LA GESTIÓN DEL CONOCIMIENTO Y LA INTELIGENCIA ORGANIZACIONAL COMO HERRAMIENTAS PARA COMBATIR EL COVID-19

Presentada por Gleison Lopes Fonsêca para optar al grado de Doctor por la Universidad Politécnica de Cartagena

Dirigida por:
Dr. ANTONIO JUAN BRIONES PEÑALVER

Codirigida por:
Dr. PEDRO FERNANDES DA ANUNCIAÇÃO

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Presented by GLEISON LOPES FONSECA
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Supervisor:
Dr. Antonio Juan Briones Peñalver

Co-supervisors:
Dr. Pedro Fernandes da Anunciação

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"There are truly two different things: knowing and believing one knows.

Science consists in knowing; in believing one knows lies ignorance."

Hippocrates
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The emergence of a novel coronavirus at the end of 2019 generated a severe health crisis worldwide. In a few months, this virus called COVID-19 was present in several countries, being recognized by the WHO as a pandemic. The COVID-19 pandemic was dramatic for the economy and society. In many economic sectors, companies were faced with the inoperability of their commercial activities. For example, in the healthcare sector, institutions were faced with unprecedented pressure, and this pandemic has exposed some weaknesses in the responses to environmental changes. As a result of this scenario, knowledge management and organizational intelligence become fundamental for hospitals to adapt to changes in the environment and respond effectively to new challenges. Considering this scenario, this research aims to analyze the influence of effective knowledge management, organizational intelligence, and organizational performance on the effective hospitals’ response to COVID-19. Data were collected through research sent to physicians and nurses working in Brazil and Portugal hospitals. We sent the survey using a professional social network, and 248 valid responses were obtained. The PLS-SEM analysis technique was used to test hypotheses. The results showed a positive relationship between effective knowledge management, organizational intelligence, and organizational performance with the effective hospital’s response to COVID-19. Additionally, the results suggest the need for managers to focus more on developing internal programs encouraging knowledge transfers among their employees. As practical implications, our research validates the relationships between effective knowledge management, organizational performance, effective hospitals’ response to COVID-19, and the importance of effective knowledge management for pandemic management. In originality, this research provides hospitals and other healthcare organizations with a direction on key resources to which these organizations should turn their efforts to improve their effectiveness in responding to new disease outbreaks.

Keywords: Effective knowledge management, Organizational performance, Effective response to COVID-19, Hospitals, COVID-19.
RESUMEN

La aparición de un nuevo coronavirus a finales de 2019 generó una grave crisis sanitaria en todo el mundo. En pocos meses, este virus denominado COVID-19 estuvo presente en varios países, siendo reconocido por la OMS como una pandemia. La pandemia de COVID-19 ha sido dramática para la economía y la sociedad. En muchos sectores económicos, las empresas se enfrentan a la inoperancia de sus actividades comerciales. En el sector de la salud, por ejemplo, las instituciones se enfrentaron a una presión sin precedentes que expuso algunas debilidades para responder a los cambios en el entorno. Ante este escenario, la gestión del conocimiento y la inteligencia organizacional se vuelven fundamentales para que los hospitales puedan adaptarse a los cambios del entorno y responder de manera efectiva a los nuevos desafíos. Considerando este escenario, esta investigación tiene como objetivo analizar la influencia de la gestión efectiva del conocimiento, la inteligencia organizacional y el desempeño organizacional en la efectividad de la respuesta de los hospitales al COVID-19. Los datos fueron recolectados a través de encuestas enviadas a médicos y enfermeras que trabajan en hospitales de Brasil y Portugal. La encuesta fue enviada a través de una red social profesional, con 248 respuestas válidas. Se utilizó la técnica de análisis de datos PLS-SEM para probar las hipótesis. Los resultados mostraron que existe una relación positiva entre la gestión efectiva del conocimiento, la inteligencia organizacional y el desempeño organizacional con la respuesta efectiva de los hospitales al COVID-19. Además, los resultados sugieren la necesidad de que los gerentes se centren más en el desarrollo de programas internos para fomentar la transferencia de conocimiento entre sus empleados. Como implicaciones prácticas, la investigación valida las relaciones entre la gestión eficaz del conocimiento, el desempeño organizacional y la eficacia de la respuesta de los hospitales al COVID-19, así como la importancia de la gestión eficaz del conocimiento para el manejo de la pandemia. Como novedad, esta encuesta brinda a los hospitales y otras organizaciones de atención médica una guía sobre los recursos clave que estas organizaciones deben dirigir sus esfuerzos para mejorar su efectividad al responder a nuevos brotes de enfermedades.

RESUMO

O surgimento de um novo coronavírus no final de 2019 gerou uma grave crise de saúde em todo o mundo. Em poucos meses, esse vírus denominado de COVID-19 estava presente em diversos países, sendo reconhecido pela OMS como uma pandemia. A pandemia do COVID-19 foi dramática para a economia e a sociedade. Em muitos setores econômicos, as empresas se depararam com a inoperância de suas atividades comerciais. No setor da saúde, por exemplo, as instituições foram confrontadas com uma pressão sem precedentes que expôs algumas fragilidades na resposta às mudanças do ambiente. Diante desse cenário, a gestão do conhecimento e a inteligência organizacional tornam-se fundamentais para que os hospitais consigam se adaptar às mudanças do ambiente e responder de forma eficaz a novos desafios. Considerando esse cenário, esta pesquisa tem como objetivo analisar a influência da gestão eficaz do conhecimento, inteligência organizacional e desempenho organizacional na eficácia de resposta dos hospitais ao COVID-19. Os dados foram coletados por meio de pesquisas enviadas a médicos e enfermeiros que atuavam em hospitais no Brasil e de Portugal. A pesquisa foi enviada por meio de uma rede social profesional, com a obtenção de 248 respostas válidas. A técnica de análise de dados PLS-SEM foi utilizada para testar as hipóteses. Os resultados mostraram que existe uma relação positiva entre a gestão eficaz do conhecimento, inteligência organizacional e desempenho organizacional com a resposta eficaz dos hospitais ao COVID-19. Adicionalmente, os resultados sugerem a necessidade de os gestores direcionarem maior enfoque ao desenvolvimento de programas internos de incentivo à transferência de conhecimento entre seus colaboradores. Como implicações práticas, a pesquisa valida as relações entre a gestão eficaz do conhecimento, o desempenho organizacional e a eficácia de resposta dos hospitais ao COVID-19, bem como a importância da gestão eficaz do conhecimento para o gerenciamento de pandemias. Como originalidade, esta pesquisa fornece aos hospitais e outras organizações de saúde uma orientação sobre os principais recursos para os quais essas organizações devem direcionar seus esforços para melhorar sua eficácia de resposta a novos surtos de doenças.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ANS</td>
<td>Agência Nacional de Saúde (National Health Agency)</td>
</tr>
<tr>
<td>AVE</td>
<td>Average Variance Extracted</td>
</tr>
<tr>
<td>BA</td>
<td>Business Analytics</td>
</tr>
<tr>
<td>BI</td>
<td>Business Intelligence</td>
</tr>
<tr>
<td>BI&amp;A</td>
<td>Business Intelligence &amp; Analytics</td>
</tr>
<tr>
<td>CFA</td>
<td>Confirmatory Factor Analysis</td>
</tr>
<tr>
<td>CR</td>
<td>Composity Reliability</td>
</tr>
<tr>
<td>DC</td>
<td>Dynamic Capabilities</td>
</tr>
<tr>
<td>EI</td>
<td>Economic Intelligence</td>
</tr>
<tr>
<td>ER</td>
<td>Effective Response</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>INE</td>
<td>Instituto Nacional de Estatística (National Institute of Statistics)</td>
</tr>
<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
</tr>
<tr>
<td>IoT</td>
<td>internet of things</td>
</tr>
<tr>
<td>IT</td>
<td>IT information technology</td>
</tr>
<tr>
<td>KM</td>
<td>Knowledge Management</td>
</tr>
<tr>
<td>NUTS</td>
<td>Nomenclatura das Unidades Territoriais para Fins Estatísticos (Nomenclature of Territorial Units for Statistical Purposes)</td>
</tr>
<tr>
<td>OI</td>
<td>Organizational Intelligence</td>
</tr>
<tr>
<td>OP</td>
<td>Organizational Performance</td>
</tr>
<tr>
<td>PLS-SEM</td>
<td>Partial Least Square - Structural Equation Modeling</td>
</tr>
<tr>
<td>QFD</td>
<td>Quality Function Deployment</td>
</tr>
<tr>
<td>SNS</td>
<td>Sistema Nacional de Saúde (National Health System)</td>
</tr>
<tr>
<td>SRMR</td>
<td>Standardized Root mean Square Residual</td>
</tr>
<tr>
<td>SUS</td>
<td>Sistema Único de Saúde (Unified Health System)</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
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CHAPTER ONE
1 INTRODUCTION AND JUSTIFICATION

The emergence of the Covid-19 pandemic has affected every aspect of human life and every sector of economic activity in every corner of the globe (Pelegrín-Borondo et al., 2021). Uncertainty on the economic impact of the COVID-19 pandemic is very high (Mennini et al., 2021). This new virus has caused severe panic and has dominated public attention (Arabi et al., 2020). The consequences were dramatic for the economy and society. Many companies were faced with the inoperability of their commercial activities. In contrast, in other sectors, such as healthcare, institutions were faced with unprecedented pressure, and this pandemic has exposed some weaknesses in the responses to the surrounding context.

Health institutions in many countries faced situations of collapse. Generally, the employees’ health resilience was praised and considered critical for sustaining operations and ensuring hospital performance (Poulsen & Ipsen, 2017). In many countries and hospitals, there was a need to implement radical active solutions suited to the contingencies of the situations experienced (W.-T. Wang & Wu, 2021).

Although human knowledge potentially reflects individual experiences in all spheres of life, it reflects a world that is only partially understood, which might be reinforced by repeated success (Cegarra-Navarro & Sánchez-Polo, 2008). However, from an economic perspective, it is mainly in crisis contexts that opportunities are created to rethink the operating models of economic and social organizations to prepare them for the adversity of situations (W.-T. Wang & Wu, 2021). Learning from a crisis is not an easy task. On the contrary, it is a challenging and complex task (Qadri et al., 2021). These are events like the one we are still experiencing that highlight the importance of knowledge in searching for solutions to emerging problems.

Knowledge is the most valuable resource an organization processes (Giraldo et al., 2019; W. Wang, 2009). Today's organizations increasingly depend on knowledge to understand the evolution of the market and society itself. As an organizational resource, information has long since ceased to be sufficient to generate competitive advantages. Today, knowledge is considered a critical success factor and a determining factor for understanding the organizational environment.
Another factor that emerged more clearly from the pandemic was organizational flexibility. As a social element, any organization is subject to stimuli from the surrounding environment. In this sense, following one of the principles of natural systems, it needs to adapt (homeostasis) to find new balances resulting from changes in the surrounding conditions. Flexibility is, therefore, the ability to reorganize productive and organizational factors to adapt and improve the responses to be given to external stimuli.

Knowledge and flexibility are two variables that integrate the concept of intelligence applied to the domain of economic organizations. If we analyze the etymology of the expression intelligence, we find its origin in Latin. It comes from Intellegentia, which means the ability to understand, from Intelligere, formed by “Inter” (between) and Legere (to choose). In this sense, we can consider that the word intelligence refers to what is revealed as “Intelligens” (intelligent), or one who understands, perceives, knows, and knows how to discern specific issues (López Casasnovas & Pifarré i Arolas, 2021).

We can assume that knowledge emerges as a pillar of intelligence and the capacity for action as a form of discernment in the context under analysis. Knowledge and capacity for action (organizational performance) are thus two central elements in understanding organizational intelligence. These constituted two lines of action in the fight against the pandemic. Knowledge of factors related to vulnerability to the disease itself or the factors associated with the spread of the pandemic and the probability of transmission and infection were relevant in the responses of the various countries to the impacts of the pandemic (López Casasnovas & Pifarré i Arolas, 2021).

The pandemic management occurred in conjunction with advancing knowledge about the virus and various decisions and actions taken to control it. The COVID-19 pandemic was not entirely unknown, as the virus belongs to the coronavirus "family."

The effects of the pandemic and its speed of spread forced hospital institutions to develop new knowledge and manage "bottlenecks," mainly associated with the ability to treat infected patients in hospital intensive care units. In the most critical periods, hospital performance was associated with the ability to hospitalize infected people, on the one hand, and the ability to save lives, on the other.

Given these facts, it is evident the importance of understanding which factors influenced hospitals' response to the effects of the pandemic of COVID-19. In order to better understand this theoretical gap, this study analyzed the effective response to COVID-19
of hospitals located in Brazil and Portugal. The healthcare sector in both countries was heavily pressured by the rapid contagion of people with COVID-19. Furthermore, just as it was verified in different countries around the world, the effective hospitals' response to COVID-19 was considerably different, with institutions obtaining better and worse performance, without an apparent reason to account for this difference.

In this sense, aiming to contribute to this theoretical gap, this study seeks to relate the concepts of effective knowledge management, organizational intelligence, and organizational performance, with the objective of better understanding how these variables may have assisted different hospitals in obtaining an effective response to COVID-19. From these contributions, the following research problem was devised:

- **What is the contribution of knowledge management, organizational intelligence, and organizational performance for hospitals to address COVID-19?**

1.1 Objectives of the study

Considering the context presented, of constant technological evolution, rapid changes in the environment, and the need to develop knowledge and skills to ensure that organizations continue performing their activities effectively, this present study has as its general objective:

- To determine the contribution of effective knowledge management, organizational intelligence, and organizational performance in effective hospitals' response to COVID-19.

To achieve the general objective, the following hypotheses were developed:

- To evaluate whether effective knowledge management, organizational intelligence, and organizational performance influence effective hospital’s response to COVID-19;
- To analyze how knowledge management, organizational intelligence, and organizational performance influence the effective hospitals' response to COVID-19;
- To propose a model that demonstrates the relationship between effective knowledge management, organizational intelligence, and organizational performance in the effective hospitals' response to COVID-19.
Initially, a literature review was developed, involving the topics knowledge management, organizational intelligence, and organizational performance. Through this literature review, theoretical propositions were extracted that guided the study and led to an in-depth theoretical review of the topics and their relationships and the use of this content to develop the research hypotheses.

In the following sections, the research sections will be presented, introducing the main concepts of the theoretical framework, the research methodology, the discussion of the results, and the main considerations.

1.2 Structure of the work

After explaining the context for creating this research and the goals we intend to achieve with it, we present the structure of this thesis. Besides the introduction, the thesis is divided into seven other parts, as illustrated in Figure 1.

**Figure 1. Structure of the work.**

Structure of the work.

```
Knowledge Management
Organizational Intelligence
Organizational Performance
Effective Response to COVID-19

LITERATURE REVIEW

HIPOTHEIS AND METHODOLOGY

RESULTS AND DISCUSSIONS

FINAL CONSIDERATIONS

Hypothesis
Expert Panel
Structural Equations
PLS-SEM

Evaluation of measurement model
Evaluation of structural model
Results of the structural model

Conclusions
Limitations
Empirical Implications
Practical Implications
```

*Note:* The structure demonstrates the main topics and the order they are addressed in this thesis.

The following section presents the literature review on knowledge management.
CHAPTER TWO
2 THEORETICAL FRAMEWORK

The theoretical framework is divided based on the main concepts and theories necessary for the development of this research. The following sections discuss the concept of knowledge management, organizational performance, and organizational intelligence. The end of this section presents an overview of the health sector in Brazil and Portugal.

2.1 Knowledge management

With the rapid development of information technology seen since 1990, in an increasingly globalized world, ancient sources of power, such as financial capital, have lost importance to other sources, such as experience, competition, and creativity (Istudor et al., 2016).

In the search for these new sources of power, organizations began to adopt Knowledge Management (KM) to generate innovation and create an information exchange environment among their employees (Istudor et al., 2016).

KM capability, represented through the effective implementation and utilization of knowledge in organizations, has become critical to achieving and maintaining a leadership position and sustainable competitive advantage (Al Saifi, 2015; Y. Hu et al., 2021).

Actually, organizations began to adopt knowledge management to generate innovation (du Plessis, 2007; Hosseini et al., 2019; Jad et al., 2017) and create an environment for sharing information among their stakeholders (Istudor et al., 2016).

KM contributes to knowledge exploration practices in organizations to produce new knowledge in a virtuous cycle. This virtuous cycle is achieved as KM contributes to creating intangible assets in organizations (Istudor et al., 2016).

KM is a process of acquiring, designing, managing, and sharing knowledge performed by an organization to achieve improved performance. Among the expected performance improvements, one can mention cost reduction in production processes, improvement of intellectual capital, and the promotion and implementation of best practices in utilizing knowledge resources (Y. Hu et al., 2021).

De Angelis (2013) states that for these improvements to be achieved, KM encompasses a set of tools, techniques, tactics, and technologies aimed at maximizing the intangible assets of an organization by extracting relevant data, information, and knowledge to
facilitate decision making and enable the organization to gain a sustainable competitive advantage.

Corroborating with De Angelis (2013), Istudor et al. (2016) specify the processes involved in KM, involving a set of processes to generate, codify, validate, store, share, use and evaluate the vast body of knowledge that each organization uses in its activities.

When analyzing the organization's point of view, it is essential to highlight that this whole process of capturing, processing, and reusing knowledge aims to make organizations more productive and closer to their customers. In this sense, KM is defined as the set of processes carried out to find, select, organize, and present information to facilitate understanding of the organization's individual that will use it (Istudor et al., 2016).

In order to achieve effective KM, it is necessary to pay attention to three organizational processes considered essential:

- Maintaining learning loops in all organizational processes;
- Systematically disseminate new and existing knowledge throughout the organization;
- Apply knowledge anywhere in the organization where it can be used (Carayannis et al., 2017; Sanchez, 2006).

A learning loop refers to any learning process that seeks to improve another process, either incrementally or radically. The logic behind learning loops is similar to that of the lean organization, in which only companies focused on their core value-adding activities (and outsourcing less relevant processes) tend to meet the demands for better performance and lower prices (Sanchez, 2006).

With learning loops in place, the organization must ensure the systematic dissemination of its existing and new knowledge generated through learning cycles. This action involves relocating employees (implicit knowledge) to other areas of the organization or disseminating new (explicit) knowledge through information and communication technology (ICT). Once this is achieved, the organization needs to apply the knowledge in all processes where it can be used, ensuring that the cycle of knowledge generation, dissemination, and application is completed (Sanchez, 2006).

KM is therefore connected to an effective organizational learning process. High-level learning processes involve the capabilities of learning, learning to learn, and learning how
to learn to learn. Through these processes and routines, the organization drives its abilities to explore and discover new competencies and create new opportunities and value (Carayannis et al., 2017).

The ability to create value is related to processes through which the organization moves to transform its "potential" state into "realized." This ability occurs through exploitation, which transforms information into intelligence to be used and applied in the organization. Examples in this sense are transformative processes and routines adopted by organizations, such as Six Sigma, Benchmarking, and Quality Function Deployment (QFD) (Carayannis et al., 2017).

This whole process of organizational transformation and learning can be described using the organizational learning cycles presented in Figure 2.
Figure 2

The five cycles of organizational learning.


These five learning cycles demonstrate how a learning organization generates, disseminates, and applies knowledge (Carayannis et al., 2017).
2.2 Effective knowledge management, organizational performance, and effective response to crisis.

Knowledge is the most valuable resource in an organization (Giraldo et al., 2019; W.-T. Wang & Wu, 2021; W. Wang, 2009) and is considered in management literature as an essential organizational resource, increasing organizational learning and allowing to acquire expertise (Nisar et al., 2019).

However, when knowledge is poorly managed and misused, it can cause errors and inappropriate decision-making. For Bolisani et al. (2021), unverified information sources, such as rumors and partial truths, create an environment of lack of trust that can lead to errors and negative attitudes, affecting the decision-making process and organizational performance (OP).

During periods of crisis, the proper conduct of KM activities becomes a key factor for the organization's managerial efforts to be effective (W.-T. Wang & Wu, 2021) and to be able to respond quickly to changes in the environment (Miller et al., 2013).

Therefore, KM emerges as an organizational response to environmental changes, emerging capabilities, new customers’ requirements, market demands, and expertise (Chang & Chuang, 2011; Gold et al., 2001; Keshavarz et al., 2018; Nisar et al., 2019).

So, if adequately managed, effective knowledge may have a significant and positive effect on OP (Bolisani et al., 2021). For knowledge to be used properly, organizations need to create an environment for knowledge exchange and sharing, constantly analyzing the effectiveness of its use (Y. Hu et al., 2021; Nurcholis, 2021).

However, knowledge does not always assume the primordial element in decisions in analyzing situations. Witkowski et al. (2021), for example, state that findings from the content analyses of government policies, documents, and news reports indicate that some aspects of Florida’s response were politically motivated, inflexible, and driven by a small circle of advisors, often ignoring expert opinions and the needs of uniquely vulnerable populations. Therefore, organizational performance may be conditioned by decision factors other than knowledge. However, given the need for objectivity in management activities, the nature of the adopted factors is questioned, allowing for better performance than those centered on knowledge.
Sibanda & Ramrathan (2017) emphasize that in performance evaluation, three dimensions must be considered, namely, people, organization, and equipment. The reason for these three dimensions derives from the need to guarantee: compatibility with the facts between the internal environment (values, practices, products, services) and the needs of the surrounding environment (present and future); organizational intelligence, which is measurable in identifying and evaluating the competitive value and benefits provided to the various stakeholders; and sustainability in results, through the adequacy of management capacity and response to the complexity of the environment.

These constitute requirements in the dynamics of the new economy, called information and knowledge (Z. Li et al., 2021). Knowledge management's relevance results from improving OP indices and, consequently, consolidating competitive advantages (Leal-Rodríguez et al., 2013; Lee et al., 2014; Nisar et al., 2019). In this sense, OP appears to be critical for the sustainability of institutions in the economy and society. Only with this assumption will economic organizations be able to generate value from their information and knowledge assets (Gold et al., 2001; Lee et al., 2014). As Nonaka and Takeuchi (1995) mentioned, this generation can have an individual focus through human capital or structural capital, or it can have a collective focus through relational capital.

In this context, the pandemic emphasized the critical role of information systems. From versatility at work, such as the massification of work and learning from home, to the digital transformation of institutions, the replacement of face-to-face services with digital services, or the sharing of information through the integration of information systems between organizations or communication between the government and citizens, among others (Chan et al., 2020; LaBerge et al., 2020; Lillie et al., 2020), we can see that society as a whole, organizations, and people, in general, were forced to develop new levels of knowledge and new skills as an imperative response to the impacts and limitations imposed by the pandemic.

Hanson et al. (2021) objectively summarize, in a resilience matrix, a roadmap of four central dimensions in the overcoming of the pandemic crisis, through which an evolution between the absorptive capacity, adaptive capacity, and transformative capacity become evident:

- Knowledge: capacity to combine and integrate different forms of knowledge (knowledge generation);
• Uncertainty: capacity to anticipate and cope with uncertainties and unplanned events (Risk management);
• Interdependence: capacity to engage effectively with and handle multiple and cross-scale dynamics (Relational capital);
• Legitimacy: capacity to develop socially and contextually-accepted institutions and norms (Governance structure).

This matrix is a concrete response to an effective response to the crisis based on KM.

Additionally, previous studies have analyzed the relationship between organizational KM, OP, and competitiveness (Abubakar et al., 2019; Adams & Graham, 2017; Brix, 2017; Esterhuizen et al., 2012; Tsai & Li, 2009; Vila et al., 2015). However, there is still a lack of studies that analyze the relationship between knowledge management and organizational performance, especially studies aimed at measuring the synergy between effective knowledge management (EKM) and OP (Y. Hu et al., 2021).

EKM can help organizations improve resource allocation and management activities and support value creation activities (Chuang, 2004; Gold et al., 2001; Y. Hu et al., 2021; Tanriverdi, 2005). From the viewpoint of EKM, KM is composed of a set of processes that include its absorption, transfer, sharing, and utilization, which may result in the creation of social and economic values (J. F. Cohen & Olsen, 2015; W. M. Cohen & Levinthal, 1990; Y. Hu et al., 2021).

KM can be understood as the process of identifying, capturing, storing, sharing, applying, and leveraging collective knowledge to improve performance (Archanjo de Souza et al., 2020; Giraldo et al., 2019; W.-T. Wang, 2011). Through this process, an effective KM assists the organization in coordinating management actions, especially concerning rapidly identifying knowledge owners and transferring that knowledge to decision-makers and the people who need it (Archanjo de Souza et al., 2020; W.-T. Wang, 2011; W.-T. Wang & Wu, 2021).

Sharing data and knowledge is considered an important activity for driving innovation (Janssen et al., 2017; Q. Zhang & Zhou, 2013) and achieving organizational success (Bacon et al., 2021; Ilvonen et al., 2018). For healthcare professionals, knowledge exchange and the combination are essential for performing their work, as knowledge is a critical resource in patient care and decision making (Hansen et al., 2018; B. Zhang et al., 2021).
Through knowledge sharing, organizations consolidate existing knowledge and can create new products or perform new services and procedures to meet the demands of the external environment (Bacon et al., 2021; H. H. Chang et al., 2016).

In times of crisis, the speed of response by decision-makers is a critical factor. Reducing the risk of exposure to COVID-19 and its effects on the population becomes urgent and demands immediate decision-making to face the constant escalation that these crises represent to the health sector. Additionally, KM brings together a set of processes oriented to the interaction of tacit and explicit knowledge to create and acquire new competencies, which will allow the organization to act intelligently in different environments (De Angelis, 2013).

2.3 Organizational intelligence (OI)

Being considered a fascinating concept by several areas of study, the term intelligence has a divergent definition in the fields of study. The concept of OI varies according to the perspectives and central ideas of researchers in the area (González & García-Muiña, 2016), especially in the behavioral, cognitive, and social fields of study (Akgün et al., 2007; Glynn, 1996; Malekzadeh et al., 2016). Among the areas interested in its study are management and organizational development, with a particular interest in the definition of OI (Akgün et al., 2007).

An example of this is the definition used by the cognitive perspective, in which intelligence is characterized as an individual trait related to the ability of individuals to think and solve problems. On the other hand, in the behavioral and social fields, intelligence is defined from a contextual point of view, in which it is considered a social product resulting from the cultural and normative network in which individuals are inserted. In this sense, individual intelligence is considered a composite of different abilities that will vary according to the context in which individuals are inserted. In other words, individuals from different societies and cultures will possess different types of intelligence (Akgün et al., 2007; Glynn, 1996).

OI is a systematic process of collecting, processing, and storing information to make it available to people at all levels of a company to help shape its future and protect it against current competitive threats. This whole process of transferring knowledge from the
environment to the organization must occur according to legally established rules (Nasri & Zarai, 2013; Salguero et al., 2017; Shujahat et al., 2017).

It is important to note that this generated knowledge is related to the opportunities and threats present in the external environment being able to be used for decision-making by any level of the organization. In this sense, OI can help the organization formulate strategies through a better understanding of its sector of activity, the competitors present in it, and the company itself. OI is, therefore, the essence of strategic business analysis (Nasri & Zarai, 2013; Salguero et al., 2017).

Generally speaking, intelligence will constantly adapt to the information and knowledge used to create it. For Glynn (1996), the term intelligence in organizations refers to the ability to solve problems or create products that are considered of some value within one or more cultural environments. Therefore, that has value according to the characteristics and needs of the environment in which it is inserted.

Each organization has different characteristics and, therefore, different processes and ways of obtaining information, as well as its human resources possess different knowledge, which will influence the generation of intelligence and its formalization within the organization (Carvalho & Esteban-Navarro, 2016).

OI is related to the ability of an organization to develop efficient behavior to ensure an adequate reaction to the dynamics and uncertainties present in the environment, thus determining its ability to create and use knowledge strategically to adapt to the market environment (Boudlaie et al., 2014; González & García-Muiña, 2016; Istudor et al., 2016; Malekzadeh et al., 2016). This concept was initially named collective intelligence, indicating, according to the proposed name, intelligence related to the use, in a synergistic way, of individual competencies, to achieve a specific objective (Istudor et al., 2016).

It is important to note that, despite this definition and the fact that most authors refer to collective intelligence through individual intelligence, there is a consensus that collective intelligence does not result from the sum of individual intelligence (Istudor et al., 2016). As an evolution of the concept of collective intelligence, the term OI arises, used to refer to the organization's ability to process, interpret, manipulate and access information in an intentional and goal-directed manner, thus increasing its capacity to adapt to the environment in which it is inserted (Glynn, 1996; Istudor et al., 2016; Malekzadeh et al., 2016).
The dividing line between individual and OI is considered very imprecise, partly due to reductionism on the subject and a lack of understanding about who or what possesses OI. The constant updating of individual intelligence is due to the various interactions derived from communications, culture, routines, and other intentional and unintentional interactions between people (Akgün et al., 2007).

We see that OI results from a systematic process of information and knowledge available internally and in the external environment used to improve the organization's ability to foresee the future and adapt to changes in the environment (Istudor et al., 2016; Malekzadeh et al., 2016).

This definition considers OI to be adaptive and a social outcome (Glynn, 1996; Yaghoubi et al., 2011), i.e., it is modified according to the conditions of the environment (internal and external) to solve the problems presented, meeting the defined objectives and providing appropriate responses to environmental challenges (Glynn, 1996).

This organization's interaction with the external environment requires the development of coordinated actions to exploit the available information, according to the definition brought by the concept of Economic Intelligence (EI). In addition, the organization will need to carry out a set of processes involving the capture, processing, and reuse of this information and knowledge to become more productive and facilitate its understanding by its human resources, according to the definition brought by the KM concept. In this sense, we see that the concepts of EI and KM seem to be related to the very definition of OI (Istudor et al., 2016).

Confusion about the term OI results from its use by different fields of study, as mentioned: behavioral, cognitive, and social. In the literature, the term OI was initially used as:

- description of the organization's information processing capability and the result obtained in that process;
- description of the intelligence of the individuals in the organization and the sum of their intelligence; and;
- a metaphor to describe the organization and an asset (property) belonging to it (Akgün et al., 2007; Glynn, 1996).

OI is related to the individual intelligence of people through the so-called aggregation mechanisms (a process of accumulation of the individual intelligence of the members of
the company resulting in the formation of OI). However, the entire understanding of this process still proves to be imprecise (Akgün et al., 2007).

In this sense, although the concept of OI possesses similarities with that of individual intelligence, OI differs in that it is a social and group outcome, i.e., the result of a group of individuals interacting as if they were the same unit, going beyond the sum of the individual intelligence of the people that make up the organization (Glynn, 1996; Keshtegar & Zare, 2016; Torabi et al., 2016; Yaghoubi et al., 2011). OI should therefore be understood as an outcome of interpersonal interactions and organizational culture.

OI is known to influence socially accepted behaviors, such as the individual’s good relationships with co-workers and family, being considered an essential capability for the work environment (Keshtegar & Zare, 2016).

Similarly, Akgün et al. (2007) argue that OI is a cognitively distributed everyday activity demonstrated by people’s behavior and organizational culture and routines. As a consequence of the continuity of organizational life, intelligence develops, evolves, and disengages from individuals or groups spontaneously. Therefore, OI should not be treated as an entity in itself but as an activity resulting from the combined interactions between individuals, groups, and the environment (Akgün et al., 2007).

To better understand the influence of OI on firm performance, it is essential to understand that it is a multidimensional concept with distinct and peculiar characteristics involving the continuous interaction of organizations' cognitive, behavioral and emotional capabilities. In this sense, it is correct to state that OI is influenced by the reciprocal interactions between the factors of information processing, emotional dynamics, organizational slack, and organizational routines and resources and can therefore be tested and measured through the operational capacity of information processing resources, emotional capabilities, adaptive capacity and innovation (Akgün et al., 2007).

Figure 3 demonstrates the connection between important concepts that affect and are affected by OI:
**Figure 3**

*Relationship between decision making, organizational resilience, and organizational intelligence.*

Knowledge acquisition and learning competencies are the basis for OI formation and improvement, leading the organization to robust competitive, and sustainable entrepreneurship. The acquisition of new knowledge ultimately enriches organizational learning competencies and promotes organizational resilience (Carayannis et al., 2017; Levinthal & Rerup, 2006).

Organizational resilience refers to a firm's ability to recover from negative impacts on its ecosystem and how quickly it can do so. Commitment to resilience generally leads to active awareness in organizations, leading to a greater openness to new information and a willingness to evaluate the context from different angles. In this sense, it can be stated that these competencies, together with Dynamic Capabilities (DC) related to, for example, knowledge acquisition, help to form and drive OI (Carayannis et al., 2017).

### 2.4 The different views on organizational intelligence

Therefore, in order for a firm's OI to be identified and measured, the environmental conditions in which it is embedded (Boudlaie et al., 2014), its type of organizational culture, type of innovation (e.g., incremental versus radical), dimension (size), age, and type of administrative control (e.g., centralized versus informal) must be considered.
(Akgün et al., 2007). All these conditions are influences and influencers of OI and should therefore be considered when analyzing the influence of OI on organizational performance.

OI has two broad visions: that of authors who consider OI as a capability, something static that certain factors can explain; and those who prefer to classify it as a sequential process, something dynamic that develops over time cumulatively and repetitively (González & García-Muña, 2016; Haber-Veja & Más-Basnuevo, 2013). This view is best described in Figure 4, which illustrates the relationships between dimensions and conceptual models:

**Figure 4**

*Classification of intelligence models by temporal dimension.*

Note: The figure demonstrates the evolution of intelligence concepts through a division between dynamic models and static models. Adapted from “Modelos de inteligencia organizativa y recomendaciones para el desarrollo de la inteligencia organizativa” by P. M. González and F. E. García-Muña, 2016, Dirección y Organización, 60, p. 26.

For Gonzalez and Muina (2016), as a consequence of the constant changes in the markets and the growing competitiveness in the environment, the vision of OI as something static proved to be fragile, prevailing the vision of something dynamic, which incorporates in its concept, over time, other organizational capabilities, such as the ability to anticipate future events, one of the current elements considered in its evaluation.

In this sense, OI is the organization's ability to learn and manage available knowledge, applying it in decision-making to adapt to business environments. OI reflects the
organization's decision-making capacity in critical situations arising from changes in the business environment and various situations that will arise over time (Malekzadeh et al., 2016).

Corroborating with the authors, Dobre and Hăhăianu (2016) consider that OI is characterized by the existence of four criteria: (i) ability to adapt to dynamic environments; (ii) ability to influence the environment in which it is embedded; (iii) ability to reconfigure itself according to the new environment and, finally, (iv) ability to contribute sustainably to the environment in which it is embedded. These four criteria can be summarized, stating that OI represents the organization's ability to integrate internal knowledge and external information into the processes and services it develops and creates to manage external problems and survive the turbulence of highly competitive environments (Dobre & Hăhăianu, 2016).

De Angelis (2013) corroborates this view by highlighting that among the various concepts of OI present in the scientific literature, all are constrained by one resource: the organization's ability to adapt to its environment and apply its knowledge. In this sense, OI is the process of transforming data into knowledge and knowledge into action to generate an organizational gain, translated into a competitive advantage (De Angelis, 2013).

For this paper, the most current and comprehensive view of OI is used, which considers it dynamic and interacting with the external environment to help the organization adapt to the constantly changing business environment. Therefore, OI is the ability of an organization to adapt, learn and change in response to environmental conditions, using for this purpose the integration of internal knowledge and relevant external information (De Angelis, 2013; Dobre & Hăhăianu, 2016; González & García-Muiña, 2016; Haber-Veja & Más-Basnuevo, 2013)

Malekzadeh et al. (2016) deepen the definition of OI by posing eight dimensions in which 36 components are present that can be used to identify it in universities, as presented in Figure 5:
Figure 5
Organizational intelligence model for universities.


Although developed with a focus on universities, many of these dimensions and components present in the study can be expanded to other market companies.
2.5 The relationship between organizational intelligence, organizational performance, and knowledge management.

The performance of organizations in today's economy depends on access to information and their ability to obtain, process, and interpret information (De Almeida et al., 2016; X. Zhang et al., 2012). Furthermore, companies must constantly invest in cost savings, communication, and information technology infrastructure and redesign their business models to ensure competitiveness. However, in order to achieve these objectives, organizations face a double challenge: they must guarantee the development of the individual intelligence of their human resources and, together, guarantee their ability to understand and learn, thus developing their OI (Carvalho & Esteban-Navarro, 2016; González & García-Muña, 2016; Istudor et al., 2016).

OI has evolved over the years and has involved different organizational aspects such as learning, communication, culture, information, perception, cognition, and individual intelligence. However, this definition fails to address other aspects, such as the influence of EI, KM, entropy, and organizational enablers (Istudor et al., 2016), as shown in Figure 6:
EI is the set of coordinated actions of economic agents' research, processing, and distribution of helpful information to exploit it for strategic and operational purposes. In this sense, EI represents an informative process of research, collection, and processing of information available in the external environment, intending to anticipate changes in the environment, detect threats, and exploit opportunities to provide a basis for the organization to take proactive actions concerning the competitive environment (Istudor et al., 2016).

Therefore, EI goes beyond collecting information from the environment, involving the development of the interpretation capacity of the human resource that generates EI. In
In this sense, EI should not be limited to the practices of searching for information in the environment (environmental scanning) (Istudor et al., 2016).

KM is fundamental for the organization to improve its decision-making processes, problem-solving, and, consequently, organizational performance. In this sense, KM acts as a facilitator for the creation of the internet of things (IoT), providing methods to identify, store, share, and create knowledge (Soto-Acosta & Cegarra-Navarro, 2016), while IoT acts with the function of integrating and interpreting these data and information inputs so that the organization's managers can make complex decisions at the organizational level (De Angelis, 2013).

The concepts of KM and OI are complementary and interdependent, being that many of the processes related to KM are responsible for the changes observed in OI (De Angelis, 2013; Yaghoubi et al., 2012). Yaghoubi et al. (2012) found a 59.2% relationship between the existing variations in the OI of public sector firms, what they termed as strategic KM processes, i.e., the KM activities related to the evaluation, construction, and sustainment of knowledge.

In the literature, some studies recognize the value of knowledge sharing and retention for organizations, realized through advanced IT learning mechanisms, relating the impact that this knowledge sharing and retention possess in improving organizational learning and decision making (Alavi & Leidner, 2001a; Carayannis et al., 2017; Sambamurthy & Subramani, 2005).

There are cases where the organization cannot capture knowledge and share it at higher levels. These situations impair decision-making by reducing the information processing capacity of the organization. When the organization's ability to process information increases, decision-making uncertainty decreases (Carayannis et al., 2017).

Despite this direct relationship of complementarity and interdependence between KM and IoT, it is essential to note that simple access to information does not guarantee knowledge generation, just as it does not create support for IoT creation. On the other hand, an excess of information impairs the creation of IoT, which shows that simple access to information and knowledge is not enough to make successful decisions (De Angelis, 2013).

Through the use of IoT, companies can achieve better performance in various areas and activities, including (i) acquiring new business; (ii) retaining existing business; (iii) improvements in sales force performance; (iv) identifying new business opportunities; (v)
sharing ideas; (vi) improving the ability to anticipate surprises; (vii) improving managers' analytical skills; (viii) forecasting, with a high level of reliability, market changes (Nasri & Zarai, 2013).

To achieve intelligence management, some organizations allocate part of their resources intending to create and maintain intelligence systems, which are composed of four groups: system actors (consumers and suppliers); sources of information from internal and external environments; the process of production, and communication and use of intelligence; information and communication technology (Carvalho & Esteban-Navarro, 2016).

It is also essential to define what information is in the strategic context in which it is being used: information is responsible for mediating the relationship with the environment and basing knowledge creation. However, information alone is not sufficient for knowledge creation. Knowledge is created through a cognitive process that develops in a given context. In this sense, organizations make use of environmental scanning systems to obtain strategic information that results in the generation of internal knowledge, i.e., information gathering and knowledge generation are activities that go hand in hand and end up directly influencing the development of IoT (De Almeida et al., 2016; Istudor et al., 2016; X. Zhang et al., 2012).

Only organizations that manage to focus on all aspects of the competitive environment, including quality, efficiency, responsiveness and speed of response, innovation (Darroch et al., 2015), and price, manage to stay ahead of their competitors, thus gaining a sustainable competitive advantage over the years (Eidizadeh et al., 2017).

In order to better understand the environment, organizations perform environmental scans, monitoring their external environment to identify and anticipate market threats and opportunities to transform them into a competitive advantage (De Almeida et al., 2016; X. Zhang et al., 2012). In addition, they also seek to encourage knowledge sharing among employers to support the organization's OI management process (De Almeida et al., 2016).

Scanning the environment is an effective way for companies to detect signals present in the environment, thus formulating adaptive strategies for survival and success in the market (X. Zhang et al., 2012). In the quest to achieve better performance in aspects related to the competitive environment, which guarantees a sustainable competitive
advantage, companies have analyzed the factors that lead to superior performance to their competitors.

The DC theory seeks to explain OP in the firm's ability to promote changes in its resources. This approach is considered particularly important for companies operating in turbulent environments under conditions of rapid environmental change. In this sense, the theory of DC emerges as a robust theoretical basis for the link between Business Intelligence & Analytics (BI&A) and firm performance to be explained and studied (English & Hoffmann, 2018).

DC can be best described by organizational skills related to identifying (perceive, sense) opportunities and threats, seizing (seize) occasions to make organizational changes, and then transforming (transform) organizational processes (Torres et al., 2018).

The perspective brought by the DC theory and concepts defended through the SST theory (sense, seize and transform), related to identifying, seizing, and transforming resources to improve organizational performance, are directly linked to the importance of BI&A to improve OP. However, despite the existence of related studies (Kim et al., 2011; Seddon et al., 2017; Wamba et al., 2017), mostly there is the use of DC as a fundamental theory to explain organizational performance, while few studies examined BI&A capabilities through the lens of SST theory (Torres et al., 2018).

The term Business Intelligence (BI) is used in the literature to refer to a series of activities related to the IT area of companies, especially those connected to information management and reporting from management systems. BI is the set of technologies that help organizations acquire, assimilate and transfer new knowledge. The term Business Analytics (BA) is one of the components of BI aimed explicitly at the application of data analysis techniques to answer the main organizational questions, thus supporting decision making (Torres et al., 2018).

Due to both terms' importance and conceptual similarity, BI&A arises in the literature to refer to both concepts jointly. The use of the term BI&A instead of the distinction between them is justified by the similarity between both definitions and the growing importance of both in the literature. Distinguishing the terms and seeking to treat them separately causes more confusion than it contributes to the development of the literature and the fact that they are already widely used together. In this sense, the term BI&A defines the set of
organizational information practices that rely on information and communication technology and involve applying analytical techniques (Torres et al., 2018).

2.6 Organizational performance of hospitals and the pandemic of COVID-19

The quest of managers for improved Organizational Performance (OP) and increased efficiency in healthcare delivery became even more relevant after the emergence of the COVID-19 pandemic. During this period, hospitals were affected by the sudden growth in patient flow and the consequent need for resource and capacity management (Krupička, 2021).

Many countries have adopted private sector management practices to improve the performance of publicly funded healthcare systems, reduce wasteful spending, and increase the efficiency of resource application, thus reducing pressure on the public budget (Krupička, 2021; van Elten et al., 2019).

Despite these efforts, the different characteristics of healthcare systems make it challenging to develop a universal theory of effective hospital management. In this sense, a more comprehensive contextual analysis approach, in which one seeks to identify best management practices at the national level and with a focus on knowledge management practices, is considered more suitable to develop new knowledge regarding the best management practices to be used by healthcare professionals (Krupička, 2021).

Because it involves different objectives to be jointly achieved, the performance of healthcare organizations needs to be assessed in a multidimensional way, and these dimensions can be divided between financial and non-financial performance. The financial performance involves an evaluation through variables that demonstrate the organization's performance, such as profit margin indicators and economic efficiency in using resources (van Elten et al., 2019). Non-financial performance, on the other hand, includes the evaluation of indicators related to operational efficiency and effectiveness (Al-Amin et al., 2016), quality of care/service (Upadhayay et al., 2020), and perceived quality of care/service (Oppel et al., 2019; van Elten et al., 2019).

Additionally, it is vital to highlight the role that OP measurement has on the outcomes achieved by hospitals. The composition of performance measurement systems and the way they are used by hospital managers directly interfere with hospital performance outcomes (Naranjo-Gil & Hartmann, 2007), thus generating better or worse performances.
in regard to areas such as patient-oriented care, collective work culture, and operational performance (Krupička, 2021; van Elten et al., 2019).

Although there are differences in the structures and policies adopted by health systems in different countries, in a cost-benefit analysis, there is no health system that can be considered systematically better than the others (Isabelle Joumardi & Nicqi, 2010). In this sense, the search and adoption of best practices related to OP management should be implemented after understanding the aspects that influence it, in addition to the aspects that interfere with the performance management practices themselves at the institutional level, in order to understand which combination of practices is best for each organization (Krupička, 2021).

Although the importance of OP management is recognized, the complexity of the nature of healthcare services makes performance measurement a problematic task. Among the reasons for this difficulty are the use of inadequate indicators (Speklé and Verbeeten 2014; Mannion and Braithwaite 2012), the crudity in the way of measurement (Nyland and Pettersen, 2004), and the narrow focus of performance measurement systems, usually created without considering their importance to measure and promote organizational learning and strategic management and with the narrow purpose of accountability (Krupička, 2021).

The first aspect to consider about this problem resides in the specificity of knowledge management and OP. As there are no equal organizations, there is also no equal knowledge and OP. There are different practices related to KM or OP when considering the differences between the surrounding environment, economic policy, organizational culture, management styles, and other aspects (Krupička, 2021). The contextual analysis of the management of each hospital and the level of management and knowledge sharing should determine a specific approach to support their individual needs. Eventually, the most appropriate option may be part of a mix of management practices (Krupička, 2021).

In economic activities, knowledge can be defined as any information that is relevant, accessible, and based on people's experiences. On the other hand, the knowledge management process must include the creation of knowledge, storage, sharing, and its use, while knowledge management systems include the systems, policies, processes, and procedures used to manage the creation, storage, sharing, and reuse of knowledge (Alavi & Leidner, 2001b; Choi et al., 2010). Conceptually, a KM system corresponds to a system
that allows the creation, dissemination, transfer, and permanent availability of knowledge in the organization (Ghosh & Scott, 2006).

Organizations are the owners of knowledge, as it is part of the KM system. In this sense, the organization must assume the relevance of developing and implementing a KM system, as the more complete it presents itself in supporting organizational activities, the better the performance, the competitiveness, and sustainability. Although knowledge results, in part, from organizational artifacts, such as processes, structures, and technologies, the dynamic context for knowledge is provided by people - knowledge workers and their culture, which, in the specific situation of a hospital, will correspond to the interactions between the different stakeholders (patients, physicians, nurses, and other associated health personnel) (Davenport & Glaser, 2002). OP is thus dynamic and is dependent on the KM System.

Designing a KM system closely related to OP presupposes that it considers crucial aspects such as aligning with the strategy, an effective architecture, and adequate support to organizational management (King et al., 2002). In the hospital case the quality of knowledge will be reflected in how the knowledge of different health professionals is consolidated and increased, and it supports the adequacy of decision-making because of the nature of the patients' problems (I.-C. Chang et al., 2012). The quality of the KM system determines the quality of existing records, decision quality, service quality, and OP.

Additionally, its role is often overlooked despite the importance of knowledge for organizations to manage crises (W.-T. Wang & Wu, 2021; W. Wang, 2009). Effective crisis response is directly related to an organization's ability to make strategic, quick, and accurate decisions related to prevention, preparedness, mitigation, and recovery (Meyer Jr et al., 2020). However, to achieve this goal, the organization must possess or develops a specific set of KM practices to quickly acquire critical knowledge to deal with the situation (W.-T. Wang & Wu, 2021).

In this sense, although there is research in the literature aimed at identifying practices related to the gain of efficiency and quality in the provision of health services (Speklé & Verbeeten, 2014; van Elten et al., 2019), the study of OP management from the different contextual aspects still shows many opportunities (Krupička, 2021).
2.7 The health sector in Brazil

The WHO defines health systems as a set of activities carried out to promote, restore, and maintain the health of a given people (WHO - World Health Organization, 2022).

In Brazil, the health sector can be divided between the institutions that compose the Unified Health System (SUS, Sistema Único de Saúde), with the offers health services free of charge and universal to the entire population and the institutions that compose supplementary health, with the offer private health services, complementary to those offered by SUS (E. Fernandes et al., 2007).

The creation of the SUS occurred together with the Brazilian democratization process in 1990. Among the pillars on which the SUS is based are the principles of (i) universality, with the guarantee of access to health services to all Brazilians, without any distinction arising from the profession, income, race, or gender; (ii) integrality, in which the goal of meeting all health needs of the individual is defined, without any discrimination or restriction; and (iii) equity, which aims to ensure equality during the care process, observing the situations in which special care should be given to unequal ones, in order to ensure care to the needs of those who need it most.

Similarly, the Brazilian supplementary health sector underwent some modifications over the years, acquiring its current format in 1998, with the formalization of the creation of the National Health Agency (ANS, Agência Nacional de Saúde), the government agency responsible for regulating the institutions that operate in supplementary health (Alves, 2009).

Both systems act in a complementary way to offer health services to the Brazilian population. Moreover, for this to occur, both SUS and the supplementary health system have a hierarchical structure composed of various entities, as presented in Figure 7.
On the governmental side, the organization of health care is shared among the Brazilian federative entities: municipalities, states/Federal District, and the central government (Union), with the Ministry of Health being the government agency responsible for centralizing some of the decisions that directly affect the entire health sector. In this sense, the Brazilian Federal Constitution defines health as a right of all citizens, and the federative entities have the joint duty to care for the population's health. In other words, the constitution establishes a joint duty of municipalities, states, the Federal District, and the central government to guarantee access to health care in the country (Dresch, 2014).

The supplementary health system is managed by health plan operators and regulated by the government agency ANS in the private sector. Health plan operators are considered the legal organizations that manage products, services, or contracts for the continued provision of services or coverage of care costs to guarantee access to health care (Brasil, 1998).
Concerning the participation of the public and private systems in providing health care to Brazilians, SUS prevails in absolute numbers, serving 100% of the Brazilian population (Frasão, 2021). In 2022, the Brazilian population totaled 214 million inhabitants (IBGE, 2022), and there were 79.2 million beneficiaries of private health care plans in the country. However, it should be noted that of this total of private health care plans, about 50 million are beneficiaries of medical-hospital operators, while the other 29.2 million are exclusively dental.

The following Figure 8 presents the evolution of the supplementary health sector in the number of beneficiaries, demonstrating its growth over the years.

**Figure 8**

Evolution of the number of beneficiaries covered by supplementary health plans in Brazil.

![Graph showing the evolution of beneficiaries covered by private health plans in Brazil](https://www.ans.gov.br/perfil-do-setor/dados-gerais)

*Note:* The illustration shows the evolution of the number of beneficiaries of private health plans in Brazil, divided according to the type of plan. Adapted from “Beneficiários de planos privados de saúde, por cobertura assistencial (Brasil – 2011-2021)” by ANS, 2022a. (https://www.ans.gov.br/perfil-do-setor/dados-gerais). In the public domain.

It is essential to highlight that the availability of SUS resources to the population and the coverage of medical-hospital health plans from the supplementary health network are not equally distributed in the Brazilian territory. According to ANS (2022), in 2021, the state of São Paulo had medical-hospital coverage of 42.2% of its population with supplementary health plans, while the Brazilian average was 25.2%.
Another data that demonstrates the regional differences in the health system in Brazil is the ratio of doctors per thousand inhabitants. According to data from the Federal Council of Medicine, in 2020, Brazil had an average of 2.3 doctors per thousand inhabitants, while the Southeast region of the country had an average of 3.15 doctors per thousand inhabitants, while the North and Northeast regions had only 1.30 and 1.69 doctors per thousand inhabitants, respectively (Scheffer, 2020).

Figure 9 illustrates the ratio of doctors per thousand inhabitants of the Brazilian states and the Federal District.

**Figure 9**

*Distribution of physicians by Brazilian federative entity.*

The regions with darker colors present the highest rates of physician concentration. As seen in Figure 9, the highest concentration is in the Southeast region, besides the highlight for the Federal District, with a ratio of 5.11 doctors for every thousand inhabitants.

**2.8 The health sector in Portugal**

The Portuguese health system, currently known as National Health System (SNS, Sistema Nacional de Saúde), has similar characteristics to those described above in the Brazilian health system. Among these characteristics, the SNS has a general coverage when considering the medical specialties served and the universal coverage of the population. Additionally, the NHS has a predominance of public funding, although, in recent years, the private sector has gained participation in the provision of health services (A. C. Fernandes & Nunes, 2016).

The Portuguese health system has undergone several modifications until it reached its current model. The 1974 reform stands out among these modifications when the SNS was effectively created to provide universal and general coverage and gratuity. Furthermore, the reforms that occurred in the health system after the 1990s highlighted as one of the main changes the recognition of the end of gratuity of the system, thus allowing the joint action of private health entities (Baganha et al., 2002).

With the introduction of the Basic Law on Health (Lei de Bases da Saúde), Portugal began to recognize public and private health service providers in its health system, thus clearly including the participation in the SNS of three segments that should work to provide health services: (i) the National Health Service, in which are included all health organizations that depend directly on the Ministry of Health; (ii) public organizations that provide prevention, promotion and health treatment services; and (iii) private organizations and other health professionals that have a link with the NHS for the provision of health services (Baganha et al., 2002; Simões et al., 2017).

Regarding the health activities included in the SNS, one can mention primary care, which is the responsibility of health centers; hospital care, performed by hospitals and hospices; and the so-called continued and palliative care, aimed at patients who need medical follow-up/rehabilitation, performed in the patient's own home or their health units (Nunes, 2020).
Primary care is considered the main stage of contact with patients. The goal of the activities developed is to promote health care and prevent the population from diseases. To achieve this goal, the NHS provides a multidisciplinary health care team to provide care to patients. On the other hand, hospital healthcare is developed by healthcare organizations that provide a broader set of services, involving everything from consultations to medical specialties to the hospitalization of patients. Finally, as mentioned above, palliative care focuses on post-hospital health care services, focused on rehabilitation, and medical follow-up (Nunes, 2020).

Therefore, the Portuguese health system is composed of a set of organizations with different functions and objectives in providing health services. The hierarchy among these organizations and the other institutions that are part of this system is represented in Figure 10.
The central figure in the Portuguese health system is the Ministry of Health which is responsible for coordinating all activities related to the functioning of the health system, from the provision of care to the financing of public health activities (Simões et al., 2017). Included in this structure are various government bodies, private sector agents, and health professionals, as represented in Figure 10 and detailed below:

- **National Health Council**: an independent body of the Ministry of Health with an advisory role. The National Health Council is responsible for assisting the Ministry of Health through recommendations and advice on actions to achieve national health policy objectives;
• **Professional Associations**: are professional entities that bring together certain categories of health workers, such as the Portuguese Medical Association, which has the objective of regulating the profession in the country. Also included are unions and industry associations, such as the National Association of Pharmacies. Each entity has different objectives and responsibilities. The Portuguese Medical Association, for example, is responsible for granting licenses for the exercise of the profession, as well as enforcing the medical disciplinary code, among other activities;

• **Regional Health Administrations**: are institutions responsible for the regional coordination and implementation of national health policy. The Portuguese territory is divided into five Regional Health Administrations: Lisbon and the Tagus Valley, Center, Algarve, North, and Alentejo. Each administration has the responsibility at the regional level for the supervision and control of hospitals, the strategic management of population health, and the direct management of primary care in the Portuguese health system;

• **Health Regulatory Agency**: is the national agency responsible for regulating the health sector and supervising health institutions. This agency has the objective of guaranteeing that the entities in the sector fulfill their operational obligations, promoting market competition, and guaranteeing adequate health care for the population (Simões et al., 2017).

Similar to the Brazilian situation, Portugal has an unequal distribution of doctors per thousand inhabitants in its territory. According to the National Institute of Statistics (INE, Instituto Nacional de Estatística), the Coimbra region has the highest proportion, with 35.4 doctors for every thousand inhabitants. The region of Leiria has the lowest proportion, with 4.4 doctors for every thousand inhabitants (INE, 2021).

Figure 11 illustrates the division of Portugal's territory according to the Nomenclature of Territorial Units for Statistical Purposes (NUTS, Nomenclatura das Unidades Territoriais para Fins Estatísticos) (PORDATA, 2013).
**Figure 11**

*Distribution of physicians in Portugal by NUTS.*

*Note:* The map represents the distribution of doctors per thousand inhabitants in the Portugal territory by means of a color scale. Adapted from “Médicas/os por 1000 habitantes” by INE, 2021. (https://www.ine.pt/xportal/xmain?xpid=INE&amp;xpgid=ine_indicadores&amp;contexto=pi&amp;indOcorrCod=0008356&amp;selTab=tab0). In the public domain.
The regions (NUTS) with darker colors present the highest rates of physician concentration. Coimbra, Porto, and Lisbon have the highest proportions, respectively. While Leiria, Castelo Branco, and Setúbal have the lowest proportions of doctors per thousand inhabitants.
CHAPTER THREE
3 HYPOTHESIS

Knowledge is considered the most valuable resource in an organization (Giraldo et al., 2019; W.-T. Wang & Wu, 2021). Promoting EKM assists organizations in generating improvements in their resource allocation and management activities, as well as supporting activities that create value for the organization (Chuang, 2004; Gold et al., 2001; Y. Hu et al., 2021; Tanriverdi, 2005).

In this same sense, EKM is considered fundamental to enabling the organization to improve its decision-making processes, problem-solving, and, consequently, organizational performance. Additionally, EKM acts as a facilitator for the creation of OI by providing methods to identify, store, share, and create knowledge (Soto-Acosta & Cegarra-Navarro, 2016), while OI acts with the function of integrating and interpreting these data and information inputs so that organizational managers can make complex decisions at the organizational level (De Angelis, 2013).

OI is directly related to the organization's ability to respond effectively to environmental conditions by integrating internal knowledge and capabilities with information from the external environment. In other words, it involves the organization's ability to adapt, learn, and change in response to environmental turbulence (De Angelis, 2013; Dobre & Hăhăianu, 2016; González & García-Muiña, 2016; Haber-Veja & Más-Basnuevo, 2013)

The concepts of KM and OI are complementary and interdependent, and many of the processes related to KM are responsible for the changes observed in OI (De Angelis, 2013; Yaghoubi et al., 2012). Yaghoubi et al. (2012) found a 59.2% relationship between existing variations in OI in public sector firms and what he termed strategic KM processes, that is, KM activities related to the assessment, construction, and sustainment of knowledge.

For knowledge to be used effectively, organizations need to create an environment for knowledge exchange and sharing, constantly analyzing the effectiveness of its use (Y. Hu et al., 2021; Nurcholis, 2021). This environment is composed of a series of processes that aim to manage KM and make resource allocation activities more effective (Chuang, 2004; Gold et al., 2001; Y. Hu et al., 2021; Tanriverdi, 2005). These processes also interfere in obtaining OI. They are somehow related to the organization's ability to process, interpret, manipulate, and access the available information to achieve its objectives (Glynn, 1996; Istudor et al., 2016; Malekzadeh et al., 2016).
From these definitions, we have that the organization will be interfering in its strategic processes of KM and, consequently, in the creation of OI when achieving EKM. Thus, we have the first hypothesis:

**H1:** Effective knowledge management has a significant and positive effect on organizational intelligence.

As mentioned, EKM can generate benefits for the organization (Gold et al., 2001; Santoro et al., 2018) in a way that improves its performance (Daña et al., 2020; Gaviria-Marin et al., 2019; Keshavarz, Givi, et al., 2018a; Nisar et al., 2019; Santoro et al., 2018) by generating both economic and social improvements (J. F. Cohen & Olsen, 2015; W. M. Cohen & Levinthal, 1990; Y. Hu et al., 2021).

De Almeida et al. (2016) e Zhang et al. (2012) state that the OP in the current economy is related to the ability of each one to obtain, process, and interpret the available information, going far beyond the simple activity of obtaining that information.

In this sense, through EKM, knowledge-intensive organizations such as hospitals can improve their knowledge extraction and application process, which will also interfere with the improvement of services provided to the population (Hosseini et al., 2019; W.-T. Li & Hung, 2009), as well as in their ability to innovate in processes and services, a factor considered essential for maintaining competitiveness in the long term (du Plessis, 2007; Jad et al., 2017) (Dalkir, 2013), and the quality of the workforce of health professionals working in the organization (Lee et al., 2014).

Additionally, according to evidence present in previous studies (Beikzadeh et al., 2010; Toolarood & Daryani, 2015), it has been found that the formative dimensions of OI positively influence the performance of organizational managers and, consequently, the OP.

OI is related to an organization's ability to develop efficient behavior to ensure an adequate reaction to the dynamics and uncertainties present in the environment. This behavior determines its ability to create and use knowledge in a strategic way to adapt to the market environment (Boudlaie et al., 2014; González & García-Muña, 2016; Istudor et al., 2016; Malekzadeh et al., 2016). Through this systematic processing of information
and knowledge available in the internal and external environments, OI influences the organization's ability to anticipate the future and adapt to changes in the environment (Istudor et al., 2016; Malekzadeh et al., 2016), thus improving its OP.

In this sense, it is expected that the OP of hospitals is related to organizational factors such as EKM and OI since knowledge is considered an essential organizational resource, allowing for to acquire of expertise and the increase in organizational learning (Nisar et al., 2019), besides allowing improving OP and competitive advantages (Leal-Rodríguez et al., 2013; Lee et al., 2014; Nisar et al., 2019).

Based on these arguments, the following hypothesis of this study was elaborated:

**H2:** Effective knowledge management has a significant and positive effect on the organizational performance of hospitals.

**H3:** Organizational Intelligence has a significant and positive effect on the organizational performance of hospitals.

During periods of crisis, as occurred during the COVI-19 pandemic, knowledge sharing and new knowledge creation are considered essential activities to achieve an effective crisis response (Bdeir et al., 2013).

The COVID-19 pandemic required organizations and governments to make quick decisions and adapt to the new environment (Comfort et al., 2020) in order to quickly manage and mitigate the effects of the pandemic (Ammirato et al., 2020), thereby reducing the risk of loss of life (Huang & Shih-Wei, 2020).

The availability and sharing of knowledge through clinical reports on a global scale about the pandemic of COVID-19 are considered one of the factors that contributed to rapid learning about the disease, assisting in reducing the average intensive care unit (ICU) mortality rate in several countries around the world, with rates dropping from over 50% in March to an average rate of 41.6% in May (Armstrong et al., 2020).

EKM is directly related to the ability of organizations to drive improvements in their resource allocation activities (Y. Hu et al., 2021), as well as to improve their ability to make strategic decisions quickly and accurately, increasing their chances of mitigating damage and subsequent recovery to times of crisis (Meyer Jr et al., 2020).
EKM is directly related to the ability of organizations to make strategic decisions quickly and accurately, as well as to promoting improvements in their resource allocation activities, thus increasing their chances of mitigating the damage caused by moments of crisis and recovering quickly (Y. Hu et al., 2021; Meyer Jr et al., 2020).

In a complementary manner, organizations with a higher level of OI can develop efficient behavior that allows them to respond appropriately to environmental turbulences (Istudor et al., 2016), such as those caused by the COVID-19 pandemic. These organizations have a greater ability to identify and generate knowledge to strategically adapt to the environment and solve problems of technical and human aspects (Toojarood & Daryani, 2015).

The acquisition of new knowledge ultimately improves the organizational learning process and increases organizational resilience (Carayannis et al., 2017; Levinthal & Rerup, 2006). This process increased OP by allowing the organization to acquire new skills and knowledge, become more competitive (Carayannis et al., 2017; Levinthal & Rerup, 2006), and prepared to react to threats in the environment (Salguero et al., 2017; Shujahat et al., 2017).

In this sense, the effective hospitals' response to the challenges of the new scenario imposed by COVID-19 and their OP became determinants in mitigating the effects of the pandemic (Huang & Shih-Wei, 2020). Furthermore, to achieve this goal, OI and processes related to EKM become essential for the organization to respond to environmental changes and improve OP.

Therefore, it is expected that hospitals with EKM and OI will also achieve high OP (Lee et al., 2014; Toojarood & Daryani, 2015), with more extraordinary ability to solve the new problems and challenges imposed, acquire new expertise, and increase their organizational learning (Nisar et al., 2019), to manage and achieve effective crisis response (Huang & Shih-Wei, 2020) caused by COVID-19.

Based on these arguments, the following study hypotheses were developed:

**H4**: Effective knowledge management has a significant and positive effect on the effective hospitals’ response to COVID-19.
**H5:** Organizational Intelligence has a significant and positive effect on the effective hospitals’ response to COVID-19.

**H6:** Organizational performance of hospitals has a significant and positive effect on the effective hospitals’ response to COVID-19.

After presenting the hypotheses, Figure 12 presents the proposed model. In this model, the effective hospitals’ response to COVID-19 is measured through the constructs of EKM, OP, and OI. The relationships of influence between the constructs are highlighted.

**Figure 12**

*Conceptual model of the research.*

The measurement scales used to create each construct that comprises the model illustrated in Figure 12 are presented in the sequence.

Table 1 presents the measurement scale and main references used to create the construct of effective knowledge management.
**Table 1**  
*Measurement scales and theoretical framework for effective knowledge management construct.*

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKM1</td>
<td>Employees receive adequate training from the organization to carry out their activities.</td>
<td>(Ghosh &amp; Scott, 2006; Preece, 2015)</td>
</tr>
<tr>
<td>EKM2</td>
<td>The instructions described in the institution's procedures are easy to understand.</td>
<td></td>
</tr>
<tr>
<td>EKM3</td>
<td>The organization adopts the best practices available in the market.</td>
<td></td>
</tr>
<tr>
<td>EKM4</td>
<td>Meetings in the workplace include discussions related to practices adopted in the market.</td>
<td>(Ghosh &amp; Scott, 2006; Preece, 2015)</td>
</tr>
<tr>
<td>EKM5</td>
<td>There is information available in the organization for employees to consult and solve problems.</td>
<td></td>
</tr>
<tr>
<td>EKM6</td>
<td>Employees are encouraged to ask for assistance from other employees when they need it.</td>
<td></td>
</tr>
<tr>
<td>EKM7</td>
<td>Employees are encouraged to share and discuss their work with employees from other departments.</td>
<td></td>
</tr>
<tr>
<td>EKM8</td>
<td>The structure of departments and units facilitates interaction and knowledge sharing.</td>
<td></td>
</tr>
</tbody>
</table>

*Notes: EKM = effective knowledge management. The table presents the items used to measure the effective knowledge management construct. Adapted from “Effective Knowledge Management Systems for a Clinical Nursing Setting” by B. Ghosh and J. E. Scott, 2006, *Information Systems Management*, 24(1). [https://doi.org/10.1080/10580530601038188]; “Managing information and knowledge in service industries” by M. Preece, 2015, Sustaining competitive advantage via business intelligence, knowledge management, and system dynamics, 22 ed. [https://doi.org/10.1108/S1069-09642015000022B002]*

Table 2 presents the measurement scale and main references used to create the construct of organizational intelligence.
Table 2

*Measurement scales and theoretical framework for organizational intelligence.*

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>OI1</td>
<td>One seeks to identify how changes in the business environment influence decision-making.</td>
<td>(Carvalho &amp; Esteban-Navarro, 2016; González &amp; García-Muiña, 2016; Istudor et al., 2016).</td>
</tr>
<tr>
<td>OI2</td>
<td>Knowledge is successfully used to make forecasts in order to anticipate changes and make decisions.</td>
<td></td>
</tr>
<tr>
<td>OI3</td>
<td>Information about good work practices and lessons learned are used in decision-making.</td>
<td></td>
</tr>
<tr>
<td>OI4</td>
<td>Management promotes an atmosphere of openness and acceptance of change.</td>
<td></td>
</tr>
<tr>
<td>OI5</td>
<td>Communication is clear and efficient.</td>
<td></td>
</tr>
<tr>
<td>OI6</td>
<td>Processes and norms are defined with the participation of representatives from various areas.</td>
<td></td>
</tr>
</tbody>
</table>


Table 3 presents the measurement scale and main references used to create the construct of organizational performance.
Table 3

*Measurement scales and theoretical framework for organizational performance.*

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP1</td>
<td>Offered a good overall quality of services</td>
<td>(Wamba et al., 2017; Wu &amp; Hu, 2012; Zangoueinezhad &amp; Moshabaki, 2009)</td>
</tr>
<tr>
<td>OP2</td>
<td>Presented good financial health</td>
<td></td>
</tr>
<tr>
<td>OP3</td>
<td>Presented good reputation in relation to its technical skills</td>
<td></td>
</tr>
<tr>
<td>OP4</td>
<td>Demonstrated high innovation in services and processes</td>
<td></td>
</tr>
<tr>
<td>OP5</td>
<td>Increased the number of services performed</td>
<td></td>
</tr>
<tr>
<td>OP6</td>
<td>Increased success rate in treatments / services</td>
<td></td>
</tr>
</tbody>
</table>


Table 4 presents the measurement scale and main references used to create the construct of an effective response to COVID-19.
**Table 4**

*Measurement scales and theoretical framework for effective response to COVID-19.*

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Effective response to COVID-19 (ER)</th>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER</td>
<td>...has effectively acquired and applied available information about COVID-19.</td>
<td>(Bolisani et al., 2021; Y. Hu et al., 2021; Q. Li et al., 2021; Z. Li et al., 2021; W.-T. Wang &amp; Wu, 2021; Witkowski et al., 2021).</td>
<td></td>
</tr>
<tr>
<td>ER2</td>
<td>...made assertive decisions to anticipate the challenges of COVID-19.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ER3</td>
<td>...adapted quickly to the changes imposed by COVID-19.</td>
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<td></td>
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</table>

CHAPTER FOUR
4 METHODOLOGY

This section presents the main methodological foundations used in this research, with a brief description of the sector that is the object of this study. In the next paragraph, the description of the data analysis technique is presented and the justifications that supported its choice. Next, the description of the measurement instrument, the sample composition and data collection process, and the specifications of the measurement model used in the research are presented.

4.1 Data Analysis Technique

PLS-SEM (Partial Least Square - Structural Equation Modeling) has been applied more and more frequently in the social sciences, with particular emphasis on the business area (Hair et al., 2018). This preference for PLS-SEM stems from several modeling features that go far beyond the requirement of a smaller sample size (Bido & Da Silva, 2019).

Among the main characteristics, it is held that PLS-SEM is:

I. an excellent technique for assessing the relationship between constructs (or latent variables, components, and factors) (Bido & Da Silva, 2019; Hair et al., 2018; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Hult, Ringle, Sarstedt, et al., 2017);

II. suitable for working with complex models (Bido & Da Silva, 2019; Hair et al., 2014; Hair, Hult, Ringle, & Sarstedt, 2017);

III. considered robust to the lack of multivariate normality of the data (Bido & Da Silva, 2019; Hair et al., 2014, 2018; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Hult, Ringle, Sarstedt, et al., 2017; Latan, 2018)

IV. considered suitable for analysis of small samples (smaller than 100 individuals) (Bido & Da Silva, 2019; Hair et al., 2014, 2018; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Hult, Ringle, Sarstedt, et al., 2017; Latan, 2018).

Despite the characteristics listed above, many articles justify the choice of PLS-SEM as a method only due to having a small sample size, ignoring the other strengths and weaknesses that justify the choice of this method (Bido & Da Silva, 2019; Guide & Ketokivi, 2015).

Additionally, PLS-SEM has its main statistical goal to find the prediction that maximizes the explained variance in the dependent variable. In contrast, the previous CB-SEM approach’s main statistical goal was to confirm an existing theory by estimating a new
covariance matrix with no significant differences from the original observed covariance matrix (Hair et al., 2014, 2018).

Some criticisms of PLS-SEM involve underestimating the structural model parameters and overestimating the measurement model parameters, known as PLS-SEM bias. However, it has been shown that PLS-SEM bias is small in absolute terms, and it also decreases as a larger number of indicators per construct and a larger sample size are used for analysis (Hair et al., 2018; Reinartz et al., 2009).

For Hair et al. (2018), five characteristics directly affect the sample size when working with SEM techniques among them: (i) the estimation technique chosen; (ii) whether or not the data have multivariate normality; (iii) the complexity of the model one intends to create; (iv) the amount of missing data in the sample; and (v) the average error variance among the reflective indicators present in the model.

For structural equation models with up to five constructs, each with three or more items and communality greater than 0.6, sample sizes greater than 100 are suggested so that the sample fulfills its role of producing more information and stability to the study while reducing variability and increasing the stability of the solutions (Hair et al., 2014, 2018).

It is noteworthy that, despite the characteristics mentioned above, many articles justify the choice of PLS-SEM as a method only as a result of having a small sample size, ignoring the other strengths and weaknesses that justify the choice of this method (Bido & Da Silva, 2019; Guide & Ketokivi, 2015).

Additionally, PLS-SEM has its main statistical goal of finding the prediction that maximizes the explained variance in the dependent variable. In contrast, the previous CB-SEM approach has its main statistical goal of confirming an existing theory by estimating a new covariance matrix with no significant differences from the original observed covariance matrix (Hair et al., 2014, 2018).

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As presented in Figure 12, this description fits the model of this research, using four constructs. Additionally, as will be analyzed later in the results section, the latent variables (Effective Knowledge Management and Organizational Intelligence) have high correlations (between 0.6 and 0.7), something expected as a result of the convergence between the themes of this study (Bido & Da Silva, 2019).

Regarding the use of the structural equation model, Hair et al. (2018) define six steps present in its construction process, related to:

- Step 1: Definition of research objectives and Constructs;
- Stage 2: Designing the study to produce empirical results;
- Step 3: Specification of structural and measurement models;
- Step 4: Evaluation of the validity of the measurement model;
- Step 5: Evaluation of the structural model;
- Step 6: Advanced analyses with PLS-SEM.

Steps 1 and 2 have been previously detailed by presenting the research objectives and the structural model. Next, the remaining steps will be detailed, with the presentation of the remaining model specifications and presentation of the results for the evaluation of the measurement model and the evaluation of the structural model.
CHAPTER FIVE
5 MEASUREMENT INSTRUMENT

The study was carried out in two phases: In the first phase, the validation of the survey was carried out. The Delphi methodology validated the questionnaire by a panel of experts to reach a consensus on the conceptual definitions and validity of the items' content (Hasson et al., 2000; Lima et al., 2016; Malekzadeh et al., 2016). The questionnaire was delivered to 6 academics (Ph.D.) and specialized health consulting members and ten health professionals (physicians and nurses) for opinion-collection interactions (Dalkey and Helmer, 1963; Lima et al., 2016). After three interactions, the final version was reached, comprising of eight questions on EKM, six on OP, and three on effective response to COVID-19. The final questionnaire in this survey is available in Appendix 1.

In the second phase, this study analyzes the relationships between EKM, OP, and effective response to COVID-19. A standardized questionnaire combined with a Likert scale of five points, ranging from "totally disagree" to "totally agree," was developed based on the proposal of authors Darroch (2005), Ghosh and Scott (2006), Preece (2015), Wamba et al. (2017), Zangoueinezhad and Moshabaki (2009) Peters et al. (2016) and Wu and Hu (2012).

The questionnaire was answered by physicians and nurses, the principal organizational actors in the Covid-19 fight, from the leading hospitals in Portugal and Brazil (state of São Paulo). The choice of these two countries resulted from the cultural closeness between them and the hospital selection from the health importance in respective geographical areas (knowledge, technological resources, infrastructural dimension).

5.1 Sampling and data collection

The study sample was composed of healthcare professionals, physicians, and nurses who worked in hospitals in Brazil and Portugal during the confrontation of the COVID-19 pandemic. The answers were collected through a self-administered electronic questionnaire shared through the Linkedin professional social network. According to Jabbour (2007), the use of the researcher's contact networks, such as social networks, helps maximize the return rate of respondents, and the personalized approach to the potential respondent demonstrates the relevance of their participation for the success of their success the research.
Collection via online questionnaire is characterized by a low response rate, which requires sharing to as many individuals of interest as possible (Lefever, Dal, & Matthíasdóttir, 2007; Van Selm & Jankowski, 2006).

Respondents who had a complete and updated professional profile were selected (professional description, position, and current company in which they worked) and who worked during the pandemic period in at least one of the 30 best hospitals in Portugal according to the Web Ranking of Hospitals (CSIC, 2016) and in the 41 best hospitals in Brazil according to Newsweek magazine (Newsweek, 2020).

After making the initial contact with 3,100 health professionals, 248 responded to the questionnaire, exceeding both the minimum of 68 samples required according to the calculation performed using the GPower 3.1 software, in which the effect size of 0.15 and a power of 0.80 was considered (Faul et al., 2009) and the minimum of 100 samples suggested by (Hair et al., 2018) in order to produce more information and stability to the study.

Of the total respondents, 51.6% were physicians, primarily professionals with undergraduate academic level (67.7%) and with more than 8 years of practice in the current position (34.3%).

Table 5 shows more details about the demographic profile of the sample.
Table 5

Demographic data of respondents.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Item</th>
<th>Frequency</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nature of professional activity</td>
<td>Physicians</td>
<td>128</td>
<td>51.6%</td>
</tr>
<tr>
<td></td>
<td>Nurse</td>
<td>120</td>
<td>48.4%</td>
</tr>
<tr>
<td>Education</td>
<td>Undergraduate</td>
<td>168</td>
<td>67.7%</td>
</tr>
<tr>
<td></td>
<td>Master</td>
<td>70</td>
<td>28.2%</td>
</tr>
<tr>
<td></td>
<td>Doctorate</td>
<td>10</td>
<td>4.0%</td>
</tr>
<tr>
<td>Professional responsibility</td>
<td>Director-General</td>
<td>4</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>Area Manager / Department / Service</td>
<td>35</td>
<td>14.1%</td>
</tr>
<tr>
<td></td>
<td>Team Leader</td>
<td>43</td>
<td>17.3%</td>
</tr>
<tr>
<td></td>
<td>Team member</td>
<td>159</td>
<td>64.1%</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>7</td>
<td>2.8%</td>
</tr>
<tr>
<td>Working time in the current</td>
<td>Up to 2 years</td>
<td>70</td>
<td>28.2%</td>
</tr>
<tr>
<td>position</td>
<td>From 3 to 4 years</td>
<td>38</td>
<td>15.3%</td>
</tr>
<tr>
<td></td>
<td>From 5 to 6 years</td>
<td>31</td>
<td>12.5%</td>
</tr>
<tr>
<td></td>
<td>From 7 to 8 years</td>
<td>22</td>
<td>8.9%</td>
</tr>
<tr>
<td></td>
<td>Over 8 years</td>
<td>85</td>
<td>34.3%</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>2</td>
<td>0.8%</td>
</tr>
</tbody>
</table>

Notes: the table shows the demographic characteristics of the 248 survey respondents. The “Frequency” column shows the number of respondents in absolute values, and the “(%)” column shows the relative values in percentage.

5.2 Specification of the statistical technique and measurement model

The preference for using PLS-SEM (Partial Least Square - Structural Equation Modeling) in business (Hair et al., 2018) stems from modeling characteristics that go far beyond the requirement of smaller sample size (Bido & Da Silva, 2019). In this study, the main characteristics that led us to choose to develop a PLS-SEM model were: the complexity of the proposed model (Bido & Da Silva, 2019; Hair et al., 2018; Hair, Hult, Ringle, & Sarstedt, 2017) (Bido & Da Silva, 2019; Hair et al., 2014; Hair, Hult, Ringle, & Sarstedt, 2017), associated mainly to analyze the effect of latent variables (Bido & Da Silva, 2019; Hair et al., 2018; Hair, Hult, Ringle, & Sarstedt, 2017; Hair, Hult, Ringle, Sarstedt, et al., 2017); the predictive nature of the research (the effect of the latent variables on effective response to COVID-19) (Hair et al., 2014, 2018); and the higher expected correlations...
between the exogenous latent variables EKM and OI as a result of being convergent themes (Bido & Da Silva, 2019).

Because this is a model with reflective measures, internal consistency tests to assess the reliability and convergent and discriminant validities were conducted to assess the study's validity (Hair, Hult, Ringle, & Sarstedt, 2017).

Composite reliability (CR) and Cronbach's alpha (α) tests were used to assess internal consistency, while factor loadings analyses of the indicators and average variance extracted (AVE) were used to assess convergent validity. Finally, the square root analysis of the AVE was employed for the assessment of discriminant validity (Fornell & Larcker, 1981).

CR and Cronbach's alpha values higher than 0.7 are expected for reliability validation. Conversely, for convergent validity, factor loading values greater than 0.7 and AVE values greater than 0.5 are expected (Hair, Hult, Ringle, & Sarstedt, 2017). Finally, square root values of the AVE of each construct are expected to be higher than the correlations of the construct with the others that make up the model (Fornell & Larcker, 1981; Franke & Sarstedt, 2019; Hair, Hult, Ringle, & Sarstedt, 2017).
CHAPTER SIX
6 RESULTS

This section presents the results of the data analysis and model evaluation. The model assessment aims to demonstrate the measures of the existing relationships between the indicators and constructs, called measurement models, and the existing relationship between the constructs themselves called structural model. In other words, through these analyses, it becomes possible to estimate how well the theory fits the reality measured by the data (Hair, Hult, Ringle, & Sarstedt, 2017).

To achieve this goal, the analyses presented below were divided between (i) evaluation of the measurement scale, (ii) evaluation of the measurement model, and (iv) evaluation of the structural model.

6.1 Evaluating the Measurement Scale

In analyses with SEM (Structural Equation Model), the evaluation of the measurement scale is not concerned with the use of the same type of scale (5, 7, or 10 point scales, for example) among all items that make up the survey questionnaire, nor does it have a requirement that the different scale values be normalized (Hair et al., 2018). The evaluation of the measurement scale is performed to verify that the selected indicators provide adequate measures for the constructs that make up the conceptual model (Campos, 2019).

As presented in Appendix 1, the indicators used to form the constructs mainly were developed based on the proposal of authors Darroch (2005), Ghosh and Scott (2006), Preece (2015), Wamba et al. (2017), Zangoueinezhad and Moshabaki (2009), Peters et al. (2016)(2016) and (2012)Wu and Hu (2012) and subsequently supplemented with indicators raised from the literature review. Hair et al. (2018) state that although the scales have already been successfully applied regarding their reliability and validity in previous research, the use in conjunction with other scales or even with the introduction of new indicators has been used justifies the need for this new evaluation.

In this sense, through the use of SmartPLS 3 software (Ringle et al., 2015), a Confirmatory Factor Analysis (CFA) was performed (Latan, 2018; Roemer, 2016).

The CFA allows one to assess the contribution of each scale item in shaping the construct and whether the scale adequately measures the concept (reliability) (Bandalos, 2018; Hair et al., 2018; Kock & Lynn, 2012).
Once the calculations are performed, the value of the factor loadings should be analyzed, as they show how well the indicator is related to the construct and are, therefore, a demonstration of construct validity (Hair et al., 2018).

Kock & Lynn (2012) consider that should remain in the study only indicators that have factor loadings equal to or greater than 0.5, a value that demonstrates a good agreement between respondents and questionnaire creator regarding which construct each indicator belongs. In a complementary manner, Hair et al. (2018) recommend including only indicators with factor loadings equal to or greater than 0.7 (although they do not discard those with factor loadings equal to or greater than 0.5).

Although there is no "golden rule" or psychometric criterion to decide on the number of items to be removed, the decision should consider theory and common sense so that the removal choices do not undermine the information expected to be obtained from the factor (Bido & Da Silva, 2019; DeVellis, 2016; Netemeyer et al., 2003). Moreover, include together other criteria, such as the statistical significance of each estimated coefficient (Hair et al., 2018).

Table 6 presents the results of the Confirmatory Factor Analysis (CFA), used to assess whether the scale adequately measures the constructs and the contribution of each item in the measurement (Bandalos, 2018; Hair et al., 2018; Kock & Lynn, 2012). The analyses were performed using SmartPLS 3 software (Ringle et al., 2015).
Table 6

*Standardized CFA path loadings and descriptive statistics.*

<table>
<thead>
<tr>
<th>Questions</th>
<th>Items</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effective knowledge management (EKM)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees receive adequate training from the organization to carry out their activities.</td>
<td>EKM1</td>
<td>0.742</td>
<td>0.742</td>
<td>0.031</td>
<td>23.780</td>
<td>0.000</td>
</tr>
<tr>
<td>The organization adopts the best practices available in the market.</td>
<td>EKM3</td>
<td>0.805</td>
<td>0.804</td>
<td>0.026</td>
<td>30.863</td>
<td>0.000</td>
</tr>
<tr>
<td>Meetings in the workplace include discussions related to practices adopted in the market.</td>
<td>EKM4</td>
<td>0.807</td>
<td>0.806</td>
<td>0.025</td>
<td>31.807</td>
<td>0.000</td>
</tr>
<tr>
<td>There is information available for employees to consult and solve problems.</td>
<td>EKM5</td>
<td>0.804</td>
<td>0.803</td>
<td>0.024</td>
<td>33.420</td>
<td>0.000</td>
</tr>
<tr>
<td>Employees are encouraged to ask for assistance from other employees when they need it.</td>
<td>EKM6</td>
<td>0.749</td>
<td>0.747</td>
<td>0.032</td>
<td>23.633</td>
<td>0.000</td>
</tr>
<tr>
<td>Employees are encouraged to share and discuss their work with employees from other departments.</td>
<td>EKM7</td>
<td>0.772</td>
<td>0.771</td>
<td>0.027</td>
<td>28.353</td>
<td>0.000</td>
</tr>
<tr>
<td>The structure of departments and units facilitates interaction and knowledge sharing.</td>
<td>EKM8</td>
<td>0.827</td>
<td>0.827</td>
<td>0.021</td>
<td>39.735</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Organizational Intelligence (OI)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information on good work practices and lessons learned are used in decision-making.</td>
<td>OI3</td>
<td>0.830</td>
<td>0.830</td>
<td>0.022</td>
<td>37.348</td>
<td>0.000</td>
</tr>
<tr>
<td>Management promotes an atmosphere of openness and acceptance of change.</td>
<td>OI4</td>
<td>0.869</td>
<td>0.869</td>
<td>0.019</td>
<td>45.922</td>
<td>0.000</td>
</tr>
<tr>
<td>The organization has clear and efficient communication.</td>
<td>OI5</td>
<td>0.879</td>
<td>0.878</td>
<td>0.021</td>
<td>41.076</td>
<td>0.000</td>
</tr>
</tbody>
</table>
The organization demonstrates the ability to change and adapt to new environmental conditions when necessary.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Items</th>
<th>Loadings</th>
<th>Mean</th>
<th>SD</th>
<th>t-value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational performance (OP)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regarding the organization's performance where you work, it is correct to say that the organization in the last 2 years...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offered a good overall quality of services</td>
<td>OP1</td>
<td>0.831</td>
<td>0.831</td>
<td>0.019</td>
<td>42.794</td>
<td>0.000</td>
</tr>
<tr>
<td>Presented good financial health</td>
<td>OP2</td>
<td>0.679</td>
<td>0.678</td>
<td>0.048</td>
<td>14.215</td>
<td>0.000</td>
</tr>
<tr>
<td>Presented good reputation in relation to its technical skills</td>
<td>OP3</td>
<td>0.857</td>
<td>0.856</td>
<td>0.021</td>
<td>40.932</td>
<td>0.000</td>
</tr>
<tr>
<td>Demonstrated high innovation in services and processes</td>
<td>OP4</td>
<td>0.865</td>
<td>0.865</td>
<td>0.015</td>
<td>57.007</td>
<td>0.000</td>
</tr>
<tr>
<td>Increased success rate in treatments / services</td>
<td>OP6</td>
<td>0.705</td>
<td>0.705</td>
<td>0.045</td>
<td>15.645</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Effective response to COVID-19 (ER)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regarding the effects of COVID-19, we ask you to evaluate with notes from 1 (I totally disagree) to 5 (I totally agree). The organization where you work...</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>…made assertive decisions to anticipate the challenges of COVID-19</td>
<td>ER1</td>
<td>0.883</td>
<td>0.882</td>
<td>0.015</td>
<td>57.791</td>
<td>0.000</td>
</tr>
<tr>
<td>…adapted quickly to the changes imposed by COVID-19</td>
<td>ER2</td>
<td>0.923</td>
<td>0.922</td>
<td>0.014</td>
<td>66.266</td>
<td>0.000</td>
</tr>
<tr>
<td>…acquired and effectively applied available information about COVID-19</td>
<td>ER3</td>
<td>0.908</td>
<td>0.907</td>
<td>0.016</td>
<td>58.234</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**Notes:** SD = standard deviation. The table shows the values of descriptive statistics for confirmatory factor analysis. The total sample is 248.
The indicators EKM2, OI1, OI2, and OP5 were excluded because they have factor loads lower than 0.7 and, after confirmation of their removal, did not have a negative impact on the square root of the AVE and CR and did not significantly affect the content of the model (Bido & Da Silva, 2019; DeVellis, 2016; Netemeyer et al., 2003). Todas as correlações foram significativas (p < 0.01).

Despite having factor loadings of less than 0.7, indicator OP2 was retained due to its content importance to the study, although its removal does not negatively impact AVE and CR (Bido & Da Silva, 2019; DeVellis, 2016; Netemeyer et al., 2003).

### 6.2 Evaluation of the measurement model

In structural equation modeling, the evaluation of the measurement model requires different statistical tests for reflective and formative models. For studies using reflective measurement models such as this one, tests for internal consistency and convergent and discriminant validities are required. The Smart PLS 3 software (Ringle et al., 2015) was used to perform the internal consistency and convergent and discriminant validity tests (Hair, Hult, Ringle, & Sarstedt, 2017).

In this first moment, the analyses of the internal consistency, performed through the Composite Reliability and Cronbach's alpha tests, of the Convergent Validity, performed through the Individual Indicator Reliability (usually referred to as the indicator's External Load) and the Average Variance Extracted (AVE) tests are presented (Hair, Hult, Ringle, & Sarstedt, 2017), and discriminant validity, performed by analyzing the square root of the AVE (Fornell & Larcker, 1981) or the Heterotrait-Monotrait (HTMT) index (Franke & Sarstedt, 2019).

Internal consistency is used to assess the reliability of the variables used to measure the constructs, which can be accomplished through Cronbach's alpha and Composite Reliability (CR). While Cronbach's alpha provides an estimate of the intercorrelations of the indicators that make up the constructs, Composite Reliability provides a count of the external loadings of these same indicators to inform how well the indicators represent the construct (Hair, Hult, Ringle, & Sarstedt, 2017).

For more exploratory research such as this, one would expect to find composite reliability values between 0.60 and 0.70, while for research in more advanced stages, one would expect values between 0.70 and 0.90. Composite reliability values lower than 0.60 or
higher than 0.95 demonstrate that the indicators used to measure the constructs have problems, either as a result of low (or lack of) internal consistency reliability (values lower than 0.60) or because the indicators are measuring the same phenomenon (values higher than 0.95), probably due to the use of redundant questions (Hair, Hult, Ringle, & Sarstedt, 2017).

As presented in Table 7, both internal consistency assessment tests showed values as expected. All latent variables have values for Cronbach's alpha above 0.70 and below 0.90, as well as CR values above 0.60 and below 0.95, which indicates the reliability of the variables used to measure the respective construct of the conceptual model developed (Hair, Hult, Ringle, & Sarstedt, 2017).

Evaluating internal consistency using two different tests is indicated due to the greater sensitivity attributed to Cronbach's alpha, which underestimates reliability (usually presenting lower values). In this sense, it is common to use both tests to analyze internal consistency, using Cronbach's alpha as the lower threshold and Composite Reliability as the upper threshold of the analysis (Hair, Hult, Ringle, & Sarstedt, 2017). Additionally, Table 7 also presents the Average Variance Extracted (AVE) values used to assess convergent validity.
Table 7

Results of discriminant validity and convergent validity analysis.

<table>
<thead>
<tr>
<th></th>
<th>ER</th>
<th>EKM</th>
<th>OI</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER</td>
<td>0.905</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EKM</td>
<td>0.610</td>
<td>0.787</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OI</td>
<td>0.576</td>
<td>0.775</td>
<td>0.843</td>
<td></td>
</tr>
<tr>
<td>OP</td>
<td>0.561</td>
<td>0.673</td>
<td>0.630</td>
<td>0.792</td>
</tr>
<tr>
<td>α</td>
<td>0.889</td>
<td>0.897</td>
<td>0.864</td>
<td>0.848</td>
</tr>
<tr>
<td>CR</td>
<td>0.931</td>
<td>0.919</td>
<td>0.908</td>
<td>0.893</td>
</tr>
<tr>
<td>AVE</td>
<td>0.819</td>
<td>0.620</td>
<td>0.711</td>
<td>0.627</td>
</tr>
</tbody>
</table>

Notes: ER = effective response. EKM = effective knowledge management. OI = organizational intelligence. OP = organizational performance. α = Cronbach’s alpha. CR = composite reliability. AVE = average variance extracted. The table shows a summary of the criteria for evaluating convergent and discriminant validities. The values highlighted diagonally represent the square root of the AVE. All correlations are 1% significant. The lowest outer loading value was 0.679.

Convergent validity represents shared variance among the indicators used to measure a reflective construct. It is expected that the indicators of a reflective construct share a high proportion of variation among themselves, which is measured utilizing the AVE and the outer loading of the indicators. The higher the value of the outer loading of a construct, the greater the association between the indicators used to measure it (Hair, Hult, Ringle, & Sarstedt, 2017).

Most indicators showed factor loading (outer loading) greater than 0.7 or very close to the reference value (as detailed in Table 6), as well as AVE square root values greater than 0.5 were consequently obtained. Indicators with factor loadings between 0.4 and 0.7 should impact AVE and CR analyzed before being excluded. As a result of this analysis, indicator OP2 with a factor loading of 0.679 was kept to avoid the impact that its removal would have on content validity (Hair, Hult, Ringle, & Sarstedt, 2017).
Finally, there is the analysis of discriminant validity, which assesses how much the construct is distinct from the others so that its capture of the phenomenon under study is not verified in the other constructs of the model. To this end, there are two measures to be considered when assessing discriminant validity: cross-loadings analysis, used to assess the indicators, and AVE analysis, used to assess the constructs (Franke & Sarstedt, 2019; Hair, Hult, Ringle, & Sarstedt, 2017).

The values for the cross-loadings of the indicators are presented in Table 8.
Table 8

*Discriminant validity: analysis of the cross-loadings of the indicators.*

<table>
<thead>
<tr>
<th>Indicadores</th>
<th>ER</th>
<th>EKM</th>
<th>OI</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER1</td>
<td>0.883</td>
<td>0.571</td>
<td>0.517</td>
<td>0.503</td>
</tr>
<tr>
<td>ER2</td>
<td>0.923</td>
<td>0.506</td>
<td>0.502</td>
<td>0.494</td>
</tr>
<tr>
<td>ER3</td>
<td>0.908</td>
<td>0.574</td>
<td>0.542</td>
<td>0.523</td>
</tr>
<tr>
<td>EKM1</td>
<td>0.539</td>
<td>0.742</td>
<td>0.505</td>
<td>0.529</td>
</tr>
<tr>
<td>EKM3</td>
<td>0.564</td>
<td>0.805</td>
<td>0.653</td>
<td>0.598</td>
</tr>
<tr>
<td>EKM4</td>
<td>0.462</td>
<td>0.807</td>
<td>0.575</td>
<td>0.519</td>
</tr>
<tr>
<td>EKM5</td>
<td>0.508</td>
<td>0.804</td>
<td>0.672</td>
<td>0.553</td>
</tr>
<tr>
<td>EKM6</td>
<td>0.433</td>
<td>0.749</td>
<td>0.573</td>
<td>0.517</td>
</tr>
<tr>
<td>EKM7</td>
<td>0.360</td>
<td>0.772</td>
<td>0.600</td>
<td>0.437</td>
</tr>
<tr>
<td>EKM8</td>
<td>0.470</td>
<td>0.827</td>
<td>0.678</td>
<td>0.535</td>
</tr>
<tr>
<td>OI3</td>
<td>0.483</td>
<td>0.653</td>
<td>0.830</td>
<td>0.554</td>
</tr>
<tr>
<td>OI4</td>
<td>0.470</td>
<td>0.682</td>
<td>0.869</td>
<td>0.549</td>
</tr>
<tr>
<td>OI5</td>
<td>0.462</td>
<td>0.688</td>
<td>0.879</td>
<td>0.526</td>
</tr>
<tr>
<td>OI6</td>
<td>0.530</td>
<td>0.589</td>
<td>0.791</td>
<td>0.493</td>
</tr>
<tr>
<td>OP1</td>
<td>0.502</td>
<td>0.587</td>
<td>0.550</td>
<td>0.831</td>
</tr>
<tr>
<td>OP2</td>
<td>0.341</td>
<td>0.445</td>
<td>0.378</td>
<td>0.679</td>
</tr>
<tr>
<td>OP3</td>
<td>0.471</td>
<td>0.557</td>
<td>0.507</td>
<td>0.857</td>
</tr>
<tr>
<td>OP4</td>
<td>0.467</td>
<td>0.600</td>
<td>0.583</td>
<td>0.865</td>
</tr>
<tr>
<td>OP6</td>
<td>0.421</td>
<td>0.452</td>
<td>0.446</td>
<td>0.705</td>
</tr>
</tbody>
</table>

*Notes:* ER = effective response. EKM = effective knowledge management. OI = organizational intelligence. OP = organizational performance. The table shows a summary of the criteria for evaluating discriminant validity. The values highlighted represent the outer loading value of the indicators. The lowest outer loading value was 0.679.

The values of the external loadings of the indicators associated with each construct are presented in bold. The first three values in the ER column represent the external load of the indicators belonging to the ER construct, while the other values in the rows, presented on the right side, represent the cross-load with other constructs, that is, how many
indicators of the ER construct are associated with the EKM, OI and OP constructs. Similarly, the other values in the ER column represent the cross-loadings of other indicators with this construct.

The external loadings of the indicators associated with a given construct should be greater than the cross-loadings of this indicator with the other constructs (Franke & Sarstedt, 2019; Hair, Hult, Ringle, & Sarstedt, 2017). Therefore, the values present in Table 8 suggest that there is discriminant validity.

The next step of the analysis involves evaluating the square root of the AVE against the existing correlations between the latent variables, an analysis methodology developed by Fornell and Larcker (1981), which is why it is also known as the Fornell-Larcker criterion (Franke & Sarstedt, 2019). As highlighted on the diagonal of Table 7, all the results found are in line with the expected values (Fornell & Larcker, 1981; Franke & Sarstedt, 2019; Hair, Hult, Ringle, & Sarstedt, 2017).

Although the results found through the AVE analysis indicate discriminant validity, we also chose to analyze discriminant validity through the HeteroTrait MonoTrait (HTMT) index, proposed by Henseler et al. (Henseler et al., 2015).

The HTMT criterion calculates the mean of the correlations of indicators between constructs that measure different phenomena (i.e., different constructs) relative to the geometric mean of the correlations of indicators that are measuring the same construct (belong to the same construct) (Hair, Hult, Ringle, & Sarstedt, 2017; Henseler et al., 2015).

Although the Fornell-Locker criterion is the most widely used in academia to assess discriminant validity, Henseler et al. (2015) point out that there are weaknesses in the criterion that make it ineffective in certain circumstances. Its employment universally has come under criticism by other authors as they find the criterion unable to detect lack of discriminant validity when employed in PLS-SEM analyses (Hair, Hult, Ringle, & Sarstedt, 2017; Henseler et al., 2017). Additionally, the Fornell-Locker criterion has better performance for specific cases, such as in factor-based modeling (Voorhees et al., 2016), as well as being a heuristic test (using a set of rules) rather than a statistical test of the effects of sampling error (Franke & Sarstedt, 2019).

Franke and Sarstedt (2019) found greater robustness in the analysis of discriminant validity when using the HTMT correlation criterion, especially in situations in which the
constructs are perfectly correlated or even when there is a small difference between the loading of the indicators (e.g., between 0.70 and 0.90), which is the case for the values previously presented in Table 7.

In this sense, the universal applicability of the Fornell-Lorcker criterion may lead to inconsistent analyses of reality, which led to the complementary use of the HTMT criterion, as presented in Table 9.

**Table 9**

**Discriminant validity: HTMT results.**

<table>
<thead>
<tr>
<th>Constructs</th>
<th>ER</th>
<th>OI</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>ER</td>
<td></td>
<td>0.658</td>
<td></td>
</tr>
<tr>
<td>OI</td>
<td></td>
<td>0.642</td>
<td>0.730</td>
</tr>
</tbody>
</table>

*Notes: ER = effective response. OI = organizational intelligence. OP = organizational performance. HTMT = Heterotrait-Monotrait. The table shows a summary of the HTMT criteria used to assess discriminant validity.*

For this analysis, a value of 0.85 is considered the maximum threshold when the constructs in the model deal with conceptually different phenomena, and a value of 0.90 for models with conceptually similar constructs (Hair, Hult, Ringle, & Sarstedt, 2017; Henseler et al., 2015), as is the case for the constructs effective knowledge management (EKM) and organizational intelligence (OI).

As indicated in Table 9, all values for the HTMT criterion are below 0.85. Therefore, discriminant validity was also validated by the HTMT criterion.

In this sense, according to the values presented in Table 6, Table 7, Table 8, and Table 9, it can be stated that there is adequate internal consistency, convergent validity, and discriminant validity. In other words, the measurement model proves to be adequate.

### 6.3 Evaluation of the structural model

The structural model's evaluation is performed to verify the predictive ability of the model concerning its endogenous variables/constructs (Hair et al., 2014). To this end, a series of heuristic criteria are used, which involves assessing: (i) the relevance and significance of
the relationships in the structural model; (ii) the level of the coefficient of determination, represented by $R^2$; the effect size on the coefficient of determination, represented by $f^2$; the predictive power, represented by $Q^2$; and the effect size on the predictive power, represented by $q^2$.

The evaluation of the relevance and significance of the structural model relationships was performed through bootstrapping, a technique that calculates the standard error value for the estimated path coefficients and thus analyzes the significance of each one within the model. In other words, through the standard error, bootstrapping allows us to analyze the hypothesis that the standardized values of the path coefficients are statistically equal to zero (to be significant, the values of the path coefficients must be closer to -1 or +1). This hypothesis testing is performed using Student’s t-test (to assess the hypothesis) and the $p$-value to assess the probability of assuming the existence of significance when there is not (Hair, Hult, Ringle, & Sarstedt, 2017).

For a significance level of 5%, in two-tailed tests such as this, one can state that the path coefficient is significantly different from zero when the t-test value is more significant than 1.96, as can be seen from the results in Table 10 for all coefficients in the structure model. In this sense, the null hypothesis that the path coefficients have values equal to zero is rejected (Hair, Hult, Ringle, & Sarstedt, 2017).

### Table 10

**Results of the structural model.**

<table>
<thead>
<tr>
<th>Path</th>
<th>Hypothesis</th>
<th>$f^2$</th>
<th>$\beta$</th>
<th>SD</th>
<th>Value t</th>
<th>p-value</th>
<th>$R^2$ Adjusted</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKM -&gt; ER</td>
<td>H1</td>
<td>0.054</td>
<td>0.300</td>
<td>0.092</td>
<td>3.255</td>
<td>0.001</td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>OI -&gt; ER</td>
<td>H5</td>
<td>0.025</td>
<td>0.194</td>
<td>0.098</td>
<td>1.987</td>
<td>0.047</td>
<td>0.421</td>
<td>Supported</td>
</tr>
<tr>
<td>OP -&gt; ER</td>
<td>H6</td>
<td>0.051</td>
<td>0.237</td>
<td>0.072</td>
<td>3.285</td>
<td>0.001</td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>EKM -&gt; OP</td>
<td>H2</td>
<td>0.165</td>
<td>0.463</td>
<td>0.072</td>
<td>6.419</td>
<td>0.000</td>
<td>0.482</td>
<td>Supported</td>
</tr>
<tr>
<td>OI -&gt; OP</td>
<td>H4</td>
<td>0.056</td>
<td>0.271</td>
<td>0.073</td>
<td>3.713</td>
<td>0.000</td>
<td></td>
<td>Supported</td>
</tr>
<tr>
<td>EKM -&gt; OI</td>
<td>H3</td>
<td>1.509</td>
<td>0.775</td>
<td>0.025</td>
<td>30.594</td>
<td>0.000</td>
<td>0.601</td>
<td>Supported</td>
</tr>
</tbody>
</table>

*Notes:* ER = effective response. EKM = effective knowledge management. OP = organizational performance. $f^2$ = $f$ square. $\beta$ = structural coefficient. SD = standard deviation. $R^2$ = coefficient of determination. The table shows a summary of the evaluation criteria for the structural model. The highest value for VIF was 2.922.
The next step involves evaluating the coefficient of determination, represented by the adjusted $R^2$ values. The use of the adjusted $R^2$ avoids the simple addition or removal of an exogenous construct affecting the determination coefficient of the endogenous construct. Through the coefficient of determination, one has a measure of the model's predictive power, that is, the amount of variance of the endogenous variable that is explained by the exogenous variables (Hair, Hult, Ringle, & Sarstedt, 2017).

The results demonstrated a high predictive power of the EKM, OI, and OP constructs concerning the effective hospitals’ response to COVID-19 by the hospitals analyzed in this study. Among the results obtained, there is a coefficient of determination ($R^2$) for the ER constructs of 42.1% ($R^2 = 0.421$), in addition to the results obtained for the OP ($R^2 = 0.482$) and OI ($R^2 = 0.601$) constructs, all of which are considered to have high predictive power ($R^2 >= 0.26$) (Cohen (1988). These results confirm the hypotheses developed for the creation of the theoretical model. All the analyzed relationships are significant at the 5% level, thus supporting $H1$, $H2$, $H3$, $H4$, $H5$, and $H6$.

Complementary to this analysis, the effect size ($f^2$) that one construct has over the other was also verified. A given construct can be influenced by a different number of constructs in a structural model. Moreover, to analyze this relationship, we used the effect size ($f^2$) in order to demonstrate the variance that each of the exogenous variables can explain from the endogenous (dependent) variables (J. Cohen, 1988; Faul et al., 2009; Hair, Hult, Ringle, & Sarstedt, 2017).

For this analysis, Cohen (1988) classifies effect sizes between small (for $f^2$ values $>= 0.02$), medium (for $f^2$ values $>= 0.15$), and large (for $f^2$ values $>= 0.35$). The relationships of $EKM \rightarrow ER$ (0.054), $OI \rightarrow ER$ (0.025) and $OP \rightarrow ER$ (0.051) have small effect size ($f^2$ values $>= 0.02$). The same is true for the relationship of $OI \rightarrow OP$ (0.056), while $EKM \rightarrow ER$ (0.165) has a medium effect size ($f^2 >= 0.15$). Finally, for the relationship of $EKM \rightarrow OI$ (1.509) a large effect size ($f^2 >= 0.35$) was found (J. Cohen, 1988; Faul et al., 2009; Hair, Hult, Ringle, & Sarstedt, 2017).

In addition to these analyses, we analyzed the predictive relevance of the model using Stone-Geisser's $Q^2$ values (Geisser, 1974; Stone, 1974). This analysis aims to verify the model's ability to predict data that is omitted from the sample itself. The technique omits part of the sample data to estimate the model parameters. The estimates are then used to predict the omitted data, and through the difference between predicted and omitted data
(true sample), the value of $Q^2$ is calculated. One can say that the PLS path model has predictive relevance when it can accurately predict the data that was omitted from the model (Hair, Hult, Ringle, & Sarstedt, 2017).

In this sense, Stone-Geisser's $Q^2$ analysis uses a blindfolding process to verify that the model can predict the indicators of each endogenous construct. And for predictive relevance, $Q^2$ values must be greater than (Garson, 2016; Hair et al., 2014).

The omission distance seven ($D = 7$) was used for this analysis. The seventh data point of the indicators of the measurement construct of the latent variable were systematically eliminated from the sample, and through the sale procedure, the measurement model was used with the aim of predicting the omitted data. This process is performed seven times so that one can omit and test each of the data points in turn (Hair, Hult, Ringle, & Sarstedt, 2017).

As highlighted earlier, we can affirm that the model has predictive relevance for values greater than zero. Through the Blindfolding procedure performed through PLS-SEM and considering the cross-validation of construct redundancy, the value of $Q^2 = 0.337$ was obtained for the endogenous latent variable Effective Responses (ER), $Q^2 = 0.422$ for OI, and 0.296 for OP. These results demonstrate the predictive relevance of this empirical model (Garson, 2016; Hair et al., 2014) that relates the effective hospitals’ response to COVID-19 to the capabilities and characteristics of hospitals.

Similar to the effect size analysis performed using $f^2$ to complement the $R^2$ analysis, we have the $q^2$ effect size analysis, a measure that shows the size of the predictive relevance that an exogenous construct has for an endogenous construct, being divided between (i) small, for $q^2 >= 0.02$; (ii) medium, for $q^2 >= 0.15$ and (iii) large, for $q^2 >= 0.35$ (Hair, Hult, Ringle, & Sarstedt, 2017). For this analysis, Equation 1 was used:

$$q^2 = \frac{Q_{included}^2 - Q_{excluded}^2}{1 - Q_{included}^2}$$

Where:

$q^2$ represents the effect size of an exogenous construct on an endogenous construct;

$Q_{included}^2$ represents the $Q^2$ value obtained with the exogenous construct present in the empirical model;

$Q_{excluded}^2$ represents the $Q^2$ value obtained after excluding the exogenous construct from the empirical model.
For the evaluation of the size of the predictive relevance among the constructs, the same classification range was considered as previously used for effect size, considering the size of predictive relevance small for values of $q^2 >= 0.02$; medium for values of $q^2 >= 0.15$; and large for values of $q^2 >= 0.35$. Performing the calculations, we find that the size of the predictive relevance is considered small for all relationships $EKM \rightarrow OP (0.07)$, $EKM \rightarrow ER (0.03)$; $OI \rightarrow OP (0.02)$, $OI \rightarrow ER (0.01)$; $OP \rightarrow ER (0.03)$ (Hair, Hult, Ringle, & Sarstedt, 2017).

The final model is shown in Figure 13.

**Figure 13**

*Results of the structural model.*

The analysis of the overall model fit was confirmed using the standardized root mean square residual (SRMR) test, obtaining a value of 0.059, in accordance with the expected
conditions (SMRM ≤ 0.08) (Hair, Hult, Ringle, & Sarstedt, 2017; Henseler, 2018; L. Hu & Bentler, 1999)
CHAPTER SEVEN
7 DISCUSSION

This research aimed to analyze the influence of effective knowledge management and organizational performance on the effective hospitals’ response to COVID-19. During the COVID-19 pandemic, many healthcare institutions in different countries collapsed during the sudden increase in the number of infected people, generating a significant number of deaths. However, in the following months, many health institutions were able to improve their results in fighting the pandemic by learning and sharing information about the virus, demonstrating the importance of effective knowledge management and well-trained health systems.

As analyzed using Table 10, there is a positive relationship between effective knowledge management and organizational performance (β = 0.676, t = 19.758, p < 0.01), thus supporting H1. Previous research had already reported benefits arising from effective knowledge management for organizations (Gold et al., 2001), reporting benefits related to increased ability to acquire expertise and increase organizational learning (Nisar et al., 2019), as well as creating an environment for sharing information among their stakeholders (Istudor et al., 2016) and promoting performance improvements related to cost reduction, improved intellectual capital, and the promotion and implementation of best practices in utilizing knowledge resources (Y. Hu et al., 2021).

In this sense, the positive relationship between effective knowledge management and organizational performance refers to improvements that these healthcare organizations can obtain in these various fields, especially in hospitals where knowledge can be identified and leveraged behind specific mechanisms for its management. Among these mechanisms are knowledge-sharing routines, which will enable a constant flow of knowledge transfer by sharing the best practices to be performed in each activity (Daña et al., 2020; Keshavarz, Esmaili Givi, et al., 2018).

This outcome means that better information and knowledge about diseases, patient diagnoses, drugs, can improve hospital performance, namely in patients’ recovery, death patient’s reduction, reduction in occupancy rate. The knowledge level of specialized workers can leverage the results and improve the organizational and management mechanisms. This performance improvement will only be possible if the flow of knowledge transfer promotes the better knowledge sharing routines (Daña et al., 2020; Gaviria-Marín et al., 2019; Keshavarz et al., 2018), as well as increases the capacity to
create new processes (Thrassou et al., 2012) and innovation (Darroch, 2005; Santoro et al., 2018) aiming the health levels of the patients and population.

The results also indicated a positive connection between effective knowledge management and effective response to COVID-19 \( (\beta = 0.489, t = 7.109, p < 0.01) \), thus supporting H2. As discussed earlier, effective knowledge management can provide the organization with greater flexibility and capacity for action. Flexibility stems from increased knowledge flow between areas and health workers (Daňa et al., 2020) and increased capacity for innovation (Teece, 2007; Thrassou et al., 2012). Capacity for action, on the other hand, is the result of effectiveness in knowledge management, as seen during the COVID-19 pandemic in the response of several countries and health institutions to the pandemic, using knowledge about the factors related to the disease itself and the spread of the virus to adopt health measures to contain its spread (López Casasnovas & Pifarré i Arolas, 2021).

Through these results, with more agile responses, hospitals can adapt more quickly to the environment and better manage the pandemic response (Huang & Shih-Wei, 2020). In other words, hospitals with effective knowledge management also achieve better organizational performances (Lee et al., 2014).

Complementary to what was discussed in the other hypotheses, this study also confirmed a positive and significant relationship between organizational performance and COVID-19 response effectiveness \( (\beta = 0.231, t = 3.185, p < 0.01) \). Hospitals with better organizational performance demonstrated better responsiveness to COVID-19 for several reasons. Among these reasons, the greater relevance to efficient resource utilization caused after the emergence of the COVID-19 pandemic should be noted. The hospitals with the best results were those that managed the sudden growth in patient flow through their better organizational performance in the application of resources (Krupička, 2021). Additionally, these organizations are also known to adopt best management practices, which allows them to develop new knowledge about best practices to be applied by their health care professionals with greater agility (Krupička, 2021). Therefore, healthcare organizations with better organizational performance can make strategic, rapid, and accurate decisions related to prevention, preparedness, mitigation, and recovery (Meyer Jr et al., 2020), thus generating a virtuous cycle of response to COVID-19.
CHAPTER EIGHT
8 CONCLUSIONS

This study can confirm that effective knowledge management has a positive effect on organizational performance and the effective hospitals’ response to COVID-19. It is also evident the positive effect of organizational performance on the effective hospital response to COVID-19. These results support the theoretical model and validate the three variables included. It is possible to see the significant associations between effective knowledge management and effective response to COVID-19, as well as between effective knowledge management and organizational performance and between organizational performance and effective response to COVID-19.

These findings provide valuable information to managers for readjusting hospital practices and redefining the knowledge management framework in hospitals, seeking continuous improvement of institutional responses to the challenges of unexpected situations such as pandemics. This study also demonstrated that effective knowledge management should be considered a core resource for healthcare organizations to perform their functions adequately. It directly interferes with organizational performance and its ability to respond appropriately to changes in the environment, as occurred during the COVID-19 pandemic. Hospitals with better knowledge management processes were better able to cope with the pandemic, thus reducing the side effects caused by COVID-19.

There is also greater room for further discussion on the investment of financial resources in hospitals, with the need to examine the need for more significant investment in improving knowledge management practices. A knowledge-based organizational management approach can avoid asymmetries between communication structures and provide all healthcare professionals with adequate knowledge to perform their functions, which can generate better results than the use of financial resources considered scarce, especially in times of crisis.

Finally, the importance of adopting knowledge management mechanisms within hospitals should be emphasized to allow a constant flow of knowledge transfer and sharing of best practices. The results show that the best organizational performance is related to effective knowledge management, agility, and responsiveness to COVID-19. In this sense, it opens space for further discussion about the implementation and effective use of these mechanisms, especially in times of crisis, in which they become essential.
8.1 Limitations

This study has some limitations to be highlighted. We chose to collect data electronically, using a professional social network having been conducted during a pandemic period. This means of collection rather than an institutional contact and the turbulent period experienced by health professionals may have contributed to the low response rate.

The respondents are formed mostly by health professionals (physicians and nurses) who work in operational areas of hospitals in direct patient care. Although relevant to assessing the effective hospitals’ response to COVID-19, the low participation of professionals in managerial positions may have limited the results regarding the effects on organizational performance.

In this sense, future studies could choose to direct their analyses to health professionals in managerial positions. Additionally, they could also use institutional means for data collection to reduce sample heterogeneity and increase the rate of respondents.

8.2 Implications

This study presents practical and empirical evidence on the importance of effective knowledge management in healthcare organizations for an effective response during times of crisis. Through analysis of data from the COVID-19 pandemic, it was possible to demonstrate the influence of effective knowledge management and organizational performance on the effective response to COVID-19 and the influence of effective knowledge management on organizational performance.

With specific regard to empirical implications, this study has shown that effective knowledge management plays a key role in effective hospitals’ response to COVID-19 and may even be considered more relevant than organizational performance. As demonstrated by the results, effective knowledge management has an average ability to explain the variance in COVID-19 response effectiveness, while organizational performance showed a small effect size. Part of this result is related to the importance of effective knowledge management in times of crisis, by allowing the sharing of new knowledge and promoting a more effective response to the crisis through new routines, processes, and innovations.
Additionally, this study identified a direct and positive relationship between effective knowledge management and organizational performance, a significant result for the decision making and response effectiveness of managers in moments of crisis in the health area. As occurred during the pandemic of COVID-19, the availability of resources becomes a critical success factor in crisis response. The speed of governments and health care organizations to transform new knowledge into new procedures in the treatment of patients and create better care routines and implement harm reduction actions was one of the decisive factors for these organizations to achieve better performances in response to COVID-19. In this sense, effective knowledge management supports the organization to utilize its available resources better, also achieving better organizational performance.

Regarding the practical implications of this study, we can highlight the contribution for healthcare organizations to invest more resources and seek to improve their knowledge management. The COVID-19 pandemic demonstrated in a practical way the importance of effective knowledge management, with hospitals being better prepared and obtaining better response indicators in the fight against COVID-19 due to their speed of adaptation to new needs. Part of this speed of adaptation is related to the organization's ability to manage available knowledge and ensure that it is shared among health professionals. In this sense, they should encourage knowledge sharing among team members, offer training, and encourage team members to ask each other for help, among other actions related to the best medical practices on the market. Through these actions, managers can prepare for new crisis periods that may occur.

Additionally, it should be highlighted the need for managers to invest in creating and developing internal programs to improve knowledge management practices. This investment may help hospitals better prepare for new moments of crisis in health systems and improve the quality of services provided and the use of resources. Good knowledge management practices should be included in the organization's routine so that they are part of the performance evaluation systems of health professionals, both in regular times and in times of crisis.
PUBLICATIONS DURING THE DEVELOPMENT OF THE THESIS

Article indexed in JCR


Book chapter

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REFERENCES


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Keshtegar, A., & Zare, M. (2016). The study of organizational citizenship behavior and its role in improving the componentes of organizational intelligence (study at the University of Sistan and Baluchestan). *IJOABJ, 7*(1), 356–364.


Management, 17(1), 21–44. https://doi.org/10.1080/15475778.2012.650108


# APPENDIX 1. QUESTIONNAIRE.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKM1</td>
<td>Employees receive adequate training from the organization to carry out their activities.</td>
<td>(Ghosh &amp; Scott, 2006; Preece, 2015)</td>
</tr>
<tr>
<td>EKM2</td>
<td>The instructions described in the institution's procedures are easy to understand.</td>
<td></td>
</tr>
<tr>
<td>EKM3</td>
<td>The organization adopts the best practices available in the market.</td>
<td></td>
</tr>
<tr>
<td>EKM4</td>
<td>Meetings in the workplace include discussions related to practices adopted in the market.</td>
<td></td>
</tr>
<tr>
<td>EKM5</td>
<td>There is information available in the organization for employees to consult and solve problems.</td>
<td></td>
</tr>
<tr>
<td>EKM6</td>
<td>Employees are encouraged to ask for assistance from other employees when they need it.</td>
<td></td>
</tr>
<tr>
<td>EKM7</td>
<td>Employees are encouraged to share and discuss their work with employees from other departments.</td>
<td></td>
</tr>
<tr>
<td>EKM8</td>
<td>The structure of departments and units facilitates interaction and knowledge sharing.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective knowledge management (EKM)</td>
<td></td>
</tr>
</tbody>
</table>

We ask you to evaluate each statement below according to the situation of the organization in which you work, on a scale of 1 (I totally disagree) to 5 (I totally agree). In the organization where I work...

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Intelligence (OI)</td>
<td></td>
</tr>
</tbody>
</table>

We ask you to evaluate each statement below according to the situation of the organization in which you work, on a scale of 1 (I totally disagree) to 5 (I totally agree). In the organization where I work...

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational performance (OP)</td>
<td></td>
</tr>
</tbody>
</table>

Regarding the performance of the organization where you work, in the last 2 years, it is correct to say that the organization...

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

<table>
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<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

Effective response to COVID-19 (ER) | |

Regarding the effects of COVID-19, we ask you to evaluate with notes from 1 (I totally disagree) to 5 (I totally agree). The organization where I work...

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

<table>
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<tr>
<th>Questions</th>
<th>References</th>
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</table>

<table>
<thead>
<tr>
<th>Questions</th>
<th>References</th>
</tr>
</thead>
</table>

...has effectively acquired and applied available information about COVID-19. | (Carvalho & Esteban-Navarro, 2016; González & García-Muiña, 2016; Istudor et al., 2016). |
...made assertive decisions to anticipate the challenges of COVID-19.

...adapted quickly to the changes imposed by COVID-19.

<table>
<thead>
<tr>
<th>Characterization of the respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ER2</strong></td>
</tr>
</tbody>
</table>

1) Indicate your level of training

<table>
<thead>
<tr>
<th>a) Graduation</th>
<th>a) General-Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Master</td>
<td>b) Area / department / service manager</td>
</tr>
<tr>
<td>c) Doctorate</td>
<td>c) Team leader</td>
</tr>
<tr>
<td>d) Team member</td>
<td></td>
</tr>
</tbody>
</table>

2) Working time in the current position

| a) Up to 2 years      |                                  |
| b) From 3 to 4 years  |                                  |
| c) From 5 to 6 years  |                                  |
| d) From 7 to 8 years  |                                  |
| e) Over 8 years       |                                  |
| f) Retired            |                                  |

3) Working time in the current institution

| a) Up to 2 years      |                                  |
| b) From 3 to 5 years  |                                  |
| c) From 6 to 10 years |                                  |
| d) From 11 to 20 years|                                  |
| e) Above 20 years     |                                  |
| f) Retired            |                                  |

4) Professional Responsibility

<table>
<thead>
<tr>
<th>a) General-Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Area / department / service manager</td>
</tr>
<tr>
<td>c) Team leader</td>
</tr>
<tr>
<td>d) Team member</td>
</tr>
</tbody>
</table>

5) Nature of the property of the institution where it performs its professional duties

<table>
<thead>
<tr>
<th>a) Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Private (for profit)</td>
</tr>
<tr>
<td>c) Private (non-profit)</td>
</tr>
<tr>
<td>d) Other (please specify):</td>
</tr>
</tbody>
</table>

6) Nature of professional activity:

| a) physician                  |
| b) nurse                      |
| c) Other (please specify):    |
APPENDIX 2. QUESTIONNAIRE APPLIED IN BRAZIL.

Seja bem-vindo!

A pandemia da COVID-19 demonstrou a importância para os países da eficiência dos seus sistemas de saúde. Em especial, a importância que possui a gestão do conhecimento para que esses sistemas enfrentem momentos de crise. Por isso, essa pesquisa acadêmica realizada no Brasil e Portugal tem por objetivo analisar o impacto da Gestão do Conhecimento, Inteligência Organizacional e o COVID-19 no desempenho de instituições do setor da saúde.

O tempo estimado para responder ao questionário é de 7 minutos.

Agradecemos a sua participação e contribuição:

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Dr. Antonio Juan Briones Peñalver - UPCT, Espanha.

Dr. Pedro Fernandes da Anunciação - Instituto Politécnico de Setúbal (IPS), Portugal.

Observação: Os dados obtidos serão tratados e analisados de forma confidencial, com os seus resultados apresentados de maneira agregada.

**Importante:** Pedimos que avalie cada afirmação a seguir segundo a situação da organização na qual trabalha, em uma escala de 1 (*discord totalmente*) a 5 (*concord totalmente*).
I) Na organização onde eu trabalho…

<table>
<thead>
<tr>
<th>Nº</th>
<th>Questões</th>
<th>Discordo Totalmente</th>
<th>Concordo Totalmente</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Os empregados recebem formação adequada da organização para exercerem as suas atividades.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>As instruções descritas nos procedimentos da instituição são fáceis de entender.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>A organização adota as melhores práticas de trabalho do setor.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Reuniões no local de trabalho incluem discussões relacionadas às melhores práticas de trabalho adotadas no mercado.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Há informações disponíveis na organização para que empregados consultem e resolvam problemas.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Empregados são encorajados a pedir assistência a outros funcionários quando necessitam.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Empregados são encorajados a compartilhar e discutir o seu trabalho com empregados de outros departamentos.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>A estrutura dos departamentos e unidades facilita a interação e compartilhamento de conhecimento.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>Busca-se identificar como mudanças no ambiente de negócios influenciam a tomada de decisão.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Utiliza-se com sucesso o conhecimento para fazer previsões, de maneira a antecipar mudanças e tomar decisões.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Informações sobre boas práticas de trabalho e lições aprendidas são utilizadas na tomada de decisões.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>A administração promove uma atmosfera de abertura e aceitação da mudança.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>A comunicação é clara e eficiente.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Processos e normas são definidos com a participação de representantes das diversas áreas.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
II) Com relação ao desempenho da organização na qual você trabalha, nos últimos 2 anos, é correto afirmar que a organização…

<table>
<thead>
<tr>
<th>Nº</th>
<th>Questões</th>
<th>Discordo Totalmente</th>
<th>Concordo Totalmente</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Ofereceu uma boa qualidade geral de serviços.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Apresentou uma boa saúde financeira.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Apresentou uma boa reputação em relação às suas habilidades técnicas.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Demonstrou elevada inovação em serviços e processos.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Aumentou o número de atendimentos realizados.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Aumentou a taxa de sucesso nos tratamentos / prestações de serviços.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>

III) Com relação aos efeitos do COVID-19 na organização onde você trabalha, é correto afirmar que a organização…

<table>
<thead>
<tr>
<th>Nº</th>
<th>Questões</th>
<th>Discordo Totalmente</th>
<th>Concordo Totalmente</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Adquiriu e aplicou eficazmente informações disponíveis sobre o COVID-19.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Tomou decisões assertivas para se antecipar aos desafios do COVID-19.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Adaptou-se rapidamente às mudanças impostas pelo COVID-19.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
IV) Pedimos que assinale as respostas a seguir conforme suas características.

<table>
<thead>
<tr>
<th>Caracterização do respondente</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Indique seu nível de formação completo:</td>
</tr>
<tr>
<td>a) Graduação</td>
</tr>
<tr>
<td>b) Mestrado</td>
</tr>
<tr>
<td>c) Doutorado</td>
</tr>
<tr>
<td>d) Membro de equipe</td>
</tr>
<tr>
<td>2) Tempo de trabalho no cargo atual:</td>
</tr>
<tr>
<td>a) Até 2 anos.</td>
</tr>
<tr>
<td>b) De 3 a 4 anos.</td>
</tr>
<tr>
<td>c) De 5 a 6 anos.</td>
</tr>
<tr>
<td>d) De 7 a 8 anos.</td>
</tr>
<tr>
<td>e) Acima de 8 anos.</td>
</tr>
<tr>
<td>3) Tempo de trabalho na instituição atual:</td>
</tr>
<tr>
<td>a) Até 2 anos.</td>
</tr>
<tr>
<td>b) De 3 a 5 anos.</td>
</tr>
<tr>
<td>c) De 6 a 10 anos.</td>
</tr>
<tr>
<td>d) De 11 a 20 anos.</td>
</tr>
</tbody>
</table>
APPENDIX 3. QUESTIONNAIRE APPLIED IN PORTUGAL.

Seja bem-vindo!

A pandemia da COVID-19 demonstrou a importância para os países da eficiência dos seus sistemas de saúde. Em especial, a importância que possui a gestão do conhecimento para que esses sistemas enfrentem momentos de crise. Por isso, essa pesquisa acadêmica realizada no Brasil e Portugal tem por objetivo analisar o impacto da Gestão do Conhecimento, Inteligência Organizacional e o COVID-19 no desempenho de instituições do sector de saúde.

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**I) Na organização onde eu trabalho…**

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<th>Concorde Totalmente</th>
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<td>03</td>
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<td></td>
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<th>Concorro Totalmente</th>
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<td>1 2 3 4 5</td>
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</table>
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<table>
<thead>
<tr>
<th>Caracterização do respondente</th>
<th>4) Responsabilidade profissional:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Indique seu nível de formação completo:</td>
<td>a) Director geral</td>
</tr>
<tr>
<td>a) Licenciatura</td>
<td>b) Responsável de área / departamento / serviço</td>
</tr>
<tr>
<td>b) Mestrado</td>
<td>c) Chefe de equipa</td>
</tr>
<tr>
<td>c) Doutoramento</td>
<td>d) Membro de equipa</td>
</tr>
<tr>
<td>2) Tempo de trabalho no cargo actual:</td>
<td>e) Outro (favor especificar):</td>
</tr>
<tr>
<td>a) Até 2 anos.</td>
<td></td>
</tr>
<tr>
<td>b) De 3 a 4 anos.</td>
<td></td>
</tr>
<tr>
<td>c) De 5 a 6 anos.</td>
<td>a) Pública</td>
</tr>
<tr>
<td>d) De 7 a 8 anos.</td>
<td>b) Privada (com fins lucrativos)</td>
</tr>
<tr>
<td>e) Acima de 8 anos.</td>
<td>c) De natureza social (sem fins lucrativos)</td>
</tr>
<tr>
<td>f) Reformado.</td>
<td>d) Outra (favor especificar):</td>
</tr>
<tr>
<td>3) Tempo de trabalho na instituição actual:</td>
<td>6) Natureza da atividade profissional:</td>
</tr>
<tr>
<td>a) Até 2 anos.</td>
<td>a) médico(a)</td>
</tr>
<tr>
<td>b) De 3 a 5 anos.</td>
<td>b) enfermeiro(a)</td>
</tr>
<tr>
<td>c) De 6 a 10 anos.</td>
<td>c) outra (favor especificar):</td>
</tr>
<tr>
<td>d) De 11 a 20 anos.</td>
<td></td>
</tr>
<tr>
<td>e) Acima de 20 anos.</td>
<td></td>
</tr>
<tr>
<td>f) Reformado.</td>
<td></td>
</tr>
</tbody>
</table>
## Errata

<table>
<thead>
<tr>
<th>Página</th>
<th>Párrafo</th>
<th>Donde dice</th>
<th>Debe decir</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>1º</td>
<td>Todas as correlações foram significativas</td>
<td>All correlations were significant</td>
</tr>
</tbody>
</table>