Knowledge Management Performance in Health Organizations

VERSÃO FINAL APÓS DEFESA

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Dissertação para obtenção de Grau de Mestre em

Gestão de Unidades de Saúde

(2º ciclo de Estudos)

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Covilhã, 11 de dezembro de 2022

Declaração de Integridade

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CARTÃO DE CIDADÃO

Abstract

Creation, organization, distribution, and application of knowledge are critical to managerial activities in healthcare organizations, giving relevance to knowledge management. However, the literature and empirical studies are scarcity in this context. To fill this gap, this study aims to investigate the relationship between knowledge characteristics, implementation measures and knowledge management performance.

This study applies fuzzy-set Qualitative Comparative Analysis (fsQCA) methodology to evaluate the sufficient and necessary conditions that explain the high performance of knowledge management as outcome of interest. Data were collected through a questionnaire sent to the Director Nurse/Clinical Council Nursing Member, Clinical Director/Clinical Council President and Training Center Director of 156 Portuguese health organizations, from the public, private and social sectors. We got 101 answers out of 468 possible, representing a response rate of 21.6%. All the answers were considered valid.

The results reveal that high performance could be achieved through different combinations of conditions and that there are no significant differences between the combinations in both outcomes of interest. The findings highlight the relevance of explicitness and volatility in both internal processes and overall performance. Information infrastructure show impact to internal processes and incentive programs to overall performance. The study also points the absence of appropriability is relevant in most settings for the interest outcomes. The obtained results allow us to conclude the importance of knowledge management and its characteristics on health care organizations.

The study aims to provide a process that will add to other models of knowledge management performance, based on a configurational approach with fsQCA methodology, focused on necessary and sufficient conditions for high knowledge management performance. This model can help healthcare professionals and management to evaluate their current knowledge management processes and the potential to improve their knowledge performance further. Practitioners can use the informative concepts and solutions that come from this study to make deeper and richer assessments of how they build, diffuse, capture and implement knowledge, dealing with its characteristic specificities.

Practitioners and policymakers should note that, according to our results, health organizations with higher performance in knowledge management show

a predominance of formal, complex, dynamic, and non-proprietary knowledge. They rely on information infrastructures that ensure availability, storage and sharing of knowledge and maintain incentive policies that increase professional commitment to systematizing operational rules and procedures. The expertise development can make the difference in dealing with the unpredictability of clinical situations and patient-centered care and human resources planning must consider organizational goals and context to a higher efficiency and effectiveness.

The main result of this approach comes from the evidence that different paths could induce the same outcome of interest, that there are many solutions to address the unique organizational and contextual characteristics, which allows the organizations to reach the same high knowledge management performance. Knowledge management policies and programs should be designed according to these organizational and contextual characteristics to provide organizations with the resources needed to achieve high efficiency and effectiveness, high quality of service, patient satisfaction and safety.

Keywords

Knowledge management, knowledge characteristics, implementation measures, internal processes performance, performance, health organizations, fuzzy-set qualitative comparative analysis; fsQCA.

Resumo

A criação, organização, distribuição e aplicação do conhecimento é fundamental para a gestão de organizações de saúde, dando relevância à gestão do conhecimento. No entanto, a literatura e os estudos empíricos nesta área, são escassos. Por forma a dar resposta a esta lacuna, este estudo pretende investigar a relação entre as características do conhecimento, as medidas de implementação e a performance da gestão do conhecimento.

Este estudo aplica a metodologia fuzzy-set Qualitative Comparative Analysis (fsQCA) para avaliar as condições suficientes e necessárias que explicam o alto desempenho da gestão do conhecimento como resultado de interesse. Os dados foram recolhidos através de um questionário remetido a Enfermeiros Diretores/Vogais do Conselho Clínico, Diretores Clínicos/Presidentes do Conselho Clínico e Diretores do Serviço de Ensino e Formação de 156 organizações de saúde portuguesas, dos sectores público, privado e social. Obtivemos 101 respostas das 468 possíveis o que representa uma taxa de resposta de 21.6%. Todas as respostas foram consideradas válidas.

Os resultados mostram que níveis altos de desempenho da gestão do conhecimento podem ser alcançados através de diferentes combinações de condições e que não se verificaram diferenças significativas entre as combinações de soluções nos resultados de interesse. Destaca-se a relevância da explicitude e da volatilidade nos processos internos e no desempenho global. As infraestruturas da informação mostram impacto ao nível dos processos internos e os programas de incentivos ao nível do desempenho global. O estudo também aponta para a relevância da ausência de apropriabilidade na maior parte das configurações para os resultados de interesse. Os resultados obtidos permitem confirmar a importância da gestão do conhecimento no desempenho das organizações de saúde.

O estudo pretende fornecer um processo complementar a outros modelos de desempenho da gestão do conhecimento, baseado na abordagem com a metodologia fsQCA, que se foca nas condições suficientes e necessárias para o alto desempenho neste domínio. Este modelo pode ajudar os profissionais de saúde e os gestores a avaliarem os seus processos atuais de gestão do conhecimento e o potencial para melhorar o seu desempenho. Os profissionais podem usar os conceitos e soluções que resultam deste estudo para avaliar de modo mais profundo e complexo sobre a forma como elas

constroem, difundem, captam e implementam o conhecimento, tendo em consideração as especificidades das características do mesmo.

Os profissionais e os decisores deverão ter em conta que, de acordo com os nossos resultados, as organizações de saúde com alta performance da gestão do conhecimento apresentam a predominância de um conhecimento formal, complexo, dinâmico e não proprietário. Recorrem a infraestruturas de informação que garantam a disponibilidade, o armazenamento e a partilha e mantêm políticas de incentivos que potenciem o comprometimento dos profissionais com a sistematização de normas e procedimentos operacionais. O desenvolvimento de perícia poderá fazer a diferença na capacidade de enfrentar a imprevisibilidade das situações clínicas e dos cuidados centrados no paciente e o planeamento de recursos humanos deverá considerar os objetivos e o contexto organizacional com vista a maiores níveis de eficiência e efetividade.

O principal resultado desta investigação reside na evidência de que diferentes abordagens podem levar ao mesmo resultado de interesse, que existem várias soluções para enfrentar as características contextuais e organizacionais únicas, que permitem às organizações alcançar alta performance da gestão do conhecimento. As políticas e os programas de gestão do conhecimento devem ser concebidos de acordo com essas características organizacionais e contextuais, por forma a dotar as organizações com os recursos para alcançar altos níveis de eficiência e efetividade, alta qualidade de serviço, satisfação e segurança do paciente.

Palavras-chave

Gestão de conhecimento, características do conhecimento, medidas de implementação, desempenho dos processos internos, desempenho, organizações de saúde, fuzzy-set Qualitative Comparative Analysis; fsQCA.

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1. Introduction

The spread of the globalization process guided by information, modern technology availability, and increasingly demanding consumers are central in evaluating the organizational environment (Anjos *et al.*, 2011).

Innovation capability is one of the most important skills in the present, capable of changing the competition rules and one of the most relevant sources of sustainable competitive advantage (Takahashi & Takahashi, 2007). The knowledge core represents a central organizational skill that should be understood as part of the organization (Santos & Takahashi, 2013).

Knowledge management is inseparable from innovation. Generally, we can consider two types of innovations: (i) product innovation (new or improved goods or services that the organization have implemented in the market; market focused and costumer oriented) and (ii) process innovation (new or improved business processes that organization have implemented; internal focus; optimization of producing or marketing of goods and services) (Instituto Nacional de Estatística, 2020; Martinés-Ros, 2019; Utterback & Abernathy, 1975). Product and process innovations are not distinct but complementary (Damanpour & Aravind, 2006). Innovation is the creative process through which knowledge is transformed into products, processes and procedures; meanwhile, it also creates added value (better health), increases the quality of social interactions (greater effectiveness and participation in collective actions) and improves the economy (directly or indirectly). Creating innovation implies imagination and risk (Sakellarides, 2008).

However, creating innovation may not be enough, and it is necessary to make it go all the way to reach the end users of the object of that innovation. Diffusion is the process whereby innovation is communicated through certain channels to the members of a social system over a certain period and analyses the dynamics that influence the spread of an innovation among adopters. It is a type of communication where the messages focus on a new idea associated with the concept of innovation which involves a certain degree of uncertainty (Rogers, 2003; Zanello *et al.*, 2016).

Diffusion seems to be more suitable to characterize a part of the communication process that involves the transmission of an idea, process, or product, even if it may not necessarily be new. It is also part of the communication process through which

information, an opinion, an attitude, or a practice expands over a population (Fisher *et al.*, 2018; Rogers, 2003).

In healthcare, organizational performance is influenced by knowledge management insofar as it creates competitive advantages, which could be translated into support for decision-making, quality improvement and errors and costs reduction (Cruz & Ferreira, 2016; El Morr & Subercaze, 2010).

Information, knowledge, communication, and innovation play a special role in any hospital culture transformation that may occur. The clinical practice and the provision of healthcare are characterized by the intensive use of knowledge constantly changing, representing a challenge that organizations are not always able to answer most effectively. Therefore, it is important to identify factors that appear to play an important role in implementing knowledge management in healthcare organizations, understanding how it is practised and the associated outcomes. In this constantly changing area, the constraints that most services have to deal with this change are evident. Even in more technologically advanced countries, this evolutionary delay in healthcare services has, over the last years, been attributed to the fact that they are considered "last adopters" in terms of the design process and information and communication tools that characterize knowledge society (Sakellarides, 2009).

In healthcare, we face an increasingly ageing population with more morbidities and increasing expectations regarding the quality and safety of care. This sector also faces the constant technological and scientific evolution that opens the way for new diagnoses and treatments for diseases previously classified as incurable. These two axes of demand, together with the sector's competitiveness, the shortage of specialized professionals and the need to guarantee sustainability, imposing limits on public health financing, are some of the determinants of the enormous pressure for change to which health systems are subject. (Camilleri & O'Callaghan, 1998; Kivisaari *et al.*, 2004; Porter & Teisberg, 2004).

The challenge is to maintain responsiveness and contain costs in a context of more complexity and quality of care without increasing health expenditure. Facing this dilemma requires instilling innovation in technological processes and practices associated with healthcare analysing, in detail, all the health system elements, especially the production that encompasses processes, resources, skills, technology, organization and management (Kivisaari *et al.*, 2004).

Jih *et al.* (2006) concluded that knowledge management involves providing quality health services using highly specialized knowledge to answer health problems, considering resource constraints. The same authors argue that, as in other areas of intensive knowledge acting in highly competitive and challenging environments, healthcare organizations must also face the creation, organization, distribution and application of knowledge as critical to their management activities.

Based on these assumptions and considering the importance of knowledge management in the sustainability, competitivity, efficiency and effectiveness of health organizations, and the scarcity of empirical inquires in this context, we conducted this study to analyse knowledge management performance in healthcare organizations. This study aims to investigate the relationship between knowledge characteristics, implementation measures and knowledge performance using a fuzzy-set Qualitative Comparative Analysis (fsQCA). fsQCA is a diversity-oriented methodology that allows us to perceive the different paths to a certain outcome (Shipley *et al.*, 2013). fsQCA, instead of a traditional quantitative methodology centred on correlations, intends to analyse the interdependence of casual conditions and the supposed causality represented by a certain configuration (Ragin, 2008; Rihoux & Ragin, 2009).

The fsQCA model presupposes equifinality in all the configurations so that the same outcome can result from more than one configuration (Misangyi & Acharya, 2014). Based in these assumptions, fsQCA could help understand the heterogeneity between cases and the complexity of the different configurations (Furnari *et al.*, 2021). This methodology allows us to evaluate the sufficient and necessary conditions that explain the high performance of knowledge management as an outcome of interest. For this purpose, data were collected through a questionnaire to the Clinical, Nurse and Training directories of the Portuguese health organizations. Although there are some investigations about knowledge management in the Portuguese context, majorly directed to industrial, hotel and public services contexts, in healthcare the research is still insipient (Cruz & Ferreira, 2016).

The measurements were collected through adapting the questionnaire applied by Jih *et al.* (2006) to the Portuguese context and a wider scope, analysing a multiprofessional perspective. The results establish several conditions that are determinants to high performance both in internal processes and in an overall perspective. It is consistent to reveal that high performance could be achieved through different combinations of conditions, and that there are no significant differences between the combinations in both interest outcomes. The findings highlight the relevance of explicitness and volatility

(knowledge characteristics) in both outcomes of interest and information infrastructure to internal process and incentive programs to overall performance (implementation measures). The study also points the absence of appropriability as relevant in most settings for the outcomes of interest.

Further investigations should be developed to understand more clearly, and comprehensively which causal conditions are most relevant to achieve high levels of knowledge management performance. Managers and policy makers will also be able to take advantage of the results of this study, as it indicates some important points to achieve better levels of performance in knowledge management.

Our analysis will be presented in four separate sections. In the first section, we present some literature review, and the next section describes the sample and the methodology followed. The two last sections present several results from the statistical models applied and, finally, the conclusion that includes an evaluation and presents some contributions for managers and policymakers.

2. Theoretical Background

Knowledge exchange, openness to change and feeling of belonging can determine organizational success. Otherwise, resistance to change can be a cause of failure. Considering the increasing need to assure service quality, it is important to know which combination of variables could help organizations to reach this challenge (Bonomi *et al.*, 2020).

In this chapter, we intend to address the constructs that serve as a basis for our study. We will approach the concepts of knowledge management, knowledge characteristics, implementation measures and knowledge management performance.

2.1. Knowledge Management

By emerging as a new multidisciplinary management area, knowledge management aims to increase the competitive advantage in a highly dynamic, valuable, and scarce knowledge field, viewing it as a critical organizational asset that must be systematically managed (Sharkie, 2003; Ulrich & Smallwood, 2004).

Knowledge management represents a viable strategy that allows healthcare organizations to provide quality care while increasing operational efficiency and addressing political and regulation challenges (Jih *et al.*, 2006).

It seems controversial if we consider that clinical practice and healthcare provision are characterized by intensive use of knowledge constantly changing, which represents an organizational deficit of the utmost importance. The development of complex organizations can't be sustained in a normative, purely downward path. The answer to this challenge requires establishing a movement toward good clinical governance in hospitals that could be the engine to influence the global hospital organization (Sakellarides, 2009).

We could consider that many hospital services involve knowledge-intensive processes related to their ability to solve their patients' health problems, which means that organizational success, in these cases, is related to the effective and efficient way in which they face the management of this knowledge (Jih *et al.*, 2006).

As an intangible asset in organizations, knowledge can lead to competitive advantage. Considering the high complexity of healthcare organizations, with their own characteristics, based on the heterogeneity of health professionals' orientation, networking and decision-making processes, better performance in knowledge management could match with increased productivity and more efficient use of resources (Kamitri *et al.*, 2017). In fact, according to Ferreira *et al.* (2022a), enhancing the value of the resource represents a competitive advantage which leads to better organizational performance.

Knowledge management is central to organizational competitivity due to its relationship with organizational performance through creating competitive advantages. In healthcare contexts, these advantages are translated into greater decision-making support and speed, reduced healthcare-associated errors, increased healthcare quality and cost reduction (Cruz & Ferreira, 2016; El Morr & Subercaze, 2010).

Ferreira *et al.* (2022b) consider that to achieve a competitive advantage, the organization must have valuable, rare, and inimitable resources and be able to exploit them. According to these authors, knowledge represents an organizational resource in both explicit and tacit knowledge maintained by organizations and their professionals.

Knowledge management results from the combination of management and information sciences. This area has already established its own theoretical system and captured the

attention of both theorists and practitioners (Zhao & Pablos, 2011). Knowledge and knowledge management have become prominent areas of organizational management development (Sensuse & Cahvaningsih, 2018).

Knowledge management has acquired consistent prominence in academia and business as it is recognized as a determinant of organizational competitiveness (Cruz & Ferreira, 2016). An enabled organizational environment that allows knowledge generation could improve organizational performance (Oyemomi *et al.*, 2016; Oyemomi *et al.*, 2019). The interest in knowledge management become from the relation between knowledge management and organizational performance, aiming to create sustainable and competitive advantages. Based on this target, this interest is also extended to health organizations (Arias & Hernández, 2008).

There are several advantages of implementing knowledge management programs in health organizations, namely improvement of decision-making and care quality and reduction of clinical errors and costs that, directly or indirectly, seem to contribute to the efficiency and economic sustainability of health systems (El Morr & Subercaze, 2010).

In Portugal, the health system has been subject to reforms since the middle of 80's, searching for efficiency and competitiveness that end with the institution of new management models such as the corporatization of hospitals and the creation of health centers clusters. These changes aim to increase efficiency, determination, organizational and management flexibility, autonomy, responsibility, and continuous healthcare improvement while reducing bureaucracy (Cruz & Ferreira, 2016).

Innovation represents work and requires knowledge and strategy as an effect on the economy and society that implies a change in behaviour or in processes, being closely linked, centred, and driven by the market (Drucker, 2008).

All organizations try to manage innovations in processes to identify and create solutions to their problems. Tidd & Bessant (2009) developed a model of innovation that includes strategy, organization, process, learning and relationships/networking.

We cannot talk about knowledge management dissociated from innovation and the process of diffusion of innovation. The diffusion concept, suggested by Rogers (2003), is like a kind of social change, a process that allows the change of structure and function of a social system. Some consequences produce social change when new ideas or concepts are created, diffused, adopted, or rejected. The "Diffusion Theory" comes up with the necessity of explaining how new ideas diffuse to subjects and how these subjects adopt

them. This adoption process may not be easy, despite inherent advantages. In many knowledge areas, there is a real difference between the most recent evidence and what is effectively put into practice. Generally, there is a large lapse of time from the innovations availability until they are completely adopted and implemented (Dearing & Cox, 2018).

The innovation diffusion process includes decisions, activities and impacts from necessities or problems. In this process, subjects strive to acquire knowledge about an innovation that allows them to take an attitude about her (Rogers, 2003).

The factors that affect the diffusion of innovation could be classified into three categories (Estabrook *et al.*, 2008; Rogers, 2003):

1. **Innovation attributes** – relative advantages: the degree how which innovation is perceived as better than the idea it replaces; costs (monetary, time, others); simplicity (implementing and understanding ease); effectivity (improvement responsiveness/work ability); compatibility (consistency with existing values and established objectives); observability (visibility and control of outcomes) and trialability (the extent to which the adoption is reversible or can be managed in stages);
2. **Characteristics of adopters** – particularly social influence and opinion leaders. We could classify subjects as first adopters (innovators doing so out of excitement at a novelty, free from restrictions, pressures or social norms); early adopters (could be opinion leaders; do it because they consider that innovation advantages outweigh disadvantages), early and late majorities (adhere to innovation by social pressure) and laggards (like first adopters they are less susceptible to social pressure and feel free to take their own rhythm of acceptation or rejection);
3. **Social and politic context** – innovation related to the challenges; how proponents and opponents frame innovation's meaning and importance (social contagion); opportune moment (or not) for implementation.

Implementation is the science that studies what happens before, during and after the adoption of an innovation in an organizational context. Most implementation studies focus on pre-dissemination times to understand how an evidence-based innovation is effective in real conditions and, therefore, a candidate to be disseminated. Otherwise, few studies analyse the behaviour after dissemination to explain the delay in diffusion (Brownson & Colditz, 2018).

An implementer is a person that changes his behaviour to use innovation in practise. In complex organizations, the users do not choose the innovations, leading to low levels of

implementing motivation and, in some cases, sabotage. One of the most important limitations to the diffusion investigation is that we give more attention to the adoption of innovation than to its implementation. In healthcare organizations, the extent, and the quality of how innovation is implemented, and the answer given by the workforce and the customers are at least as relevant as initial adoption (Stirman *et al.*, 2012).

Thus, it becomes relevant to understand how knowledge, its acquisition, and dissemination/implementation in healthcare organizations can contribute to increasing knowledge management performance.

2.2. Knowledge Characteristics

Jih *et al.* (2006) consider that the more relevant knowledge characteristics are the mode (explicit versus tacit or implicit), the complexity, the strength appropriability (ease of diffusion and replication) and volatility (dynamic versus static).

The knowledge spiral model (Nonaka & Taekuchi, 1995) assumes that knowledge development through organizations is dependent on the interconnection between explicit and tacit knowledge in the process of new knowledge creation, whether this process is made by the knowledge conversion from tacit to tacit, from explicit to explicit, from tacit to explicit or from explicit to tacit. This process could follow four different modes: socialization, combination, externalization, and internalization.

Tacit knowledge comes from experience and is subjective as it stems from the values and experience of each subject (named know-how). Conversely, explicit knowledge is based on formal language in manuals, standards, and texts. Somehow it has already been explained, systematized and is ready to be transferred and diffused between subjects or organizations.

Knowledge complexity is determined by its abstract nature, diversified components and by interaction between its components (Soo *et al.*, 2002). The clinical knowledge complexity comes from the big number of factors that could influence the decision-making of a treatment or a care plan, and it is related to the capability to identify what is relevant or not in a sensible area like health and so, it is only available for experts, build by evidence, knowledge and experience that constitute the intellectual capital of healthcare organizations (Jih *et al.*, 2006).

Knowledge appropriability stems from the link between this knowledge and a specific organization, which makes it difficult to expand beyond the limits of this organization (Soo *et al.*, 2002; Teece, 2003). From the system development point of view, the "proprietary" knowledge corresponds to a specific domain and although both specific and independent domains of knowledge are important in problem-solving, the evidence highlights a greater contribution from the specific domain when in the presence of more complex problems (Jih *et al.*, 2006). Thus, the importance of "proprietary" knowledge in healthcare is evident if we consider the specificity and complexity of health problems.

To remain valid, knowledge must have the ability to update itself frequently. The frequency of these actualisations depends on knowledge's static or dynamic nature (Liebowitz & Wilcox, 1997). When we talk about specialized and evidence-based systems, one criterion is that knowledge must be relatively static once it is difficult to assure knowledge updates and validations while keeping the accessibility of the systems. In the healthcare context, this permanent update may influence knowledge acquisition strategies and knowledge management implementation measures.

2.3. Knowledge Management Implementation Measures

Knowledge Management includes knowledge creation, accumulation or capture, organization, selection, and diffusion (Awad & Ghaziri, 2004). Knowledge management projects implementation usually resorts to technical and non-technical measures. The availability of a flexible and efficient information technology infrastructure is one of the must-have features. The subsequent diffusion and application of organizational knowledge are dependent on digital representation, digital storage, knowledge dissemination and application context, also highlighting the role of new knowledge adoption incentive programs that are extremely important to increase sharing and discourage knowledge retention (Davenport & Prusak, 2000; Soo *et al.*, 2002). Organizations must dedicate sufficient resources to encourage continuous learning and permanent update of their professional knowledge matrix (Jih *et al.*, 2006). It is, therefore, relevant to analyse how knowledge characteristics and implementation measures can simultaneously affect knowledge performance.

2.4. Knowledge Management Performance Measure

Measuring results in the scope of knowledge management projects represents an enormous challenge related to the subjective nature of the benefits and the long timeline from implementation to the quantitative measure of results (Abeysekera, 2003; Stone & Warsono, 2003). Although the result of knowledge management projects should be done by measuring the financial impact, this evidence confronts the fact that a significant part of these results is qualitative, allowing just a subjective evaluation. There is also a growing recognition that the success of knowledge management depends on its full integration with organizational objectives (Jih *et al.*, 2006). Integrating knowledge management processes with the other organizational business contributes, at least partly, to measuring their implementation results (Darroch, 2003).

3. Methodology

3.1. Fuzzy-Set Qualitative Comparative Analysis

Qualitative Comparative Analysis (QCA) is a method of looking at processes globally through systems. This methodology is based on Boolean algebra that supports scenario comparisons representing factors' configurations (Ragin, 2000; Ragin, 2008). It allows us to empirically analyse all the relations between the possible combinations of independent and dependent variables (Hajek & Stejskal, 2017). Each case is considered as a configuration of causal conditions and outcome. The outcome is the result of related conditions playing a comprehensive role and not the result of a condition acting alone (Fiss, 2011; Ragin, 2008). It helps to identify complex causal relationships resulting from the interdependence between variables. The results imply that the respective relationships between the variables are mostly asymmetric, and thereby different causal configurations can lead to the result (Espinosa & Lindahl, 2016).

The most used analysis methods of QCA include crisp-set qualitative comparative analysis (csQCA), multi-value set qualitative comparative analysis (mvQCA) and fuzzy-set qualitative comparative analysis (fsQCA).

The fsQCA analysis is a methodology oriented to diversity that led us to understand the different paths to a certain outcome (Shipley *et al.*, 2013). Instead of traditional

quantitative methodology centred on correlations, fsQCA intends to analyse the interdependence of causal conditions and the supposed causality represented by a certain configuration (Ragin, 2008; Rihoux and Ragin, 2009). The fsQCA model recognizes equifinality in all configurations, meaning that the same outcome can result from more than one configuration (Misangyi & Acharya, 2014). Considering these assumptions, fsQCA could help understand the heterogeneity between cases and the complexity of the different configurations (Furnari *et al.*, 2021).

To operationalize the fsQCA model, we need to regard the best practices. Douglas *et al.* (2020) and Greckhamer *et al.* (2018) tell us that we need to begin by extracting the casual conditions from the theoretical analysis, which could be done by analysing theory and evidence in existing studies. Then, we need to collect data. Text textual cases, secondary data, and questionnaires can provide this step. After collecting data, we must calibrate the variables, converting them into a set. Then, we analyse the presence of necessary conditions, build a true table, and proceed to a standardized analysis. At last, we must evaluate the results This methodology does not include input restrictions on the sample size (Fiss, 2011).

Based on this reasoning, we apply the fsQCA methodology to evaluate the sufficient and necessary conditions that explain the high performance of knowledge management as an outcome of interest.

3.2. Variables

Based on previous studies and theoretical background, the variables' knowledge characteristics, implementation measures and knowledge management performance were extracted to build our knowledge management model (see figure 1), using fsQCA to analyse the combination relationship between variables.

To operationalize the variables and, once again, considering the proposal of Jih *et al.* (2006), were considered the following dimensions presented in table 1.

3.3. Data

Data were collected by applying a questionnaire (see annex 1) to the Clinical, Nurse and Training directories of the Portuguese health organizations. The measurements were

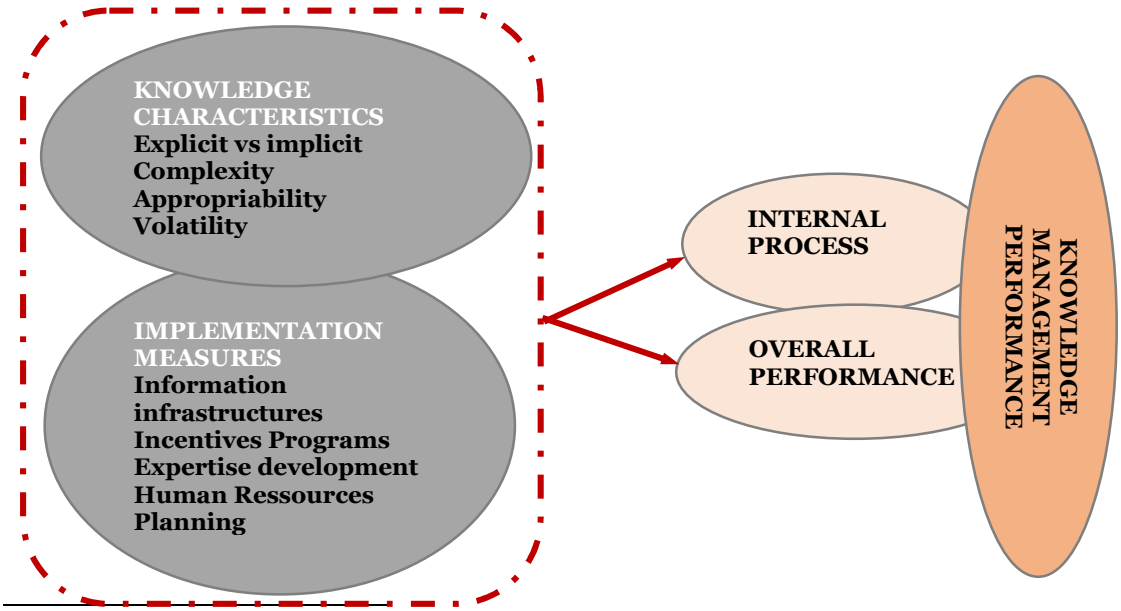
collected through the adaptation of the questionnaire applied by Jih *et al.* (2006) to this reality, to the Portuguese context and to a wider scope, analysing a multiprofessional, rather than a medical perspective.

To ensure all ethical precepts, we build a research protocol that was submitted and approved by the University of Beira Interior Ethics Committee (Annex 2).

Data collection was carried out by sending the questionnaire, in a google forms link, by electronic mail to a list of 156 Portuguese public, private and social health organizations, providing primary and hospital health care[1], to three entities: Director Nurse/Clinical Council Nursing Member, Clinical Director/Clinical Council President and Training Center Director. We got 101 answers out of 468 (156 x 3) possible, representing a response rate of 21.6%. All the answers were considered valid.

The choice for the Portuguese health organizations was guided by the interest of the investigators and by the low level of investigation made in this area, which constitutes an important gap, that we intend to fill.

The questionnaire includes three parts. In the first part, we collected the demographic characterization of the sample, and in the second part, we collected the organizational characterization. The data collected in these two first parts contribute to the demographic and organizational characterization of the sample (see table 2). In the third part, in forty-four questions measured by a five-point Likert scale (1 -Highly disagree/much worst; 5 – Highly agree/much better), we measured the causal conditions and the outcome (see tables 1 and 3).



[1] accessed at sns.gov.pt, infarmed.pt and acss.min-saude.pt in October 2021

Figure 1 – Model of relations between the variables

Table 1 - Variables and dimensions

Variables	Dimensions	Items
Knowledge Characteristics *(1 = Highly Disagree, 5 = Highly Agree)*	***Knowledge mode/explicitness***	1. Documentation has been created for all professional expertise. 2. Care service delivery processes have formal specifications. 3. Professional's practice experience may be documented in writing. 4. Professionals can share their expertise without any obstacles.
	Complexity	1. Major critical operations are accomplished by task force teams. 2. Significant differences of expertise exist among the professionals in the same specialty. 3. Outside experts often are called upon to assist with major critical operations. 4. Mutual support among professionals within the same specialty usually is difficult to come by.
	Appropriability	1. Professional expertise is integrated tightly with hospital management and organizational culture. 2. Outsourcing often is used due to inadequacy of medical expertise. 3. Innovations of professional practices are difficult to be obtained by competition.
	Volatility	1. Professionals are expected to remain up to date with data in their expertise. 2. The frequency of rare case treatment experience is higher than the competition. 3. New and innovative medical knowledge and technology are adopted faster than competition. 4. Knowledge used around here advances fast.
Implementation measures *(1 = Highly Disagree, 5 = Highly Agree)*	***Information infrastructure***	1. Information systems are developed aggressively to enable organization, dissemination, and application of knowledge. 2. Professionals are strongly encouraged to access document bases and to systematically construct medical databases. 3. Operation automations through information technology are pursued actively to support professional's work. 4. Substantial amounts of financial resources are invested in information technology. 5. Professionals are encouraged to use the Internet to enhance medical expertise exchange and diffusion.
	Knowledge sharing incentive programs	1. Knowledge sharing is an important criterion in performance evaluation. 2. Proposals for creative ideas are rewarded, even when the ideas prove to be wrong. 3. Knowledge creation and sharing often are rewarded with salary increases and bonuses. 4. Knowledge creation and sharing are rewarded with promotions.
	Expertise development	1. Professionals always are willing to accept training and work assignments that are tougher than the competition. 2. The organization is not hesitant to increase head counts of supporting technical specialists. 3. Professionals are willing to accept the challenges to enhance their professional expertise. 4. Professionals often explicitly reject the idea of being evaluated by personnel from other fields. 5. Competition among professionals in the same field often hinders knowledge sharing.
	Human resources planning	1. Professionals are strongly encouraged to learn and to innovate. 2. Open and smooth channels of communication exist in the hospital. 3. Professionals frequently are encouraged to engage themselves in experience and expertise exchange. 4. One-on-one mentor and apprentice-style training of resident professionals is common here.
Performance measures *(5 = Much Better, 3 = About the Same, and 1 = Much Worse)*	***Internal process*** improvement: communication and efficiency (e.g., employee interaction and participation)	1. Professional's expertise and experience exchange 2. Handling of professional's suggestions with regard to medical operations 3. Professionals sense of participation 4. Decision-making speed 5. Proposal preparation cycle time 6. Overall efficiency improvement
	Overall performance (e.g.,	1. Overall quality of service 2. Patient satisfaction

Variables	Dimensions	Items
	service quality and customer focus)	3. Decrease of number of administrative personnel 4. Reduction of impact caused by turnover 5. Handling of care service improvement projects

Table 2 - Demographic and organizational characterization of the sample

ATRIBUTE	CLASSIFICATION	RATIO
AGE	< 40	18.8%
	41-50	32.7%
	51-60	32.7%
	> 61	15.8%
GENDER	Male	32.7%
	Female	67.3%
ROLE	Director nurse	27.7%
	Clinical council nursing member	17.8%
	Clinical director	11.9%
	Clinical council president	9.9%
	Training Center director	14.9%
	Other	17.8%
PROFESSIONAL AREA	Nurse	60.4%
	Doctor	31.7%
	Other	7.9%
ORGANIZATION TIPOLOGY	Public	91.1%
	Private	6.9%
	Social	2%
CLINICAL ACADEMICAL CENTER/UNIVERSITARY HOSPITAL	Yes	22.8%
	No	77.2%
EMPLOYES NUMBER	< 250	19.8%
	250-500	22.8%
	500-1000	19.8%
	> 1000	37.6%

3.4. Data Calibration

Data calibration is a process of converting our variables into fuzzy sets ranging from 0 to 1. Considering this assumption, we need to categorize cases as full-member (fuzzy score 1), full-non-member (fuzzy score 0) and intermediate set (fuzzy score 0.5). The intermediate set could be considered both member and non-member, and this cross over point is considered the point of maximum ambiguity as to whether a case is further inside or outside the defined target. A standard approach is based on the fuzzy values of 0.95, 0.05 and 0.5 for full member, non-member and the point of maximum ambiguity, respectively, and those values can be determined by the 95th, 5th and 50th percentiles of the values in the original distribution of each variable (Ragin, 2008, Pappas & Woodside, 2021). In our study we follow this approach recommendation.

Table 3 – Descriptive statistical analysis of the variables

Variable	Mean	Std. Dev.	Minimum	Maximum	N. Cases	Missing
Explicitness	0.50	0.31	0.00	0.95	101.00	0.00
Complexity	0.53	0.27	0.01	0.99	101.00	0.00
Appropriability	0.45	0.28	0.02	0.99	101.00	0.00
Volatility	0.52	0.29	0.02	0.98	101.00	0.00
Information Infrastructures	0.45	0.30	0.01	0.99	101.00	0.00
Incentive Programs	0.44	0.30	0.01	1.00	101.00	0.00
Expertise Development	0.52	0.31	0.02	0.99	101.00	0.00
Human Resources Planning	0.50	0.29	0.01	0.98	101.00	0.00
Internal Processes Performance	0.51	0.31	0.00	0.97	101.00	0.00
Overall Performance	0.49	0.27	0.00	0.98	101.00	0.00

4. Results

4.1. Analysis of Necessary Conditions

The necessity of a condition is determined by the indispensability of its presence for the intended result. A consistency greater than 0.9 points that a condition/variable is relevant to determine a necessary condition. On the other hand, a sufficient condition requires a consistency value of at least 0.8 (Ragin, 2008). For this study, we followed this recommendation. The analysis of the necessary conditions, exposed in table 4, shows us that there are none necessary conditions for the outcomes of interest once all the antecedent conditions are below 0.9.

4.2. Configurational Analysis

To identify the different and achievable combinations of causal conditions, we build a truth table based the thresholds frequency and consistency. Frequency specifies the minimum cases considered in a configuration to be included in the sufficiency analysis.

Our analysis considers a frequency threshold of one case, typically in small N studies (Grekhamer *et al.*, 2013; Ragin, 2006). On the other hand, the consistency threshold specifies the minimum consistency that a given configuration needs to suggest a relationship with the occurrence of the interesting outcome. We consider a consistency threshold of 0.80, in line with the literature that assumes a reasonably well-stablished consistency benchmark ⩾ 0.80 for raw consistency (Ragin 2000; Ragin, 2008).

Table 4 – Necessary conditions

	Internal Processes		**Overall Performance**	
	Consistency	Coverage	Consistency	Coverage
Explicitness	0.736811	0.739557	0.724103	0.708766
~ Explicitness	0.562524	0.575685	0.605891	0.604679
Complexity	0.697538	0.67181	0.717892	0.674256
~ Complexity	0.612348	0.654826	0.680825	0.709987
Appropriability	0.603165	0.678163	0.621118	0.681019
~Appropriability	0.714927	0.659517	0.774394	0.696647
Volatility	0.752442	0.736047	0.790022	0.753631
~Volatility	0.548652	0.576828	0.581847	0.596549
Information Infrastructure	0.714537	0.797253	0.683029	0.743187
~ Information Infrastructure	0.596131	0.553419	0.667802	0.604571
Incentive Programs	0.685814	0.782783	0.672209	0.748216
~ Incentive Programs	0.610199	0.556089	0.685234	0.608974
Expertise Development	0.76905	0.75359	0.774594	0.740187
~ Expertise Development	0.52755	0.553619	0.589261	0.603035
Human Resource Planning	0.796795	0.810252	0.749349	0.743095
~ Human Resource Planning	0.529308	0.534636	0.638149	0.628577

Tables 5 and 6 contain the results of the configurational analysis of respectively ***Internal Process Performance (IPP)*** and ***Overall Performance (OP),*** which includes both parsimonious and intermediate solutions. Core conditions represent conditions included in both solutions, while those solutions that only appear in the intermediate solution are considered peripheral conditions (Fiss, 2011) Core conditions are represented by large circles, while small circles represent the peripheral conditions. Black circles ("●") represent the presence of a condition, and circles ("○") indicate its absence. Blank spaces indicate "don't care" situations where the presence or absence of the causal condition don't make difference in the outcome.

The results of configurational analysis establish (see table 5) thirteen configurations that lead to high levels of ***IPP***. In terms of presence, we need to highlight explicitness, volatility, information infrastructure and expertise development. In terms of absence/don't care the highlight goes to appropriability and incentive programs. Raw

coverage ranges from 0.202 to 0.419, which means that the causal configurations are not equally represented, even if they all achieve acceptable consistency (0.809 – 0.944). Approximately 66.3% of the outcomes lead to high ***IPP*** (overall coverage of 0.663) and the configuration set, assumes the consistency of 0.812. Configuration 1 includes the "core" presence of explicitness, volatility and information infrastructure, the "peripheral" presence of complexity, expertise development and human resource planning, and the do not care situation for an incentive program. This configuration led us to the highest raw coverage (0.419) and unique coverage (0.094), so it is the configuration most frequently associated with a high level of ***IPP***.

Looking at the results of the configurational analysis that lead to high levels of ***OP*** (see table 6), our study establishes fourteen configurations. In terms of presence, we need to highlight volatility. Regarding absence/don't care, the highlight goes to appropriability and incentive programs. Explicitness, complexity and expertise development are in an intermediate position as they are present in seven configurations and absent in the other seven. Raw coverage ranges from 0.213 to 0.403, which means that the causal configurations are not equally represented, even if they all achieve acceptable consistency (0.819 – 0.976). Approximately 69.6% of the outcomes lead to high ***OP*** (overall coverage of 0.696) and this solution assumes consistency of 0.793. Configuration 1 includes the "core" presence of explicitness and volatility, the "peripheral" presence of complexity, expertise development and human resource planning, and the do not care situation for appropriability, information infrastructure and incentive program. This configuration gives us the highest raw coverage (0.403) and unique coverage (0.069), so this configuration is the most frequently associated with a high level of ***OP***.

Results show that both configuration and particular cases for different outcomes (IPP and OP), are similar in thirteen solutions, and only one solution and a different case are added to OP configuration (see tables 5,6 and 7).

Twenty-one of all the twenty-three cases present in both high IPP and OP solution represents public organizations; five cases represent organizations linked with clinical academic centers/universitary hospitals; sixteen cases represent nurses; seven cases represent the male gender.

Table 5 - Configurational analysis of internal process performance

	1	2	3	4	5	6	7	8	9	10	11	12	13
CM Explicitness	●	○	●	●	●	○	○	●	○	○	○	●	●
COMPM Complexity	•	•	•	•	○	○	○	○	•	•	○	○	○
AM Appropriability		○	○	○	○	○	○	○	•	•	•	•	○
VM Volatility	●	○	●	●	○	○	●	●	●	●	●	○	○
IIM Information Infrastructure	●	●	●		○	○	○	○	●	○	●	●	●
PIM Incentive Program			○	○	○	●	○	●	○	○	●	○	●
DPM Expertise Development	•	○		•	○	○	•	○	○	•	•	•	•
PRHM Human Resource Planning	•	•	•	•	○	○	○	○	○	○	○	•	•
Consistency	0.944	0.929	0.939	0.953	0.809	0.884	0.885	0.936	0.922	0.815	0.961	0.932	0.962
Raw coverage	0.419	0.225	0.287	0.284	0.209	0.203	0.217	0.202	0.211	0.213	0.216	0.246	0.245
Unique coverage	0.094	0.019	0.013	0.009	0.007	0.012	0.008	0.008	0.014	0.009	0.015	0.015	0.015
Overall solution consistency	0.812												
Overall solution coverage	0.663												
Consistency cutoff	0.809												

Table 6 - Configurational analysis of overall performance

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CM Explicitness	●	○	●	●	●	○	○	○	●	○	○	○	●	●
COMPM Complexity	•	●	●	●	○	●	○	○	○	•	•	○	○	○
AM Appropriability		○	○	○	○	○	○	○	○	•	•	•	•	○
VM Volatility	●	○	●	●	○	○	○	●	●	●	●	●	○	○
IIM Information Infrastructure		•	•		○	○	○	○	○	•	○	•	•	•
PIM Incentive Program			○	○	○	○	●	○	●	○	○	●	○	●
DPM Expertise Development	•	○		•	○	○	○	•	○	○	•	•	•	•
PRHM Human Resource Planning	•	•	•	•	○	○	○	○	○	○	○	○	•	•
Consistency	0.886	0.882	0.959	0.955	0.869	0.819	0.920	0.935	0.965	0.929	0.846	0.976	0.939	0.959
Raw coverage	0.403	0.219	0.301	0.291	0.230	0.238	0.217	0.235	0.213	0.218	0.227	0.225	0.254	0.250
Unique coverage	0.069	0.006	0.017	0.009	0.014	0.009	0.007	0.017	0.008	0.012	0.011	0.016	0.016	0.014
Overall solution consistency	0.793													
Overall solution coverage	0.696													
Consistency cutoff	0.819													

Table 7 – Case-solution relationship

Internal Processes Performance				**Overall Performance**			
Solution	Case	Solution	Case	Solution	Case	Solution	Case
1	4,29,30,32,51, 54,68,72,82	**7**	99	**1**	4,29,30,32,51, 54,68,72,82	**8**	99
2	15,61	**8**	55	**2**	15,61	**9**	55
3	8,32	**9**	94	**3**	8,32	**10**	94
4	32,90	**10**	77	**4**	32,90	**11**	77
5	58	**11**	39	**5**	58	**12**	39
		12	21	**6**	17	**13**	21
6	33	**13**	11	**7**	33	**14**	11

4.3. Robustness Test

Testing the robustness of the analysis is an essential key in QCA research and includes various methods (Fiss, 2011; Wu *et al.*, 2021). The most used includes the reasonable adjustment in settings of relevant parameters, such as calibration, minimum case frequency and consistency threshold values, posteriorly analysing the adjusted data and comparing the configuration changes to evaluate the reliability of the results (Leppännen *et al.*, 2019; Wu *et al.*, 2011). The analysis results can be considered reliable if the adjustment of parameters does not result in substantial changes in the number, composition, consistency and coverage of configurations (Greckhamer *et al.*, 2018). In this study, the robustness test was carried out by adjusting the consistency level (increased from 0.8 to 0.9 – annex 3). For evaluating the fsQCA robustness result, we used the two set-theoretic-method-specific dimensions proposed by Schneider and Wagemann (2012). First, these authors presume that if the parameter adjustment results in marginal differences in consistency and coverage, the results can be considered robust. Second, if the parameter adjustment results in clear subset relation between different solution terms, then results can be interpreted as robust, even if these solution terms look quite different.

5. Discussion

This research identifies key attributes from knowledge characteristics and implementation measures and their contribution to knowledge management and its performance at the ***IPP*** and ***OP.*** The findings establish that high knowledge management performance at these two levels is related to a multiple solution set and that organizations can achieve this high performance with different combinations of knowledge characteristics and implementation measures.

Considering knowledge characteristics, our study represents them in four dimensions: knowledge mode (explicit vs. tacit), knowledge complexity, strength knowledge appropriability (ease of replication and transferring) and knowledge volatility (dynamic vs. static).

We found a core contribution of explicitness to both IPP and OP outcomes. Explicit knowledge is structured knowledge that represents know-what and is ready for easy storage, processing and formal diffusion. In turn, tacit knowledge is presented in a subjective form and needs to be structured before it can be formally stored and processed. It represents *know-how*, ideas, insights values and judgements of individuals, and its diffusion is driven by socialization, mentorship, and apprenticeship (Know-how) (Bahar & Bahari, 2016; Baloh, 2007; Bose, 2003; Sanford *et al.*, 2020, Zeng *et al.*, 2022). According Bahar & Bahari (2016), knowledge in healthcare organizations is available in databases, documents like clinical practice guidelines, standard operating procedures, individual experts, and network practitioners. Kothari *et al.* (2012) refers that explicit knowledge represents a core contribution to the evidence-based practice instead it demands critical appraisal before utilization. In the same line, Engel *et al.* (2019) suggest that the challenge for organizations lies in their ability to balance evidence-based practice that requires explicit knowledge and patient-centred care based on tacit knowledge, experience sharing and socialization.

The complexity of clinical knowledge and high precision of the clinical decisions-making, requires organization and consolidation of the knowledge management process. This is high knowledge management performance, in healthcare contexts (Belay *et al.*, 2021; Sousa *et al.*, 2020; Wills *et al.*, 2010). This is in line with our research that shows complexity as part of most solutions, with more influence in OP, where it assumes a core contribution.

To analyse the absence of appropriability in most solutions of our study, in both interest outcomes, we need to focus on the relation between innovation and collaboration in the knowledge-intensive business services, where technical or professional knowledge represents their capability to solve the client's problems (Arundel *et al.*, 2007; Chesbrough, 2011; Miles, 2005). Miozzo *et al.* (2016) highlight the importance of collaboration in innovation while assuming that organizations should not completely neglect formal appropriability mechanisms. According to the same authors, appropriability should not be overly formalized in the services sector, balancing this relationship to guarantee, on the one hand, ownership of assets and, on the other hand, sharing and collaboration in innovation. Here, we could include the concept of coopetition, described by Bengtsson & Kock (2000) as the way organizations can be involved and benefit from cooperation and competition. Santos *et al.* (2021) concluded that promoting knowledge through coopetition is an important path that allows organizations to achieve and sustain their competitive advantages.

In healthcare contexts, the absence of appropriability could be linked to the collaborative character of the sector, where the answer to the patients' problems, the knowledge sharing, and the co-production of knowledge overlap the ownership, the patent, and the proprietary knowledge. In certain contexts, when organizations are embedded in low geographic and organizational research & development networks, innovation search could replace knowledge appropriability (Ding & Wu, 2022). This is more relevant when we analyse a context with a predominant public health service, as the Portuguese.

The results also show the core contribution of volatility in the high ***IPP*** and ***OP***. Knowledge must be able to update itself to remain valid and top management has to facilitate dynamic knowledge creation (Liebowitz & Wilcox, 1997; Nonaka & Toyama, 2002, Sousa *et al.*, 2020). But, when we talk about specialized and evidence-based systems, one criterion is that knowledge must be relatively static once it's difficult to assure knowledge updates and validations at the same time that we keep the accessibility of the systems (Jih *et al.*, 2006; Sousa *et al.*,2020). Based on this analysis and in our results, we can assume that, in healthcare contexts, we need to find a perfect balance between explicit – tacit and dynamic - static knowledge characteristics since this is an area of specialized and evidence-based knowledge on the one hand. Still, it is also an area where knowledge is in permanent and quick update in the other hand.

Regarding knowledge management implementation measures, we represent them in four areas: information infrastructure, incentive programs, expertise development and human resource planning. According to Jih *et al.* (2006), the three first areas are linked

with three basic entities of knowledge management programs: people (incentive programs), knowledge (expertise development), and technological tools (information infrastructure); in turn, human resource planning corresponds to both people and knowledge entities.

Information infrastructures represent a fundamental path of knowledge management specially for evidence-based practice, as it is essential to allow the professionals to achieve the right information at the right time (El Morr & Subercaze, 2010; Shalom *et al.*, 2022). In this sense, information infrastructures play an important role as healthcare professionals' networks are essential to the diffusion of technical skills, academic and cultural knowledge, know-how and administrative skills. Healthcare organizations should leverage these networks as a means of spreading the most recent evidence and the best practices adapted to the patient context (Addicot *et al.*, 2006; Bahar & Bahari, 2016; Brice & Gray, 2003; Gabbay *et al.*, 2003; Shalom *et al.*,2022). Our study highlights the information infrastructures core presence on ***IPP*** and peripheral presence on ***OP***. These findings could be explained by the relevance of information infrastructures in the optimization of communication, problem-solving, decision-making time and professional participation, which inherently will influence the service quality, customer focus and patient satisfaction.

Incentive programs represent an important gate to promoting knowledge sharing and retention until processes become assimilated as organizational norms (Liebowitz, 2003). Still, these programs can become a barrier to knowledge management practices if they are not structured to motivate and reward the creation of new knowledge, but also to share it and help other units or organizations (Gold *et al.*, 2001). Jacobs *et al.* (2010) concluded that inadequate funding for evidence-based programs, policies that do not support evidence-based interventions and a lack of incentives or rewards that promote evidence-based decision-making were the most relevant organizational barriers to their implementation. The core presence of incentive programs in some IPP and OP solutions could be associated with the complexity of processes and organizational norms assimilation in healthcare organizations and with the essential role of evidence-based decision-making practice.

Concerning expertise development, we need to focus on the concepts of exploitation and exploration. To ensure harmony between the knowledge-creating process (exploration) and the process of replicating or reusing that knowledge (exploitation), organizations must use exploitation tools in exploration activities, using similar mediation elements, such as technological equipment and technical-scientific terminology. Firms with this

capability are called ambidextrous organizations (Hansen *et al.*, 2018; Oshri *et al.*, 2006). This means that an exploitation activity can also be an exploration activity if management creates the conditions for learning and development (Oshri *et al.*, 2006). As we found in our study, expertise development plays a peripherical role in both ***IPP*** and ***OP***. Still, it is present in their solutions and must be considered by organizations when planning their knowledge management strategy, balancing the relationship between exploitation and exploration.

Human resources planning strategy represents a combination of consistent and complementary practices aligned with strategic organizational objectives. However, human resources strategies are dependent on other factors such as organizational size, available resources, leadership climate, internal politics and power structures, structural inertia and cultural considerations, which contribute to hampering the alignment of human resources planning with the knowledge management strategies established by the organization (El-Farr & Hosseingholizadeh, 2019). Developing and maintaining long-term human resources planning is critical to building and sustaining a workforce capable of ensuring an effective response to the population's health problems (Martineau *et al.*, 2022). Our findings show the peripherical presence of human resource planning contributes to the interest outcomes. Therefore, organizations should pay attention to this area, considering and adjusting their human resource planning strategies according to their strategic objectives and their structural, cultural, and organizational characteristics.

Knowledge management performance has a clear impact on healthcare finances, healthcare management, quality of care, patient safety, and it influences how health professionals work, learn, and develop or seek knowledge (Kosklin *et al.*, 2022). Knowledge management should have an impact on the results, improving patient safety and quality performance in health care (Candra & Putrama, 2018; Choo *et al.*, 2007; Paul, 2006), with high importance given the need to guarantee sustainability, imposing limits on public health financing (Camilleri & O'Callaghan, 1998; Kivisaari *et al.*, 2004; Porter & Teisberg, 2004). In our study, we analyse ***IPP*** and ***OP***, and we can consider ***IPP*** a precursor of ***OP*** since ***IPP*** represents the optimization of communication, problem-solving, decision-making time and professional participation and ***OP*** represents service quality, customer focus and patient satisfaction, which are, in fact, the outcome of interest in healthcare providing.

5.1 Theoretical and Practical Implications

The present study has practical and theoretical implications. Regarding the evolution of the scientific literature, the results presented are a point of comparison with future studies carried out in other samples and cultural and organizational contexts. It aims to provide a process that will add to other models of knowledge management performance, based on a configurational approach with fsQCA methodology, focused on necessary and sufficient conditions for high knowledge management performance (Douglas *et al.*, 2020; Espinosa & Lindhal, 2016; Fiss, 2011; Furnari *et al.*, 2021; Greckhamer *et al.*, 2018; Hajek & Stejskal, 2017; Misangyi & Acharya, 2014; Pappas & Woodside, 2021; Ragin, 2000; Ragin, 2008). The development of this model can help healthcare professionals and management to evaluate their current knowledge management processes and the potential to improve their knowledge performance further. Practitioners can use the informative concepts and solutions that come from this study to make deeper and richer assessments of how they build, diffuse, capture and implement knowledge, dealing with the specificities of their knowledge characteristics.

Practitioners and policymakers should reflect on the results that present us with health organizations with higher performance in knowledge management that reveal the predominance of formal, complex, dynamic, and non-proprietary knowledge (Baloh, 2007; Ding & Wu, 2022; Miozzo *et al.*, 2016; Nonaka & Toyama, 2002; Sanford *et al.*, 2020; Sousa *et al.*, 2020; Zeng *et al.*, 2022). On the other hand, these organizations use information infrastructures that guarantee knowledge availability, storage and sharing (Bahar & Bahari, 2016; El Morr & Subercaze, 2010; Gabbay *et al.*, 2003; Shalom *et al.*, 2022). They also ensure incentive policies that increase professionals' commitment to systematizing operating rules and procedures (Liebowitz, 2003; Jacobs *et al.*, 2010). Expertise development and human resources planning must be considered in this equation. The first can be important to deal with the unpredictability of clinical situations and patient-centered care, and the second must consider the objectives and the organizational context to achieve higher efficiency and effectiveness (El-Farr & Hosseingholizadeh, 2019; Hansen *et al.*, 2018; Martineau *et al.*, 2022; Oshri *et al.*, 2006).

Knowledge characteristics and knowledge management implementation measures represent relevant antecedents of knowledge management performance, so policies should consider the ability of health organizations to deal with the particularities of these two variables in their specific context. The main result of this approach comes from the evidence that different paths could induce the same outcome of interest. This means that

there are many solutions to face the singular organizational and contextual characteristics, which allows them to reach the same high knowledge management performance. Thus, policies and knowledge management programs need to be designed, according to these organizational and contextual characteristics, to endow the organizations with the resources to achieve high efficiency and effectiveness, high service quality, patient satisfaction and safety (Camilleri & O'Callaghan, 1998; Candra & Putrama, 2018; Choo *et al.*, 2007; Kivisaari *et al.*, 2004; Kosklin *et al.*, 2022; Paul, 2006; Porter & Teisberg, 2004).

6. Conclusion

Knowledge characteristics and knowledge implementation measures can impact knowledge performance in the internal processes and overall. While ***Internal Processes Performance*** focuses on communications and efficiency improvement measures, such as problem-solving time, employee participation, decision-making cycle time, and employee interaction, ***Overall Performance*** is about service quality, customer focus, absenteeism, and patient satisfaction.

This study aimed to analyse knowledge management performance in healthcare organizations through the relation between knowledge characteristics, implementation measures and knowledge performance using a *Fuzzy-set Qualitative Comparative Analysis*. This methodology, focusing on necessary and sufficient conditions for high knowledge management performance, allowed us to advance theory to this emerging topic.

Our results show that the presence of explicit and volatile knowledge is the most relevant in terms of knowledge characteristics, both in the ***Internal Processes Performance*** and ***Overall Performance***. Complexity is present in both outcomes, but it appears only in ***Overall Performance*** configuration as core solution and in the ***Internal Processes Performance*** configuration as a peripheral solution. On the other hand, appropriability seems absent from most solutions for high performance in these two aspects under study. The challenge for organizations is to face, on the one hand, the ability to balance evidence-based practice (explicit knowledge) and patient-centered care (tacit knowledge), as well as static and dynamic knowledge and, on the other hand, deal with the complexity of clinical decisions and the knowledge sharing relevance in a context where this should overlap the knowledge ownership.

Regarding implementation measures of knowledge management, our study seems to demonstrate relevance of information infrastructures and incentive programs in the ***Internal Processes Performance***, while only the incentive programs are highlighted in the ***Overall Performance***. Expertise development and human resource planning appears in this study as peripheral solutions. However, while they are not core solutions for high-performance outcomes, they contribute to them. The challenge for organizations involves investing in these four areas. Information infrastructures are extremely important to optimize communication, problem solving and decision making. Incentive programs seems to be essential to deal with the complexity of processes and the difficulty in systematizing standards, guidelines and operating procedures. Through expertise development, organizations can be more competitive, balancing their exploitation and exploration capabilities. Human resources planning should be dynamic and adapted according with their objectives, structure, cultural and organizational context.

Our study presents several limitations that could become opportunities for further research development. First, including a limited sample (n=101) we cannot confirm the predictive validity of the results. Second, the analysis was centered on a management perspective and has not considered the practitioner's view. Third, the methodology has analyzed the joint contribution of knowledge characteristics and implementation measures and not the isolated contribution of each of them to the outcomes of interest.

Further investigation should be conducted in a wider sample, which includes both management and practitioners' perspective and could be combined with other traditional variance-based approaches. Likewise, other studies using these variables should be conducted, applying the *fuzzy-set Qualitative Comparative Analysis* methodology, but analyzing how knowledge characteristics influence implementation measures and how, in turn, these will impact knowledge management performance.

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Annex 1 - Questionnaire

FACULDADE DE CIÊNCIAS SOCIAIS E HUMANAS

DEPARTAMENTO DE GESTÃO E ECONOMIA

2º Ciclo Gestão de Unidades de Saúde

A performance da gestão do conhecimento nas organizações de saúde

Mestrando: Nuno Miguel Maia Pereira, aluno n.º M11150

Orientador: Professor Doutor João Ferreira

O presente questionário encontra-se integrado num estudo de investigação do 2º Ciclo em Gestão de Unidades de Saúde em que o objetivo geral consiste em analisar a performance da gestão do conhecimento nas organizações de saúde.

A gestão do conhecimento assume um papel central na competitividade organizacional pela sua relação com o desempenho organizacional e pela criação de vantagens competitivas.

Sendo as organizações de saúde caracterizadas por elevada complexidade, com características próprias atendendo aos profissionais de saúde, às redes e aos processos de tomada de decisão, um melhor entendimento da gestão do conhecimento pode corresponder a um aumento da produtividade e a um uso mais eficiente dos recursos.

Este questionário é direcionado a Enfermeiros Diretores, Diretores Clínicos e Diretores do Serviço de Ensino e Formação das Organizações de Saúde portuguesas. As suas respostas serão utilizadas para tratamentos estatísticos, estando os dados protegidos por lei, garantindo o seu anonimato e confidencialidade.

Vimos pedir-lhe que colabore connosco, pois sem a sua participação não será possível concretizar com êxito este projeto.

O que solicitamos é a sua colaboração no preenchimento do questionário em anexo, do qual não resultam benefícios, riscos, contrapartidas ou inconvenientes.

Este trabalho não está dotado de qualquer apoio financeiro, não existindo benefícios financeiros ou outros, diretos ou indiretos, reais ou potenciais, presumíveis para além dos científicos / académicos.

A sua confidencialidade está garantida sendo que apenas os investigadores têm acesso aos seus dados pessoais, os quais, em todo o caso, não serão divulgados, pois serão utilizados sob codificação.

A participação que solicito é voluntária, isto é, não se sinta obrigado a participar, e pode decidir não participar desde o primeiro momento ou noutro qualquer, sem que daí advenham quaisquer prejuízos para si em qualquer perspetiva.

Uma vez que a sua decisão de participar é voluntária, livre, e informada pelo presente documento, mas também esclarecida em tudo o que tiver dúvidas, qualquer pergunta, dúvida ou informação adicional de que necessite para a sua decisão poderá ser-me colocada ou transmitida através do contacto telefónico 963258808 ou do correio eletrónico nuno.miguel.maia.pereira@ubi.pt

Agradeço desde já pela sua participação e colaboração neste estudo.

PARTE I – DADOS DEMOGRÁFICOS

1. Idade _____

2. Género

Masculino ☐ Feminino ☐

3. Função na Organização

Enfermeiro Diretor ☐ Diretor Clínico ☐ Presidente do Conselho Clínico ☐

Vogal de Enfermagem do Conselho Clínico ☐ Responsável pela área de inovação, ensino e formação ☐ Outro ☐

Se respondeu outro, especifique qual. _____

4. Área de formação

Enfermeiro ☐ Médico ☐ Outro ☐

Se respondeu outro, especifique qual. _____

PARTE II - CARACTERIZAÇÃO DA ORGANIZAÇÃO

1. **Que tipo de Organização representa?**

Pública ☐ Parceria Público-privada ☐

Social ☐ Privada ☐

2. **A organização está associada a um Centro Académico Clínico ou a um Hospital Universitário (Decreto-lei n. º61/2018 de 3 de agosto)?**

Sim ☐ Não ☐

3. **Qual o número de funcionários da organização?**

Menos de 250 ☐ 250-500 ☐ 500-1000 ☐ Mais de 1000 ☐

4. **Em que distrito, a organização, desenvolve a atividade?**

_____

5. **Se se trata de um Hospital público, qual a classificação da organização, de acordo com a Portaria n.º 82/2014 de 10 de abril, do Ministério da Saúde?**

Grupo I	Grupo II	Grupo III	Grupo IV

PARTE III – CARACTERISTICAS DO CONHECIMENTO

Discordo Totalmente	Discordo Parcialmente	Não Concordo Nem Discordo	Concordo Parcialmente	Concordo Totalmente
1	2	3	4	5

	1	2	3	4	5
1. A documentação existente foi criada para todos os profissionais.					
2. Os processos de prestação de cuidados obedecem a especificações formais					
3. A experiência prática dos profissionais pode ser documentada por escrito.					
4. Os profissionais podem partilhar os seus conhecimentos profissionais sem quaisquer obstáculos.					
5. As situações mais críticas são realizadas por equipas de *task-force.*					
6. Existem diferenças significativas de especialização entre os profissionais da mesma especialidade.					
7. A organização recorre a consultoria externa para situações mais complexas.					
8. O apoio entre profissionais da mesma área do conhecimento é difícil de alcançar					
9. A experiência profissional está fortemente integrada com a gestão e cultura organizacionais.					
10. A necessidade frequente de consultoria externa advém da inadequação da experiência dos profissionais.					
11. As inovações de práticas de cuidados são difíceis de serem obtidas pela competição.					
12. É expectável que os profissionais se mantenham atualizados relativamente à evidência científica mais recente na sua área de conhecimento.					
13. A frequência da experiência de tratamento de casos raros é maior do que a da competição.					
14. O conhecimento novo e inovador e tecnologia são adotados mais rapidamente do que a concorrência.					
15. Na organização, o conhecimento evolui rapidamente.					

PARTE IV – MEDIDAS DE IMPLEMENTAÇÃO DA GESTÃO DO CONHECIMENTO

Discordo Totalmente	Discordo Parcialmente	Não Concordo Nem Discordo	Concordo Parcialmente	Concordo Totalmente
1	2	3	4	5

	1	2	3	4	5
16. Os sistemas de informação são desenvolvidos agressivamente por forma a permitir a organização, disseminação e aplicação de conhecimento.					
17. Os profissionais são fortemente encorajados a aceder e a construir sistematicamente a bases de dados.					
18. Automatizações de operações por meio de tecnologias de informação são procuradas ativamente para apoiar o trabalho dos profissionais.					
19. Há um investimento financeiro significativo em tecnologias de informação.					
20. Os profissionais são incentivados a usar a Internet para aumentar o intercâmbio e a difusão de conhecimentos.					
21. A partilha de conhecimento é um critério valorizado na avaliação de desempenho.					
22. As propostas de ideias criativas são recompensadas, mesmo quando as ideias se revelam erradas.					
23. A criação e partilha do conhecimento são recompensados com aumentos salariais ou bónus.					
24. A criação e partilha de conhecimento são recompensados com promoções.					
25. Os profissionais estão sempre dispostos a aceitar programas de formação e funções específicas que sejam mais resistentes do que os da concorrência.					
26. A organização não hesita em contratar o número necessário de profissionais de apoio técnico especializado.					
27. Os profissionais aceitam os desafios que lhes permitem reforçar a sua perícia profissional.					
28. Os profissionais não aceitam ser avaliados por parceiros de outras áreas do conhecimento.					
29. A competição entre profissionais da mesma área muitas vezes dificulta a partilha de conhecimento.					
30. Os profissionais são fortemente encorajados a aprender e inovar.					
31. Existem canais de comunicação abertos e eficazes na organização.					
32. Os profissionais são frequentemente encorajados a envolverem-se na partilha de experiências e conhecimentos.					
33. A formação individual de mentores e aprendizes de profissionais residentes é comum na organização.					

PARTE V – PERFORMANCE DA GESTÃO DO CONHECIMENTO

Muito fraco	Fraco	Normal	Forte	Muito forte
1	2	3	4	5

	1	2	3	4	5
34. Partilha de experiências e conhecimentos entre profissionais.					
35. Gestão das sugestões dos profissionais relacionadas com a sua atividade assistencial.					
36. Sentido de participação dos profissionais.					
37. Rapidez na tomada de decisão.					
38. Tempo de elaboração e implementação dos projetos/propostas.					
39. Melhoria geral da eficiência.					
40. Qualidade geral do serviço.					
41. Satisfação dos clientes/utentes.					
42. Redução do pessoal administrativo.					
43. Redução do impacto causado pela rotatividade.					
44. Gestão de projetos de melhoria de qualidade dos serviços.					

PARTE VI – ESTRATÉGIA PRINCIPAL DE AQUISIÇÃO DO CONHECIMENTO

Escolha apenas uma das opções

Instituição de Ensino Superior	
Sistema de mentor e aprendiz/Tutoria	
Consultoria	
Estágios em outras organizações de saúde	
Reuniões matinais	
Intranet	
Reuniões departamentais	
Seminários e conferências externos	
Bases de dados científicas na organização	
Gestão documental (procedimentos operativos, manuais de instruções, e.g.)	
Outra	
Se respondeu outra, indique qual?	

Obrigado pela sua colaboração

Annex 2 – Advice of the University of Beira Interior Ethics Committee

Comissão de Ética
Universidade da Beira Interior

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6201-001 Covilhã | Portugal

Parecer relativo ao processo n.º CE-UBI-Pj-2021-060:ID1091

Na sua reunião de 19 de outubro de 2021, a Comissão de Ética apreciou a documentação científica submetida referente ao pedido de parecer do projeto "**A performance da gestão do conhecimento nas organizações de saúde**", do proponente **Nuno Miguel Maia Pereira**, a que atribuiu o código n.º CE-UBI-Pj-2021-060.

Na sua análise não identificou matéria que ofenda os princípios éticos e morais, sendo de parecer que o estudo em causa pode ser aprovado.

Covilhã e UBI

A Presidente da Comissão de Ética

Assinado por: ANA LEONOR SERRA MORAIS DOS SANTOS
Num. de Identificação: BI112741975
Data: 2021.10.28 13:58:05 +01'00'

CARTÃO DE CIDADÃO

(Professora Doutora Ana Leonor Serra Morais dos Santos)
(Professora Auxiliar)

Annex 3 - Robustness Analysis

Configurational analysis of internal process performance adjusted to consistency cutoff 0.9

	1	2	3	4	5	6	7	8	9	10	11	12	13
Explicitness	•	○	●	●	•	○	○	●	○	○	○	•	•
Complexity	•	•	•	•	○	○	○	○	•	•	○	○	○
Appropriability		○	○	○	○	○	○	○	•	•	•	•	○
Volatility	•	○	●	●	○	○	●	●	•	●	●	○	○
Information Infrastructure	•	•	●		○	○	○	○	●	○	●	●	●
Incentive Program			○	○	○	●	○	●	○	○	●	○	●
Expertise Development	•	○		•	○	○	•	○	○	•	•	•	•
Human Resource Planning	•	•	•	•	○	○	○	○	○	○	○	•	•
Consistency	0.944	0.929	0.939	0.953	0.809	0.884	0.885	0.936	0.922	0.815	0.961	0.932	0.962
Raw coverage	0.419	0.225	0.287	0.284	0.209	0.203	0.217	0.202	0.211	0.213	0.216	0.246	0.245
Unique coverage	0.094	0.019	0.013	0.009	0.007	0.012	0.008	0.008	0.014	0.009	0.015	0.015	0.015

Overall solution consistency	0.812	0.902
Overall solution coverage	0.663	0.614

solution with consistency cutoff 0.8
solution with consistency cutoff 0.9
communalities

Configurational analysis of overall performance adjusted to consistency cutoff 0.9

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Explicitness	●	○	●	●	●	○	○	○	●	○	○	○	●	●	○
Complexity	•	●	●	●	○	●	○	○	○	•	•	○	○	○	•
Appropriability		○	○	○	○	○	○	○	○	●	•	●	●	○	○
Volatility	●	○	●	●	○	○	○	●	●	•	●	•	○	○	○
Information Infrastructure	•	•	•		○	○	○	○	○	●	○	●	●	•	•
Incentive Program			○	○	○	○	●	○	●	○	○	●	○	●	●
Expertise Development	•	○		•	○	○	○	•	○	○	•	•	•	•	○
Human Resource Planning	•	•	•	•	○	○	○	○	○	○	○	○	•	•	•
Consistency	0.886	0.882	0.959	0.955	0.869	0.819	0.920	0.935	0.965	0.929	0.846	0.976	0.939	0.959	0.948
Raw coverage	0.403	0.219	0.301	0.291	0.230	0.238	0.217	0.235	0.213	0.218	0.227	0.225	0.254	0.250	0.193
Unique coverage	0.069	0.006	0.017	0.009	0.014	0.009	0.007	0.017	0.008	0.012	0.011	0.016	0.016	0.014	0.004
Overall solution consistency	0.793	0.876													
Overall solution coverage	0.696	0.652													

solution with consistency cutoff 0.8

solution with consistency cutoff 0.9

communalities