this sense, several authors have shown the impact of technology on firm performance. Yunis et al. (2018), in the non-manufacturing sector, found that innovative use of information and communication technologies contributes to better firm performance. Studying the role of technology in service innovation, Ryu & Lee (2018) concluded that technology indirectly influences non-financial firm performance through service innovation. Jordá-Borrell et al. (2015) deduced that technology alone is important in KIBS, namely in modernising its image and increasing added value. The study by Ribeiro-Navarrete et al. (2021) found that the use of new digital tools for business purposes can improve the financial performance of KIBS. Applied technology will be relevant if it effectively improves firm performance. Hence, the following hypothesis is possible:

H2. The use of technology positively and significantly influences business performance.

6.3.3. The use of technology and management innovation

Technology-driven innovation is inherently a socio-technical phenomenon (Mamonov & Peterson, 2021). Decision-making regarding the organisation of structures and processes, planning and control can be supported by information and communication technology systems (Gemünden et al., 2018). The new technology's restrictions or possibilities influence managers' decision-making regarding changes in management processes, practices and organisational structure (Alexiev et al., 2018). For example, technology improves the ability of firm managers to access and process more

information from multiple sources and likewise make more decisions, which in turn enables to implement the appropriate organisational structures (Martin & Bachrach, 2018). Thus, in developing management innovation, the systems and routines of firms' information technology systems are relevant (Černe et al., 2013). Interestingly, firms with low investment in technology exhibit low effects of management innovation (Hervas-Oliver et al., 2015). Therefore, a direct positive relationship between the use of technology and management innovation is suggested.

H3. The use of technology positively and significantly influences management innovation.

By adopting new technologies, business leaders can simultaneously adopt new management strategies that foster innovation (Sun et al., 2018). In implementing service innovation, the firm could apply technology to integrate knowledge (Hsieh & Chou, 2018). The use of information technology allows individual knowledge to become a collective and integrated system (Nieves & Osorio, 2018). Thus, managers may encourage the exchange of the necessary information and facilitate communication flows to better match the needs of the new service project and the resources available in the firm (Santos-Vijande et al., 2021). In particular, professional business services can be regarded as tacit services since they are delivered through interpersonal interactions based on the provider's tacit knowledge (Santos-Vijande et al., 2021). Jiang & Xu (2020) stipulate that managers should focus on modifying the reward system to motivate the occurrence of tacit knowledge-sharing behaviour. Management innovation initiatives must support and corroborate tacit and/or knowledge-creation activities to enable the creation of pertinent knowledge (Magnier-Watanabe & Benton, 2017) for innovation. When combined with technology activities, with an effective management innovation progress is achieved, by trial and error, by monitoring and making adjustments against the original concept (Birkinshaw et al., 2008). Thus, developing management capabilities to integrate technology into the organisation facilitates the construction of more complex and unique systems that promote innovation (Hervas-Oliver, Ripoll-Sempere, et al., 2016; Hervas-Oliver, Sempere-Ripoll, Rojas Alvarado, et al., 2018). KIBS specifically strive for technology adoption but they hardly focus on services concept innovation (Ryu & Lee, 2016), although management innovation may encourage and facilitate knowledge sharing (Jiang & Xu, 2020), which is critical for service innovation. Additionally, service firms have lower barriers in articulating with service innovation and are easily imitated by their peers (Feng et al., 2021). By implementing management innovation, these firms can access their exclusive

knowledge, reducing the risk of imitation and increasing the chances of developing innovation, as advanced by Ozturk & Ozen (2021).

In the relationship of complementarity in innovation activity, technological process innovation without management innovation also limits innovative performance (Hervas-Oliver, Sempere-Ripoll, Rojas Alvarado, et al., 2018). The complementary nature of the relationship between management and technological innovations suggests that, when two types of innovation are undertaken concurrently, there is a greater willingness to carry out the third type of innovation (Arranz et al., 2019). Based on the relationship of management innovation with technology use and service innovation, it is suggested that it will mediate the impact of technology use on service innovation.

H3a. Management innovation mediates the relationship between technology use and service innovation.

At the same time, sustained performance requires adaptation and renewal of organisational subsystems, urging the introduction of technological and management innovations (Damanpour, 2014). With the introduction of information technology, tasks have become more complex, increasing the focus on organisational coordination as a relevant management strategy for professional services (Fu et al., 2019). Internal change agents innovate in management practices in response to inefficiencies in the firm's daily operations (Gebauer et al., 2017). Firms can use information technology to increase employee productivity and improve service flow, enhancing business efficiency (Hsieh & Chou, 2018). Consequently, management innovation may help motivate the workforce and prepare it for adopting changes that positively influence firm performance (Khosravi et al., 2019). In addition, information technology systems and management processes that reward and encourage innovative thinking in firms lead to sales of new services (Bourke et al., 2020). In the complementary view on the relationship between management innovation and technology, this stimulates the need for a management solution that supports it and allows its full exploitation, so in this study, the following hypothesis is proposed:

H3b. Management innovation mediates the relationship between technology use and business performance.

Based on RBV and DC, this study presented a conceptual model and hypothesised the mediating role of management innovation in the relationship between technology utilisation and service innovation and firm performance - see Figure 6.1.

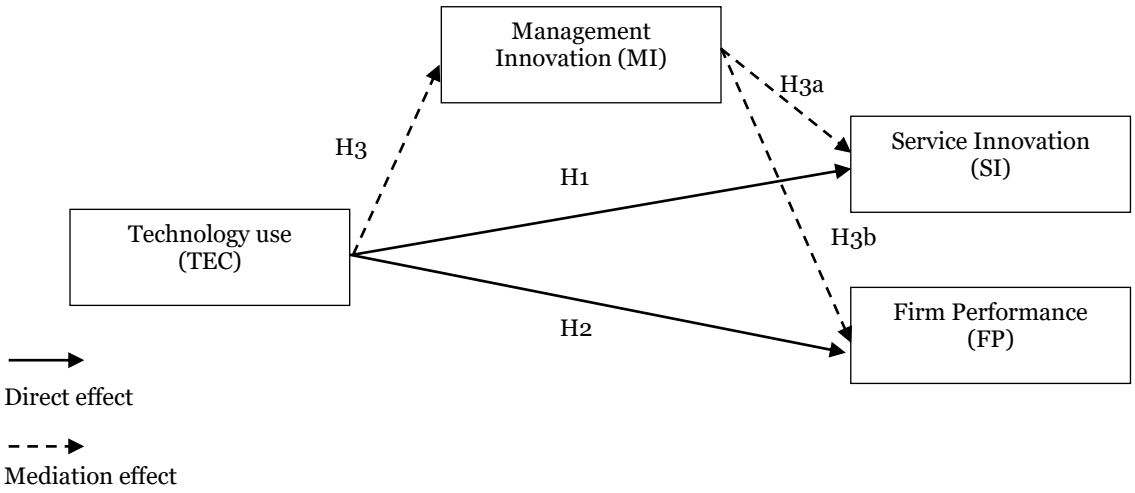

Figure 6.1 - Conceptual model

6.4.Methodology

6.4.1. Sample and data collection

The sample consists of Portuguese KIBS that used technology in their innovation activities between 2016 and 2018. The managers were knowledgeable about the application of technology, management and service innovation in their firms. Following a stratified random sampling procedure by KIBS sub-sectors (technology and professional) and size, we used the SABI database to pinpoint the target population. The KIBS sector was identified considering the NACE Rev. 2. The potential inquired firms were contacted by telephone and asked for their participation. Data were collected through a questionnaire survey sent to 741 KIBS. Out of the returned questionnaires, 207 were found to be usable, yielding a response rate of 27.9%.

Common method variance was controlled by procedural and statistical remedies (Podsakoff et al., 2012). First, the anonymity and confidentiality of the respondents were guaranteed; it was emphasised that there were no right or wrong answers. Second, a full collinearity test was fulfilled under PLS-SEM to check that the study had no issues with common method bias in PLS-SEM (Kock, 2015; Kock & Lynn, 2012). It was confirmed that all Variance Inflation Factors for all the latent variables in the structural model were lower than 3.3. As determined by Kock (2015), the model could be considered free of common method bias.

6.4.2. Measures

In this study, 29 measurement indicators used in investigations in the service sector were adopted as follows. This research used an independent variable, technology (TEC) use, two dependent variables, named service innovation (SI) and firm performance (FP), and one mediator, MI. For the independent variable, TEC use, it was decided to

use a five-item scale developed by Ryu & Lee (2016). Six items from the prior study by Vaccaro *et al.* (2012) were adopted to measure the mediator variable MI. Seven items were selected, as used by Avlonitis et al. (2001), Cheng & Krumwiede (2012) and Hsu et al. (2018), to measure SI. The research needed to simultaneously measure the FP's financial and non-financial performance measures (Ryu & Lee, 2016). Then, eleven items were used from Avlonitis et al. (2001), Carmona-Lavado et al. (2013), and Storey et al. (2016). The questionnaire used a five-point *Likert scale*, ranging from "strongly disagree" (1) to "strongly agree" (5).

6.4.3. Data analysis

The study drew on cross-sectional quantitative data. For data analysis, SmartPLS 3.3.6 software (Ringle et al., 2015) was used in modelling through Structural Equation Models (SEM), by the *Partial Least Squares* (PLS) method (PLS-SEM). In a single analysis, SEM assess the structural model - causality between a set of dependent and independent constructs - and the measurement model - loads of observed items (indicators) on their latent variables (constructs) (Gefen et al., 2000). There were two reasons to perform PLS-SEM. First, following exploratory research, this study tends to scan for possible explanations and hypotheses (Henseler, 2018). And second, there is no need for the dataset to have normal distribution, since PLS-SEM is a non-parametric method (Hair et al., 2019). Next, we shall follow the methodological procedure suggested by Hair et al. (2017) and Ringle et al. (2020) in order to assess the results of the measurement and the structural models.

6.5. Results

6.5.1. Measurement model assessment

Assessment of reflective measurement models includes (1) individual indicator reliability, (2) Cronbach's alpha and composite reliability (CR) to evaluate internal consistency, (3) average variance extracted (AVE) to evaluate convergent validity, (4) and discriminant validity (Hair et al., 2017; Ringle et al., 2020). In the measurement model analysis, three indicators with low external factor loading (SI5, SI6, SI7) were removed, and the model with 26 items was executed again. All factor loadings are above 0.674. Three indicators had outer loadings under 0.7 (MI6=0.697; SI=0.674, FP1=0.690), but they were kept according to the reflective model processing procedure (Hair et al., 2017). Generally, indicators with external loads between 0.40 and 0.70 should be considered for removal from the scale only when the exclusion of the indicator leads to an increase in composite reliability CR or the AVE (Hair et al., 2017). Internal consistency is analysed using Cronbach's alpha and CR, and both measures

must be greater than 0.70 and less than 0.95. The external loads of the indicators and the AVE are considered to assess the convergent validity of reflective constructs (Hair et al., 2017). An AVE with a value of 0.50 or higher indicates that, on average, the construct explains more than half of the variance of its indicators (Chin, 1998). The indicator's individual reliability, Cronbach's alpha, CR and AVE are given in Table 6.1.

Table 6.1 - Convergent validity and reliability

Construct	Item	Loading	Cronbach's alpha	CR	AVE
Service Innovation	SI1	0.713	0.744	0.836	0.561
(SI)	SI2	0.759			
	SI3	0.674			
	SI4	0.841			
Firm Performance	FP1	0.690	0.918	0.930	0.546
(FP)	FP2	0.762			
	FP3	0.770			
	FP4	0.761			
	FP5	0.736			
	FP6	0.700			
	FP7	0.775			
	FP8	0.749			
	FP9	0.718			
	FP10	0.704			
	FP11	0.757			
Technology	TEC1	0.709	0.856	0.897	0.636
(TEC)	TEC2	0.845			
	TEC3	0.802			
	TEC4	0.814			
	TEC5	0.811			
Management	MI1		0.832	0.876	0.542
Innovation		0.770			
(MI)	MI2	0.701			
	MI3	0.785			
	MI4	0.701			
	MI5	0.759			
	MI6	0.697			

Discriminant validity was evaluated using the Heterotrait-monotrait (HTMT) ratio, with threshold values below 0.90 (Henseler et al., 2015). All values are below 0.90, attesting to the discriminant validity of the variables included in the study (Table 6.2).

Table 6.2 - Heterotrait-Monotrait Ratio

	Original sample	**Average sample**	**2.5%**	**97.5%**
FP -> MI	0.406	0.408	0.257	0.562
SI -> MI	0.318	0.333	0.202	0.480
SI -> PF	0.438	0.445	0.292	0.601
TEC -> MI	0.410	0.412	0.271	0.553
TEC -> FP	0.499	0.500	0.361	0.633
TEC -> SI	0.203	0.237	0.121	0.407

6.5.2. Structural model assessment

After the measurement model's evaluation, the structural model's analysis was performed (Table 6.3). The explained variance (R^2) (Benitez et al., 2020; Hair et al., 2017) of the SI (0.078) and FP (0.274) was calculated. The R^2 ranges from 0 to 1, with higher values indicating greater explanatory power (Hair et al., 2019). The R^2 value of the SI is weak, nonetheless it was found that R^2 values in technology service-related studies tend to have a weak rate (Ryu & Lee, 2018). The effect sizes (f^2) should be analysed (Benitez et al., 2020), therefore, based on the effect size (f^2) of constructs, TEC use causes a small impact on SI; other impacts in the model are at medium levels (J. Cohen, 1988). In addition, Q^2 three endogenous constructs present values greater than zero, indicating the path model's predictive relevance for a particular dependent construct (Hair et al., 2017). The root mean square residual (SRMR) (Henseler et al., 2014) was used to verify the model fit. With a cutoff value close to 0.08 for SRMR, there is a relatively good fit between the hypothesised model and the observed data (Hu and Bentler, 1998), but this threshold is likely too low for PLS-SEM (Hair et al., 2017). The SRMR model demonstrates a value of 0.083.

After the structural model assessment, the hypotheses were tested. The direct effect of TEC use on SI, FP and MI was analysed. Then, a mediation analysis was conducted to assess the indirect effects of TEC use on SI and FP via MI. The guidelines from Nitzl et al. (2016) were followed to test mediation. The *bootstrapping* technique was used with 10,000 samples to assess the significance of the effects (Streukens & Leroi-Werelds, 2016).

The results in Table 6.3 show TEC use does not have a significant direct effect on SI (β=0.082, t-value=0.869), contrary to expectations, so H1 is not supported. TEC use has a positive effect on FP (β=0.387, p<0.001) and MI (β=0.355, p<0.001). Hence, the hypotheses 2 and 3 have been empirically supported.

Table 6.3 - Results of the coefficient of structural model relations (direct effects)

Paths specified	Coefficient	SD	*t* -value	[2.5%; 97.5%]	Decision
H1: TEC->SI	0.082	0.096	0.859^{ns}	[-0.105; 0.266]	Not supported
H2: TEC->FP	0.387	0.064	6.029^{***}	[0.264; 0.513]	Supported
H3: TEC->MI	0.355	0.061	5.781^{***}	[0.238; 0.483]	Supported
MI->SI	0.239	0.079	3.015^{**}	[0.090; 0.401]	
MI->FP	0.241	0.074	3.269^{**}	[0.096; 0.384]	
R^2 SI=0.078	Q^2 SI=0.035				
R^2 FP=0.274	Q^2 FP=0.131				
R^2 MI=0.126	Q^2 MI=0.063				
f^2 effect size					
TEC->SI	0.006				
TEC->FP	0.180				
TEC->MI	0.144				
MI->SI	0.054				
MI->FP	0.070				

Note: SD: Standard Deviation. ns: non-significant. *** $p<0.001$, ** $p<0.01$ (two-sided test)

6.5.3. Mediation analysis

The model also proposed that MI would mediate the relationships between TEC use and SI; and TEC use and FP (Table 6.4). The significance of indirect effect (a*b) using the *bootstrapping* procedure (Nitzl et al., 2016) was checked to assess mediation. The indirect effect is the product of two paths from TEC use to MI (path a) and from MI to the target construct, SI and FP (path b). The indirect effects of TEC use on SI (β=0.085, $p<0.05$) and FP (β=0.086, $p<0.01$) via MI are both significant, which confirms hypotheses H3a and H3b. Nevertheless, it is a full mediation between TEC use and SI. The direct effect between TEC use and SI is insignificant, whereas the indirect effect via MI exists. In other words, the effect of the TEC use on SI is completely transmitted with the help of MI. It also means the TEC application extracts its influence only under a certain condition of MI on SI.

The analysis of the relationship between TEC use and FP is a partial mediation as the direct effect of TEC use on FP is still significant. In the relationship between TEC use and FP, it is observed that the indirect and direct effects are significant, and the total effect is positive, which indicates a complementary partial mediation, i.e, a portion of TEC use effect on FP is mediated by MI, whereas TEC use still explains a portion of FP independently of MI.

As the relationship between TEC use and FP is a complementary partial mediation, it can be helpful to obtain further information on the mediated portion. The Variance Accounted For (VAF) determines how the mediation process explains the dependent

variable variance. The VAF level of complementary partial mediation in the relationship between TEC use and FP is 18%; one should conclude that nearly zero mediation occurs (Nitzl et al., 2016).

Table 6.4 - Mediation analysis

Total effects	**Direct effects**	**Specific Indirect effects**	**SD**	***t-value***	**[2.5%; 97.5%]**	**Decision**
TEC-SI =0.167^{+}	TEC-SI =0.082^{ns}	H3a: TEC->MI->SI =0.085*	0.035	2.400	[0.032; 0.169]	Supported
TEC-FP =0.472***	TEC-FP =0.387***	H3b: TEC->MI->FP =0.086**	0.032	2.683	[0.032; 0.158]	Supported

Note: SD: Standard Deviation. ns: non-significant. *** p<0.001, ** p<0.01, * p<0.05, + p<0.10 (two-sided test)

6.6. Discussion, conclusion, implications, limitations and future research lines

6.6.1. Discussion

Based on the premise that technology adoption initiates the innovation cycle in service firms (Barras, 1986), a research model was built and tested, suggesting that technology enables innovation and performance in service firms and that these effects are mediated by management innovation. A key contribution of the work is developing a mediation model to test how management innovation acts in order to enhance the technology into service innovation and firm performance. Firms that have developed such management innovation are better at creating service innovation output and are at least partially able to enhance the technology application effect of firm performance.

A complementary partial mediation of management innovation in the relationship technology application on firm performance was found, however, not very evident. In addition, support for a full mediation effect of management innovation was found between the relationship technology application and service innovation. The full mediation effect of management innovation between the relationship technology used and service innovation warrants a strategic move by firms to emphasise blending technology application with efforts to develop the service innovation. This complies with previous research on the development of management innovation to integrate technology into a complex and unique system, aiming at promoting innovation (Hervas-Oliver, Ripoll-Sempere, et al., 2016). It also means TEC application extracts its influence on service innovation only under certain management innovation.

This result shows that the significance of management innovation is critical in service innovation. The role played by management innovation in allowing a firm to reap the benefits of technology use stems from the fact that it is the management innovation in complement to the technology application that differentiates innovative from non-innovative firms (Yunis et al., 2018). This has been evident in the myriad of management innovation techniques enabled by technology. Total Quality Management, Balanced Scorecard, Activity Based Management, Benchmarking, Environmental Management Accounting and Value Chain Analysis are management innovation techniques (Su & Baird, 2018) enabled by technology use within service firms. The main result is that technology use contribution is enhanced when combined with management innovation (van Oorschot et al., 2018). The full mediation of management innovation in the relationship of technology application in service innovation justifies the firms' strategy of applying technologies with management innovation, aiming at achieving the firm's strategic objectives (Yunis et al., 2018).

These results underscore the importance of analysing the extent to which management innovation can improve the role of technology in the development of service innovation and firm performance. This study validates the assertion that firm management influences the relationship between resources and innovation and resources and performance. Particularly KIBS that hardly focus on service concept innovation (Ryu & Lee, 2016) may facilitate the construction of more complex and unique systems that promote innovation (Hervas-Oliver, Ripoll-Sempere, et al., 2016), through the development of management capabilities that better integrate technology in the firm. Additionally, this critical role of management innovation determines the differentiating use of technology in developing service innovation, contributing to minimising the risk of imitation by competitors (Ozturk & Ozen, 2021).

6.6.2. Conclusion

The aim of the present study is to analyse how the firms' management innovation influences technology utilisation in service innovation and firm performance. Firms differ in their efficiency in converting technology applications into service innovation and performance. In this context, management innovation as an innovation ability mediates the relationship between resources and performance. Support was found for the full mediation effect of management innovation between technology use and service innovation. Nonetheless, there was less clear evidence for a complementary mediating effect between technology use and firm performance. The results suggest that firms can harness management innovation to develop service innovation and that the effect of technology use is completely transmitted with the help of management innovation. In

the relationship between technology use and firm performance, management innovation provides a complementary mediation less evident.

Therefore, the contribution derived from this study is that it revealed the important influence and different mediating roles that management innovation played between technology application and service innovation and technology application and firm performance.

6.6.3. Theoretical implications

At the theoretical level, the RBV and the DC views have been integrated to emphasise the central role of management innovation to take advantage of the opportunities enabled by the technology utilisation as a resource in order to increase the firm's innovation and performance.

In addition to providing evidence of the effect of technology use and management innovation on service innovation and firm performance, this study adds to elucidating how management innovation shares with technology use their effects on service innovation and firm performance.

In conclusion, the present study expands on research revealing complementarity between technology utilisation and management innovation on service innovation and firm performance.

6.6.4. Practical implications

The results of this study help managers by showing support that management innovation is necessary for technology utilisation, thereby complementing the effects on service innovation and firm performance.

Since the effect of technology use on service innovation is completely transmitted with the help of management innovation, managers should value the influence of this type of innovation. If managers cannot create an environment in which management innovation is fostered, the technology applied to service innovation will become dependent on old practices and therefore be limited.

The practical implication of this study is that managers should be aware of the potential of management innovation when their firms use technology to innovate services.

An adequate management policy oriented towards amplifying management innovation will positively impact the relationships between technology use on service innovation.

6.6.5. Limitations and future research

First, the study's cross-sectional nature prevents the dynamic character of innovation and the causality relatiohships among constructs. Second, all firms are KIBS operating in Portugal. Although the choice of a single industry may limit generalisation, it conversely allows controlling for extraneous industry factors that would confound the analysis (Hsu et al., 2018). Third, typical service performance measures such as service quality, value or innovation performance can be used (Moreira et al., 2020). The complementarities between different innovation types could be prolifically examined by employing a wide range of service firm performance measures. Finally, carrying out interviews with members of the benchmark firms in management innovation practices included in the sample would have enriched this study. The qualitative data would favour a better understanding of the proposed mediating effect of management innovation between the utilisation of technology and service innovation and between technology use and firm performance relationships.

Chapter 7 – General conclusions

7.1. Final considerations

Based on a national and sub-sectoral context approach, this thesis has as its general objective the analysis of the introduction of management innovation as a determinant of innovation and firm performance, forwarding implications for the strategic and operational management of KIBS in Portugal. Five studies were developed to respond to this general objective, each with a specific objective.

Chapter 2 presented a systematic literature review based on bibliometric analysis to address the intellectual structure of management innovation research. Tracing the evolution research over time enables understanding that the focus is on innovation in general and technological innovation, but it also concentrates on discussing management innovation as a discipline on its own. The evolution of the management innovation field was discussed in future focus areas and key developments. Finally, three empirical studies were developed based on the overview of the management innovation field in future focus areas, key developments, and its under-researched role in the services sector.

In Chapter 3, a literature review on management innovation and business performance from a rational and institutional perspective was conducted. These theoretical views explain this relationship in the performance of the services sector. The service performance based on rational or institutional views is associated with economic or social gains. This theoretical distinction is important because it would enable to identify if different management innovations are adopted for rational or institutional reasons and if they are associated with economic or social performance.

The specific objective of Chapter 4 is to analyse the simultaneous use of technology, management and service innovations and firm performance. This research aims to bridge the research gap by including management innovation which has received less attention. By attending to a national and sub-sectoral service's context, the results suggest that the use of technology showed the strongest influence on non-financial performance and management innovation showed the weakest influence. Due to its characteristics, management innovation is difficult to implement (Gobble, 2018). This study highlights the simultaneous use of different types of innovation in the non-financial performance of KIBS, as proposed by the integrative view.

Regarding Chapter 5, the specific objective of this study is to investigate the effects of management innovation on firm performance by analysing the mediating impact of technology use and service innovation. This study found that management innovation influences firm performance directly and indirectly through its effect on the complementary mediator's technology use and service innovation. Management innovation, technology application and service innovation complement each other despite their differences. The existence of complementarity depends on the firms' national context (H. Zhang, 2022). These findings assume that the benefits of management innovation on firm performance also account for peripheral countries.

In Chapter 6, the aim is to analyse how the firm's management innovation influences technology utilisation in service innovation and firm performance. Attending to a sub-sectorial service context the results suggest that firms can harness management innovation to develop service innovation, because the effect of technology use is completely transmitted with the help of management innovation. On the other hand, the relationships between technology use and firm performance and management innovation provide a complementary less evident mediation relationship to how technology use becomes firm performance. Hence, this study suggests that management innovation plays different roles between technology utilisation and service innovation and technology utilisation and firm performance. Through management innovation, managers create distinctive advantages difficult for customers and competitors to imitate as proposed by the dynamic capabilities theory.

This thesis responds to calls for more management innovation research on issues such as relationships with other types of innovation (Walker et al., 2015), complementaries between technological and non-technological innovations (González-Blanco et al., 2019) and effects of their adoption on firm performance (Khosravi et al., 2019). Particularly, in the service sector, where the management innovation's role is not entirely clear (González-Blanco et al., 2019; Saunila, 2020; Walker et al., 2015).

This thesis draws on the RBV, firms as socio-technical systems perspectives and dynamic capabilities to substantiate the complementary role of innovation in the performance of service firms. The adoption of management innovation by firms meets the requirements of often being unique to the adopting firms, i.e. it is determined by the firm-specific context and influences their performance. Following the perspetive of Trist & Bamforth (1951), it is argued that management innovation has complementarity properties (Alexiev et al., 2018; González-Blanco et al., 2019; Hervas-Oliver et al., 2018); providing empirical evidence on the complementarity between management

innovation, technology utilization and service innovation. Adequate DC have also been developed, through management innovation, to reconfigure the technology resource for service innovation and firm performance.

This thesis contributes by developing management innovation models to advance the understanding of the effects of this type of innovation on firm performance. The complementary effect between management and service innovations and technology on service firm performance has been argued and found.

7.2. Implications

This thesis has important implications for theory and practice, focusing on the role of the new management practices, processes, or organisational structures in the innovation and performance of KIBS, in a peripheral country.

In Chapter 2, the systematic literature review on management innovation, based on bibliometric analysis, explores the evolution of the intellectual structure of management innovation research. The citation analysis allows the identification of the most cited articles, the relevant authors, and the top journals. The co-citation analysis shows the groups that constitute the intellectual structure of the management innovation research. Finally, the author's keywords co-occurrence gave insights about the main research themes in management innovation knowledge. The findings of this bibliometric analysis may be useful to researchers seeking to conduct future studies in management innovation.

In chapter 3, regarding adopting management innovation, it would be important to understand what stimulates it. If the rational perspective influences the adoption of management innovation, the economic performance is affected; if the institutional approach is dominant, the social results initially precede the potential economic performance benefits.

In chapter 4, the study allows an understanding of the joint role of innovation in the non-financial performance of KIBS. Simultaneously using the technology application, management and service innovations influence non-financial performance. The use of technology showed the strongest influence on the firm's image, retaining and attracting new clients, or increasing the profitability of the firm's services/products or its competitive advantage. Management innovation showed the weakest influence on non-financial performance. As expected, the non-financial results are reflected in KIBS firms' financial performance.

In Chapter 5, the study identifies the direct impact of management innovation on KIBS firm's performance and the indirect influence through the analysis of the effects of technology use and service innovation on the firm performance. Managers of KIBS firms should focus on developing management innovation in service firms' departments, and this significantly stimulates complementary mediation on firms' performance by using technology and service innovation. Promoting management innovation in KIBS firms triggers the implementation of technology and service innovation applications. This knowledge can provide policymakers with indicators for improving the design of the innovation policies to promote innovation in KIBS.

In Chapter 6, the study allows understanding the technology utilisation in KIBS, through the analysis of the effect of management innovation on service innovation and firm performance. It allows to comprehend that management innovation is necessary for technology utilisation, thereby complementing the effects on service innovation and firm performance. The results contribute by elucidating how management innovation shares with technology use their effects on service innovation and KIBS performance. They also demonstrate the importance of the RBV and the DC integrated views to obtain a competitive advantage by improving the role of management innovation to take advantage of the opportunities enabled by the technology resource and apply them to increase the firm's innovation and performance. These findings suggest an adequate management policy oriented towards the increase of management innovation in knowledge base service firms will positively impact the relationships between resources and service innovation and firm performance.

7.3. Limitations and future research lines

This thesis has limitations that may provide future research lines. As it takes a quantitative approach, more qualitative and mixed studies could analyse the issues examined. Attending to the fact that it focuses on a services sub-sector, the findings may not be generalised to other service sectors or countries. However, this is understandably expected, given the prominence of the local context when studying management innovation. Additionally, the Portuguese KIBS tend to have similar characteristics to KIBS in other countries; however, other countries' innovation practices and socioeconomic environments may play a distinctive role in the findings (Černe et al., 2015).

In Chapter 2, since only articles included in the Web of Science's Main Collection's database are examined in the Systematic Literature Review, future reviews may include other databases that provide access to high-quality research content. Only articles from

peer-reviewed journals were included in this study. Therefore, other documents such as conference papers, books and book chapters may include high-quality research. The analysis of other periods may also bring different perspectives of the literature.

Chapter 3 reviewed the most used theories that motivate managers to adopt management innovation. Nevertheless, different perspectives on management innovation are identified in the literature (Birkinshaw et al., 2008; Volberda et al., 2014). Their research can help firms adapt management practices to their specific context. Particularly, performance based on the institutional perspective is relatively small (Walker et al., 2015).

In chapter 4, the focus was on KIBS firms. It would be interesting to analyse the subsectors of professional, technology or creative KIBS (Miles et al., 2018) because they may have different practical implications. This study was conducted in a moderate innovator country. Future research needs to consider the country's industrial characteristics as important contextual factors because they influence the outcomes (Černe et al., 2015).

The study on Chapter 5 was based on Damanpour, Walker and Avellaneda (2009) and Damanpour and Aravind's (2012) theoretical model in which management innovation is combined with service innovation and technological process innovations, indicating that there are strong relationships between them. However, other critical success factors can be considered in the service sector, such as formal process or service offering advantage (Lins et al., 2021) that could combine with management innovation.

Chapter 6 presents some limitations. As the study has a cross-sectional nature, it will prevent finding the dynamic character of innovation and the causality relationship among constructs. More in-depth studies resorting to members of the benchmark firms that examine management innovation practices could have enriched the study. Further studies should also examine other service-typical signals of performance, such as service quality, value, or innovation performance (Moreira et al., 2020). By employing a wide range of service firm performance measures, the complementarities between different innovation types could be productive. Finally, the literature highlights that decision-making concerning the organisation of structures and processes, planning, and control can be supported by information and communication technology systems (Gemünden et al., 2018). In this context, management innovation influences the application of resources to firm performance (Arranz et al., 2019). Thus, the outcome of the direct application of technology depends not only on its innovative use in the

innovation process but also on the monitoring and adaptation of management activities.

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Appendix

Questionnaire

Assunto: Projeto de Doutoramento - PEDIDO DE RESPOSTA A QUESTIONÁRIO

Caro(a) Empresário(a),

O meu nome é Lurdes Barroso Simao e sou doutoranda em Gestão e investigadora do Núcleo de Estudos em Ciências Empresariais (NECE), na Universidade da Beira Interior.

Convido-o(a) a colaborar num estudo que incide sobre o efeito da inovação no desempenho das Empresas de Serviços de Conhecimento Intensivo. Para isso, basta preencher um breve questionário.

Este questionário é anónimo e tem por objetivo recolher dados, para exclusivo tratamento e análise estatística. É parte integrante da Tese de Doutoramento, sob a orientação da Doutora Maria José Aguilar Madeira (Universidade da Beira Interior) e Doutora Luísa Cagica Carvalho (Instituto Politécnico de Setúbal).

Agradeço a sua colaboração, pois as suas respostas, conjuntamente com as restantes, irão permitir a análise da influência da inovação de processo de gestão e tecnológico no desempenho das Empresas de Serviços de Conhecimento Intensivo (KIBS) e, como resultado, contribuir com orientações para os gestores, quanto à capacidade e impacto que estes dois tipos de inovação podem desempenhar nas empresas.

PREENCHIMENTO DO QUESTIONÁRIO

Agradeço pelo tempo que dedica ao preenchimento deste questionário e, apresento os meus respeitosos cumprimentos.

Lurdes Barroso Simao

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A Influência da Inovação de Processo de Gestão e Tecnológico no Desempenho das Empresas de Serviços de Conhecimento Intensivo

Questionário

Caro(a) Empresário(a),

Nesta Tese de Doutoramento em Gestão investiga-se a influência da inovação de processo de gestão e tecnológico, na inovação radical e incremental; bem como no desempenho financeiro e não financeiro das empresas de Serviços de Conhecimento Intensivo.

Neste sentido, solicita-se-lhe que manifeste a sua sincera perceção de dirigente da Empresa, no preenchimento deste questionário, sabendo que não há respostas corretas ou incorretas.

Objetivo: Este questionário visa a recolha de dados para posterior tratamento e análise estatística.

Duração: O tempo de preenchimento é cerca de 15 minutos.

Confidencialidade: A informação recolhida é anónima e confidencial.

Esclarecimentos: Caso deseje obter informação adicional sobre este estudo poderá contactar:

- E-mail: lurdes.simao@ubi.pt;
- Telemóvel: 965 546 817.

*Obrigatório

1. **A1. Selecione o código da Classificação da Atividade Económica (CAE) principal da empresa** *

Marcar tudo o que for aplicável.

62010 Atividades de programação informática

62020 Atividades de consultoria em informática

62030 Gestão e exploração de equipamento informático

62090 Outras atividades relacionadas com as tecnologias da informação e informática

63110 Atividades de processamento de dados, domiciliação de informação e atividades relacionadas

63120 Portais web

63910 Atividades de agências de notícias

63990 Outras atividades dos serviços de informação, n.e.

69101 Atividades jurídicas

69200 Atividades de contabilidade, auditoria e consultoria fiscal

70210 Atividades das relações públicas e comunicação

70220 Outras atividades de consultoria para os negócios e a gestão

71110 Atividades de arquitetura

71120 Atividades de engenharia e técnicas afins

71200 Atividades de ensaios e análises técnicas

72110 Investigação e desenvolvimento em biotecnologia

72190 Outra investigação e desenvolvimento das ciências físicas e naturais

72200 Investigação e desenvolvimento das ciências sociais e humanas

73110 Agências de publicidade

73120 Atividades de representação nos meios de comunicação

73200 Estudos de mercado e sondagens de opinião

74200 Atividades fotográficas (fotografia aérea para fins cartográficos)
74900 Outras atividades de consultoria, científicas, técnicas e similares, n.e. (previsão das condições atmosféricas e atividades de encarregados de medição em obra)
78100 Atividades de empresas de seleção e colocação de pessoal
78200 Atividades de empresas de trabalho temporário
78300 Outro fornecimento de recursos humanos (empresas de outsourcing)

2. **A2. Indique o ano de constituição da empresa ***

3. **A3. Indique o número de trabalhadores da empresa em 2016 ***

4. **A4. Indique o número de trabalhadores da empresa em 2018 ***

5. **A5. Indique o número de pessoas com formação superior (Incluir pessoas ao serviço com o grau de bacharelato, licenciatura, mestrado, doutoramento) em 2018 ***

6. **A6. Indique o número de especialistas, com conhecimento específico da atividade desenvolvida, com mais de 5 anos de experiência profissional em 2018 ***

7. **A7. Assinale as suas qualificações (dirigente da empresa) ***

Marcar apenas uma oval.

1=Ensino básico
2=Ensino secundário
3=Formação profissional
4=Licenciatura
5=Mestrado
6=Doutoramento
7=Outra

8. **A8. Indique o volume de negócios de 2018 ***

Marcar apenas uma oval.

1=0€
2=Superior a 0€ e inferior a 50 000€
3=50 000€ e inferior a 100 000€
4=100 000€ e inferior a 200 000€
5=200 000€ e inferior a 300 000€
6=300 000€ e inferior a 400 000€
7=400 000€ e inferior a 500 000€
8=500 000€ ou superior

Inovação de Processo de Gestão (Inovação de Gestão)

A Inovação de Gestão consiste na implementação de:

- NOVAS PRÁTICAS DE GESTÃO - referem-se ao trabalho diário dos dirigentes – definição de objetivos e procedimentos associados, organização de tarefas e funções, desenvolvimento de talentos, e atendimento às solicitações das partes interessadas;
- NOVOS PROCESSOS DE GESTÃO – novas rotinas que regem o trabalho dos dirigentes (por exemplo, planeamento estratégico, gestão de projetos, avaliação de desempenho);
- NOVAS ESTRUTURAS ORGANIZACIONAIS - distribuição de funções, atribuição de responsabilidade e fluxos de informação, autogestão de equipas, visando melhorar o funcionamento da empresa.

Nota: As implementações referidas deverão ser o resultado de decisões estratégicas da gestão da empresa.

9. **B1. Durante o período de 2016 a 2018 a empresa inovou no Processo de Gestão (Inovação em Gestão)? ***

Marcar apenas uma oval.

1=Sim

0=Não *Passe para a pergunta 16.*

Inovação de Processo de Gestão (Inovação de Gestão)

Por favor, indique o grau de concordância da empresa quanto à adoção de cada uma destas abordagens da inovação de gestão entre 2016 e 2018.

1=discordo totalmente e 5=concordo totalmente

10. *

B2. Renovaram-se as regras e procedimentos no decorrer das operações diárias da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

11. *

B3. Alteraram-se as tarefas e funções dos trabalhadores nas operações diárias da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

12. *

B4. Implementaram-se novos sistemas de gestão nas operações diárias da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

13. *

B5. Alterou-se a política de recompensa aos trabalhadores entre 2016 e 2018

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

14. *

B6. Reestruturou-se a comunicação intra e interdepartamental da empresa no decorrer das operações diárias da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

15. *

B7. Alterou-se a estrutura organizacional durante as operações diárias da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

Inovação de Processo Tecnológico (equipamento e/ou software)

Inovação de Processo Tecnológico consiste na introdução de novos equipamentos ou software, na prestação de serviços/produtos da empresa.

16. **B8. Durante o período de 2016 a 2018 a empresa inovou no Processo Tecnológico (equipamento e/ou software)?** *

Marcar apenas uma oval.

1=Sim

0=Não *Passe para a pergunta 23.*

Inovação de Processo Tecnológico (equipamento e/ou software)

Entre 2016 e 2018, até que ponto a empresa se centrou nas seguintes atividades, comparativamente aos concorrentes?

1=extremamente baixo e 5=extremamente alto

17. *

B9. Grau de utilização das tecnologias na criação, simulação e teste de novos serviços/produtos

Marcar apenas uma oval.

1 2 3 4 5

1=extremamente baixo 5=extremamente alto

18. *

B10. Grau de utilização das tecnologias na redução do tempo de entrega

Marcar apenas uma oval.

1 2 3 4 5

1=extremamente baixo 5=extremamente alto

19. *

B11. Grau de utilização das tecnologias que facilitam a comunicação e a cooperação com trabalhadores e clientes

Marcar apenas uma oval.

1 2 3 4 5

1=extremamente baixo 5=extremamente alto

20. *

B12. Grau de utilização das tecnologias na melhoria da qualidade do serviço/produto

Marcar apenas uma oval.

1 2 3 4 5

1=extremamente baixo 5=extremamente alto

21. *

B13. Grau de utilização das tecnologias na monitorização e rastreio do processo de entrega, visando gerir eficazmente o processo de entrega do serviço/produto

Marcar apenas uma oval.

1 2 3 4 5

1=extremamente baixo 5=extremamente alto

22. **B14. Indique a percentagem do volume de negócios anual que gastou (ou estima que gastou) a empresa, com a aquisição de novas tecnologias da informação (equipamento) e novos sistemas de gestão da informação (software) entre 2016 e 2018** *

Inclua despesas correntes (incluindo custos com o trabalho, atividades contratadas externamente e outros custos relacionados).

Marcar apenas uma oval.

1=0%

2=Mais de 0% e menos de 1%

3=1% e menos de 3%

4=3% e menos de 5%

5=5% e menos de 10%

6=10% e menos de 30%

7=30% ou mais

Desempenho Inovador na Empresa no Período de 2016 a 2018

Entre 2016 e 2018, questionam-se dois tipos de desempenho em inovação na empresa: serviços e produtos.

- INOVAÇÃO DE SERVIÇOS: corresponde a novas atividades na prestação do serviço principal/básico da empresa, e que resultam em FONTE DE RECEITA CORRENTE da empresa.
- INOVAÇÃO DE PRODUTOS: corresponde a novos desenvolvimentos na oferta principal da empresa, que VISAM CRIAR NOVAS FONTES DE RENDIMENTO, por exemplo, novos produtos de conhecimento, pacotes de conhecimento especializado, software empacotado, novos produtos tecnológicos.

23. **C1. Durante o período de 2016 a 2018 a empresa inovou nos SERVIÇOS prestados aos clientes? ***

Marcar apenas uma oval.

1=Sim

0=Não *Passe para a pergunta 31.*

Inovação de Serviços

Inovação RADICAL de Serviços entre 2016 e 2018

Indique o grau de concordância da empresa com cada item abaixo.

1=discordo totalmente e 5=concordo totalmente

24. *

C2. O serviço é totalmente NOVO NA EMPRESA

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

25. *

C3. O serviço permite que a empresa entre num NOVO MERCADO

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

26. *

C4. O serviço COMPLEMENTA UMA LINHA de serviços já existente

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

27. *

C5. O serviço cria uma NOVA LINHA de serviços na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

Inovação INCREMENTAL de Serviços entre 2016 e 2018

Indique o grau de concordância da empresa com cada item abaixo.

1=discordo totalmente e 5=concordo totalmente

28. *

C6. O serviço é uma MODIFICAÇÃO de outro serviço existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

29. *

C7. O serviço é uma REVISÃO de outro serviço existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

30. *

C8. O serviço é um REPOSIÇÃO de outro serviço existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

Inovação de Produtos

31. *

C9. Durante o período de 2016 a 2018 a empresa inovou nos PRODUTOS oferecidos aos clientes?

Marcar apenas uma oval.

1=Sim

0=Não *Passe para a pergunta 41.*

Inovação de Produtos

Inovação RADICAL de Produtos entre 2016 e 2018

Indique o grau de concordância da empresa com cada item abaixo.

1=discordo totalmente e 5=concordo totalmente

32. *

C10. O produto é totalmente NOVO NA EMPRESA

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

33. *

C11. O produto permite que a empresa entre num NOVO MERCADO pela primeira vez

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

34. *

C12. O produto vem COMPLETAR UMA NOVA LINHA de produtos já existente

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

35. *

C13. O produto cria uma NOVA LINHA de produtos na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

Inovação INCREMENTAL de Produtos entre 2016 e 2018

Indique o grau de concordância da empresa com cada item abaixo.

1=discordo totalmente e 5=concordo totalmente

36. *

C14. O produto é uma MODIFICAÇÃO de outro produto existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

37. *

C15. O produto é uma REVISÃO de outro produto existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

38. *

C16. O produto é um REPOSICIONAMENTO de outro produto existente na empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

39. **C17. Estime a percentagem do volume de negócios do ano de 2018, resultante dos serviços e produtos novos ou significativamente melhorados (inovação RADICAL de serviços e produtos em conjunto)** *

Marcar apenas uma oval.

1=0%

2=1% a 4%

3=5% a 9%

4=10% a 24%

5=25% a 49%

6=50% a 74%

7=75% a 100%

40. **C18. Estime a percentagem do volume de negócios do ano de 2018, resultante dos serviços e produtos modificados (inovação INCREMENTAL de serviços e produtos em conjunto) ***

Marcar apenas uma oval.

1=0%

2=1% a 4%

3=5% a 9%

4=10% a 24%

5=25% a 49%

6=50% a 74%

7=75% a 100%

Desempenho Empresarial Final

O desempenho final dos serviços/produtos é medido pelos resultados financeiros e não financeiros obtidos pela empresa em 2018, resultante do desempenho inovador do período de 2016 a 2018.

Indique o grau de concordância da empresa com cada item abaixo.

1=discordo totalmente e 5=concordo totalmente

41. *

C19. Os serviços/produtos foram rentáveis

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

42. *

C20. As vendas totais dos serviços/produtos aumentaram

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

43. *

C21. Os serviços/produtos alcançaram maior quota de mercado

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

44. *

C22. Os serviços/produtos excederam os objetivos do lucro

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

45. *

C23. Os serviços/produtos excederam os objetivos das vendas

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

46. *

C24. Os serviços/produtos excederam os objetivos de participação de mercado

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

47. *

C25. Os serviços/produtos tiveram impacto positivo maior na imagem da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

48. *

C26. Os serviços/produtos melhoraram a fidelização dos clientes

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

49. *

C27. A introdução dos serviços/produtos aumentou a rentabilidade de outros serviços/produtos da empresa

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

50. *

C28. Os serviços/produtos atraíram um número significativo de novos clientes

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

51. *

C29. Os serviços/produtos contribuíram na vantagem competitiva

Marcar apenas uma oval.

1 2 3 4 5

1=discordo totalmente 5=concordo totalmente

52. **C30. Indique a percentagem do volume de negócios anual que gastou (ou estima que gastou) a empresa, em atividades de Investigação e Desenvolvimento (I&D) realizadas dentro da empresa (I&D intramuros) entre 2016 e 2018 ***

Inclua despesas correntes incluindo custos com o trabalho e despesas de capital com equipamentos específicos para I&D.

Marcar apenas uma oval.

1=0%

2=Mais de 0% e menos de 1%

3=1% e menos de 5%

4=5% e menos de 10%

5=10% e menos de 25%

6=25% ou mais

Annex

Confirmation of the acceptance of studies

Management innovation and business performance in services: economic and social potential

"Dear Lurdes Simao,
I am pleased to inform you that your chapter, "Management Innovation and Business Performance in Services: Economic and Social Potential," submitted to "Global Campaigning Initiatives for Socio-Economic Development" has passed the editorial review phase.
(...)
IGI Global
eEditorial Discovery"

Intellectual structure of management innovation: Bibliometric analysis

"Dear Dr. Simao,
I am pleased to tell you that your work has now been accepted for publication in Management Review Quarterly.
Your accepted manuscript will now be transferred to our production department and work will begin on creation of the proof. If we need any additional information to create the proof, we will let you know. If not, you will be contacted again in the next few days with a request to approve the proof and to complete a number of online forms that are required for publication.
Thank you for submitting your work to Management Review Quarterly and we look forward to receiving further submissions from you.
Sincerely,
Joern Block
Editor-in-Chief
Management Review Quarterly"

Relations between innovation and organizational performance: evidence in knowledge-intensive business services

"Caro colega:

Em nome do Comité Científico, temos o prazer de vos informar da ACEITAÇÃO do vosso trabalho para as XXXI Jornadas Hispano-Lusas de Gestión Científica de Toledo.

(…)

O Comité Organizador"

The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology

"Dear Simao, Lurdes; Carvalho, Luisa; Madeira, Maria

It is a pleasure to accept your manuscript IJIS-01-2022-0007.R2, entitled "The influence of management innovation on the organisational performance of KIBS: the mediating role of service innovation and technology" in its current form for publication in International Journal of Innovation Science.

(…)

Thank you for your contribution. On behalf of the Editors of International Journal of Innovation Science, we look forward to your continued contributions to the Journal.

Sincerely,

Dr. Brett Trusko

Editor, International Journal of Innovation Science"