Information Science and Knowledge Management Maturity:
A Case Study in a Public Pharmaceutical Laboratory

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INTRODUCTION

Technological advances and the resulting increase in access to information have provoked intense transformations in social and organizational relationships. The organizational environments provided the density in the flow of information, so that the search for improvement of resources to deal with the volume of informational and technological data is always constant.

The need to manage information, as well as the knowledge acquired through them, leads to a constant search to better manage Knowledge Management (KM) in organizations. Alvarenga Neto (2002) defines KM as:

The set of activities aimed at promoting organizational knowledge, enabling organizations and their employees to always use the best information and knowledge available, with a view to achieving organizational goals and maximizing competitiveness (Alvarega Neto, 2002).

Starting from the premise that information science (IS) is dedicated to the problems of records of the effective communication of knowledge, there is a relationship between the application of KM and IS, in which, characterized by its interdisciplinarity, it demonstrates the need for knowledge and management of organizational information (Montanheiro, 2006).

However, when thinking about any initiative that involves the adoption or implementation of KM, there is a need to carry out a previous diagnosis, so that the strengths and weaknesses of the organization are known, and then direct more effective actions in relation to KM. In this sense, organizations are advised to assess their degree of maturity in KM, so that they can support the elaboration of a KM plan and justify the importance of KM practice. For this, they can make use of maturity models, which show the level of development and indicate points of improvement and assess the evolution and progress of organizations in relation to KM (Oliveira et al., 2011; Batista, 2012; Souza, n.d.; Helou, n.d.; Sonh, 2018).

DOI: 10.4018/978-1-6684-7366-5.ch021

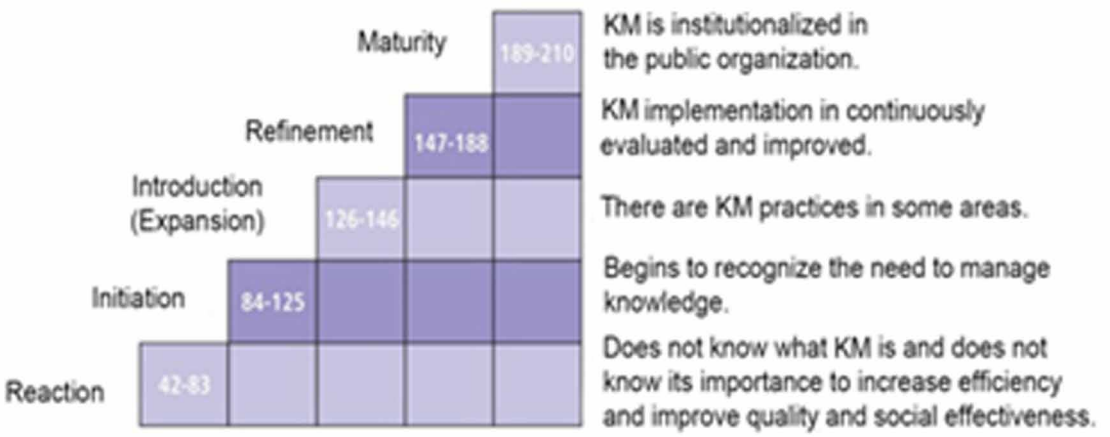
In this sense, this work used Information Technology to diagnose the level of maturity in KM in a Public Pharmaceutical Laboratory (PPL) that covers the activities of drug production, scientific research, technological development and education. A qualitative and quantitative approach was used, and the work is exploratory-descriptive and applied through a case study. Data were collected through interviews applied from senior management to the operational level of the institution. The results achieved demonstrate the degree of maturity of the PPL.

Considering the research universe to be a public organization, the model adopted as a reference was the Knowledge Management Model for the Brazilian Public Administration (MGCAPB - Brazilian term) (Batista, 2012). The model was adapted to the reality of the Brazilian public sector, which has its own instrument to assess the maturity of the KM.

This instrument makes it possible to identify the level of maturity in KM that the organization is and to assess the maturity in KM based on seven dimensions, namely: leadership in KM, processes, people, technology, knowledge processes, learning and innovation, and results of the KM, which are scored on a scale from 1 to 5, according to the real evidence of the actions described in the instrument itself. The model has five maturity levels, related to the score obtained, ranging from the "reaction" level (lowest) to the "maturity" level (highest), which show the result of the evaluation (Batista, 2012):

I) Reaction: from 42 to 83 points - the organization does not know what KM is and does not know its importance to increase efficiency and improve quality and social effectiveness;
II) Initiation: from 84 to 125 points – the organization begins to recognize the need to manage knowledge;
III) Introduction (expansion): from 126 to 146 points – there are KM practices in some isolated areas of the organization;
IV) Refinement: from 147 to 188 points – KM implementation is continuously evaluated and improved, for KM integration in all areas;
V) Maturity: from 189 to 210 points - highest level of maturity assessment, where KM is institutionalized in the organization.

Figure 1. Level of Maturity in Knowledge Management
Source: Batista (2012).



Data collection was carried out between March and July 2022, from the application of a questionnaire adapted from the KM assessment instrument proposed by Batista (2012) for the PPL context in order to assess the level of maturity in KM of the said Institute. In this sense, this instrument analyzed the perception of subjects regarding KM based on 7 (seven) dimensions, namely: leadership in KM, processes, people, technology, knowledge processes, learning and innovation and KM results. Each dimension evaluated had 6 assertions, totaling 42 for the instrument, and should be scored on a scale from 1 to 5, as described: 1 – the actions described are very poorly performed or not yet performed; 2 – the actions described are poorly performed; 3 – the actions described are carried out properly; 4 – the actions described are well performed; 5 – the actions described are very well performed.

As for data analysis, scoreboards were constructed from the responses obtained for each instrument applied.

BACKGROUND

For a better understanding of the work carried out, it is important to highlight the theoretical foundation, presenting the concepts about Data, Information and Knowledge, Types of Knowledge, Knowledge Management, the convergence between information science and knowledge management, the public pharmaceutical laboratory, the maturity in knowledge management and, finally, the application of the model for assessing the maturity of knowledge management in the public pharmaceutical laboratory.

In the same sense, the studied pharmaceutical laboratory is considered a public laboratory in Brazilian territory. In Brazil, there are both private and public pharmaceutical laboratories. These public laboratories are called Official Pharmaceutical Laboratories.

Thus, the research carried out identified gaps to be studied in the face of the academic state of the art and confronted with the industrial reality, that is, within a public pharmaceutical production of medicines in Brazil.

DATA, INFORMATION AND KNOWLEDGE

In order to elucidate the application and relationship of these concepts within Information Science, Brascher; Café (2008) explains that, in order to understand what knowledge is, it is not possible to dissociate it from the concepts of data and information, since the first consists of one of the steps resulting from a process carried out by the first two.

In the mid-twentieth century, with the advent of Information Science (Capurro, 2003), the concepts of data, information and knowledge are discussed. Since then, there are two disambiguation's: the first postulates that data, information and knowledge are interrelated; the second, and more widespread, states that data, information and knowledge are part of a sequential (or hierarchical) order, with data being the raw material of information, and information the raw material of knowledge (Zins, 2007).

Kakabadse *et al* (2003) state that knowledge should not be confused with information or data. In fact, knowledge is the result of an evolutionary cycle, which requires observation, evaluation, reflection and experience, that is, knowledge, unlike data and information, only materializes through human activity.

Glazer (1998), Roberts (2000) and Davenport and Prusak (2012) state that knowledge derives from information, in the same way that information derives from data. However, human participation in the transformation of information into knowledge is essential, which involves a level of understanding ob-

tained through experience, familiarity and personal learning (Leonard & Sensiper, 1998; Roberts, 2000; Grover & Davenport, 2001; Davenport & Prusak, 2012).

In addition to being influenced by individuals, knowledge is dependent on the social context in which it is inserted or on a specific situation (Roberts, 2000; Grover & Davenport, 2001). It is concluded that its management is not simple, as it has its origin and application in the minds of human beings.

Therefore, in the age of knowledge, the main differentiator in organizations, whether public or private, is knowledge, characterized, according to Drucker (1999) as "the resource" and no longer "a resource", which comes from people, making them if so, the only significant competitive advantage. The author already envisioned, for the 21st century, the importance of the worker no longer being seen as the figure of a worker, but as the knowledge worker (Drucker, 1994).

TYPES OF KNOWLEDGE

According to Nonaka and Takeuchi (2008), human knowledge can be classified in two ways: explicit or tacit. Arling and Chun (2011) define explicit knowledge as codifiable knowledge, that is, knowledge that can be organized and communicated through formalized or figurative means. And according to Beal (2008) this type of knowledge is defined as data that can be understood through records. In other words, it is knowledge that can be communicated through processes, figures or formulas.

In this way, explicit knowledge is shared through data, manuals, specifications, processes, among others, being expressed in a more formal and systematic language, and easily processed, transmitted and stored (Melo, 2019).

Tacit knowledge is represented by the individual's experience, know-how, hunches, intuitions, insights (technical dimension), as well as mental models, beliefs, emotions, values and perceptions of the world around them and beliefs (cognitive approach). It is difficult to articulate through formal language, since it is composed of subjective elements, such as ideas and values (Nonaka & Takeuchi, 2008).

According to Ribeiro (2012), tacit knowledge is a reference to a type of knowledge that has been developed over time, that is, by experience acquired over years and that cannot be transmitted through simple words, texts, manuals, among others. It is as if there were a limiter in the speech of individuals or in the "coding" that would define or distinguish what is tacit from what is explicit. For Nonaka *et al*. (2014), both tacit and explicit knowledge are somehow interconnected, stating that all explicit knowledge contains aspects of tacit knowledge.

THE KNOWLEDGE MANAGEMENT

Knowledge has become the biggest competitive differentiator for today's organizations; an asset that drives its development and generates innovation, from the creation or acquisition of knowledge, with a view to its competitiveness and survival. Therefore, by recognizing it as a fundamental factor of production and an asset that guarantees competitive advantage, the concern of organizations in managing it is evident, which denotes the importance of Knowledge Management in contemporary times (Drucker, 1999; Nonaka & Takeuchi, 2008; Probst et al., 2009; Cribb, 2010; Santos et al., 2019).

Wunran *et al* (2002) define KM as "a systemic strategy with the application of measures such as guides, control and promotion of knowledge resources (tangible and intangible) to use knowledge from inside and outside organizations to create new knowledge, promote improvements and innovations".

According to Dalkir (2011), the ability to manage knowledge is crucial in the knowledge economy, and its creation and diffusion have become important factors of competitiveness, making knowledge a commodity embedded in the products of organizations. Also according to Dalkir (2011), the advent of access to information made unlimited sources of information and knowledge available, which characterized the emergence of the knowledge age to the detriment of the industrial age, since the organization in the knowledge age is one that is able to learn, retain and act on the basis of the best available information, knowledge and know-how.

Therefore, for KM to happen in organizations, the presence and combination of fundamental components must be considered: people, processes and technology. The integration between these components and their development, observing the peculiarities of each one, is what will allow organizations to apply KM and achieve their goals, as they are the ones that enable the dynamic sharing of knowledge, generating value aggregation to organizations (Servin, 2005; Batista, 2012; Neves et al., 2018).

CONVERGENCES BETWEEN INFORMATION SCIENCE AND KNOWLEDGE MANAGEMENT

As with knowledge management, the diversity of concepts that define information science is natural, as it has an interdisciplinary origin. The variety of concepts and applications can be observed in the definitions of information, knowledge and even in the practices related to KM. For Capurro and Hjorland (2007), the concept of information, as used in everyday language, in the sense of communicated knowledge, has a basic role in contemporary society, since the emergence of information technology (IT) and its global impacts characterize our society as an information society. Zins (2007) emphasizes that there is no uniform concept for the term information, as it is a field with different approaches and traditions. The concept has different meanings, which imply different domains, which imply different fields of knowledge. Thus, the number of concepts that can define what would be information science is vast. However, despite appearing in the mid-1930s, it was only in the 1960s that its first definitions and concepts occurred. Borko (1968, p. 5) defines IS as:

[...] interdisciplinary science that investigates the properties and behavior of information, the forces that govern the flows and uses of information, and the techniques, both manual and mechanical, of processing information, aiming at its storage, retrieval, and dissemination ideal.

The KM practices adopted by organizations to create knowledge in order to optimize results and achieve objectives are in line with the purposes of IS, with regard to its characteristic of seeking to record the needs and use of information and knowledge.

According to Wersig (1993), the importance given to knowledge generated a paradigm regarding its complexity, and when dealing with the importance of knowledge for society, he expressed himself with the following ideas:

Knowledge has become more important than ever. One reason is that, due to the effects of knowledge on the organization of societies, the world has become extremely complex and is still becoming more complex, in part due to the advent of all technologies that aim to reduce the complexity of knowledge. (Wersig, 1993)

Given this complexity, the processes involved in knowledge management can be found in different approaches, which are considered KM models. It is possible to verify a certain similarity and evolution between the models, which permeate several areas of knowledge. Such multidisciplinary between the different theoretical approaches to KM often make it also interdisciplinary, a characteristic also found in information science. Thus, as the expansion of understanding related to the application of knowledge management is perceived, it starts to be considered by the scientific literature in different fields of knowledge, including information science. In organizations, knowledge is a key resource for adding value to products and services, providing them with a competitive advantage by accepting the premise that both information and knowledge are considered assets for institutions. It happens that knowledge is not only available in institutional repositories, but in the organization's routines and practices. When dealing with the need for information science as a discipline, Borko (1968) mentions that it aims to provide a theoretical body that would lead to improvements in various institutions and procedures dedicated to the accumulation and transmission of knowledge.

Knowledge permeates the organization's informal flows, such as culture and communication, and does not necessarily depend on formal, institutionalized flows. With the technological tools that have emerged in recent decades, providing the procedures related to the transmission of knowledge in an adequate way, preventing new knowledge from becoming outdated and continuing to be used by institutions, is one of the objectives of knowledge management. This would lead to improvements for the institutions, as recommended by Borko, identifying another intersection between the areas. Saracevic (1995) lists the three general characteristics that are the reason for the existence and evolution of IS, namely: information science is interdisciplinary in nature; is inexorably linked to information technology and that IS, along with other disciplines, is an active and deliberate participant in the evolution of the information society. Such characteristics can be identified in knowledge management.

Regarding the panorama of research in information science and the identification of topics focused on knowledge management, Pinheiro (2013) prepared a bibliometric study on research topics related to IS, separated by decades. It was identified that the theme "knowledge management", in Great Britain, emerged in the 1990s. As for the United States, it was recorded that, in the period from 2001 to 2010, the term was the 5th most cited in the Journal of the Association for Information Science and Technology (JASIST). The increase in interest on the subject has been accompanied by a greater number of publications on the subject. According to Marteleto: In the Information Science literature, in the studies of its researchers and students, in professional practice, there is a substantial and even overwhelming increase in the literature and discourse of "knowledge and information management" with a model focus and application in organizations, especially business.

Concerning what has been explained, Marteleto (2009) argues that the new fields linked to IS, such as knowledge management, are the result of a new information regime, which in turn may suggest that these are redundant topics, so it is necessary a rupture in the approach given to the new themes. As a solution, the author suggests that research should consider how to reflect on the convergence between market society and technological rationality. With the growing application of KM as an organizational practice, as well as the progressive interest in theoretical models in the area, it is noticed that this equation is in fact being made, which justifies the scientific research on the subject. The improvements incorporated to institutions arising from the application of knowledge management can be considered assets of companies, such is their ability to add value, just as information can be considered an economic resource. This theme was explained by López Yepes (1995), noting that information must be seen by organizations as a form of capital, and thus it is necessary to consider it as an economic resource or even a factor of production, as more and more activities of companies would be charged by the phenomenon

of information. The need to manage information has as a consequence the need to manage the knowledge obtained through the new information generated.

Regarding the relationship between information science and the application of knowledge management, it is necessary to point out that in organizational environments there are many models, studies and practices related to KM in progress that can be used to improve the performance of organizations, given that it is an area with broad contributions, both theoretical and practical. These initiatives, according to Alvares, Batista and Araújo Júnior (2010), are important for innovation and business competitiveness. Also, according to the authors: This objective is in line with the very perspective of development of Information Science, which has a long tradition in creating value for organizations, especially in activities related to obtaining, storing and disseminating knowledge. When analyzing the assumptions of classical authors from both areas, it is clear that there are common themes, which confirm the existing relationship and corroborate the importance of KM for IS.

THE PUBLIC PHARMACEUTICAL LABORATORY

In a macro context, Public Pharmaceutical Laboratories (PPL) follow superior guidelines for carrying out their functions, which are essential for society (Magalhães, 2010; Silva, 2012).

One way of acting for the PPL is to meet the demands of the Ministry of Health (MH), as well as the health secretariats, for those products that are not interesting for the private industry, especially in relation to neglected diseases (Figueiredo, 2015; Margotto, 2019).

It is noted that, while private pharmaceutical companies are concerned with chronic and cardiovascular diseases, the focus of international attention, infectious and neglected diseases (those related to poverty) do not provoke much interest in this market because they do not generate high profits. However, these ills still drastically affect the Brazilian population. These differences end up showing the mismatch between international drug development and national demands. Given this scenario, it is essential that the national production of medicines is aligned with the health needs of the Brazilian population (Magalhães *et al*., 2011; Mori, 2019).

Innovation regularly guides care practices and represents hope in the design of new treatments. In addition, they are of great importance for the development of new markets and businesses, for economic growth and for increasing the competitiveness of countries and organizations, in addition to being potential drivers for increasing levels of health, quality of life and well-being of the population (ALFOB/CFF, 2019).

In the context of public health, R&D activities are guided by the epidemiological scenario and the needs of the population, in order to meet the demands of the health system, thus moving away from the mere logic of the market, in which, many times, such activities serve only to the generation of profit without bringing real benefits to health systems and services and, mainly, to patients (ALFOB/CFF, 2019).

Therefore, the PPL appear as a Unified System of Health (USH) tool to enable, through public production or public-private arrangements, the expansion and qualification of access to medicines and other health technologies. Therefore, R&D activities must be carried out, understanding that these are not only for the generation of innovative products or services, but also for the implementation of improvements in existing products and processes, and so that there is technological mastery of productive activities. (ALFOB/CFF, 2019).

Thus, the PPL object of this research has complexity and specific characteristics, as it encompasses the production of medicines, scientific research, technological development, and education as activities, forming an integrated chain aimed at fulfilling its institutional mission within the USH in Brazil.

THE MATURITY IN KNOWLEDGE MANAGEMENT

Performing KM is not an easy task. Organizations have difficulties in identifying how KM progresses in their domains, as well as in evaluating the results obtained with its implementation, since knowledge is seen as an intangible resource and difficult to measure (Oliveira *et al*., 2011). However, the literature also highlights the need for organizations to implement it in their daily lives. In this sense, it is necessary for companies to carry out a preliminary diagnosis to assess the degree of application (formal or informal) of KM practices, in order to discover their stage of evolution in relation to KM, before an effective implementation. For that, there are models for assessing the maturity of the KM. These are a holistic assessment roadmap of various factors, where it is possible to identify strengths and others that need improvement. Such models contribute to the implementation of KM in organizations (Oliveira *et al*., 2011; Batista, 2012; Batista, 2015; Helou, 2015; Natale et al., 2016; Souza et al., 2018).

Regarding models in Brazilian public organizations, there is the Organizational Knowledge Assessment (OKA), from the World Bank Institute (Batista, 2015), and the MGCAPB – Knowledge Management Model for the Brazilian Public Administration (Batista, 2012).

With the results of the assessment, it is possible to determine the degree of use of KM in the organization, the conditions for implementing and maintaining KM processes, in addition to identifying strengths and opportunities for improvement. In this way, the identification and recognition of the KM maturity level of a public organization becomes a stimulus to improve the techniques used and advance in the process of institutionalization of organizational knowledge, with a view to the continuous improvement of processes that guarantee better results, efficiency and quality of the services provided (Batista, 2015; Souza et al., 2018; Santos & Bastos, 2019).

APPLICATION OF THE KNOWLEDGE MANAGEMENT MATURITY ASSESSMENT MODEL

The model was submitted to all areas of the institution in question and involved interviews with both leaders at the strategic level and employees at the operational level of the organization. The approval of the questionnaire was obtained under the number 51113221.4.0000.5262 by the Research Ethics Committee of Platform Brazil (website https://plataformabrasil.saude.gov.br).

The results obtained in the interviews provide a view of the maturity level of the organization's knowledge management, namely: variation from the "Reaction" level as the lowest level, to the "Maturity" level - the highest level (APO, 2009). Regarding the dimensions evaluated, they were (i) Leadership; (ii) the Processes; (iii) the Persons; (iv) Technology; (v) Knowledge Processes; (vi) Learning and Innovation and (vii) Knowledge Management Results.

As for the interviewees, 134 professionals were consulted, 43 of whom were managers (out of a total of 48) and 91 employees, distributed across all areas of the organization. The distribution of the 91 employees by areas aimed to understand 10% (ten percent) of the total number of employees in each area to participate in the study. From this, there was the distribution of employees according to Table 1.

Table 1. Distribution of respondents

AREA	Collaborators	Leaders	TOTAL	
Board/ Advisors	12	9	21	15,7%
Vice Director of Operations and Production	29	4	33	24,6%
Vice Director of Education, Research and Innovation	8	7	15	11,2%
Vice Director of Quality Assurance	14	5	19	14,2%
Vice Director of Institucional Management	16	10	26	19,4%
Vice Director of Work Management	5	4	9	6,7%
Technological Development Coordination	7	4	11	8,2%
Total	**91**	**43**	**134**	**100,0%**

Source: Created by the authors (2022).

The results indicate that the PPL is at the Initiation level, with an average score equal to 105.3 points, on a 210-point scale, subdivided into its 07 (seven) dimensions, as seen in Table 2. Therefore, according to the scales of the assessment instrument, the organization is beginning to recognize the need to manage knowledge. However, knowledge management is still at a very incipient level and is not yet on the strategic agenda of the organization. It should be noted that it was evidenced that there were some KM practices in some areas in isolation.

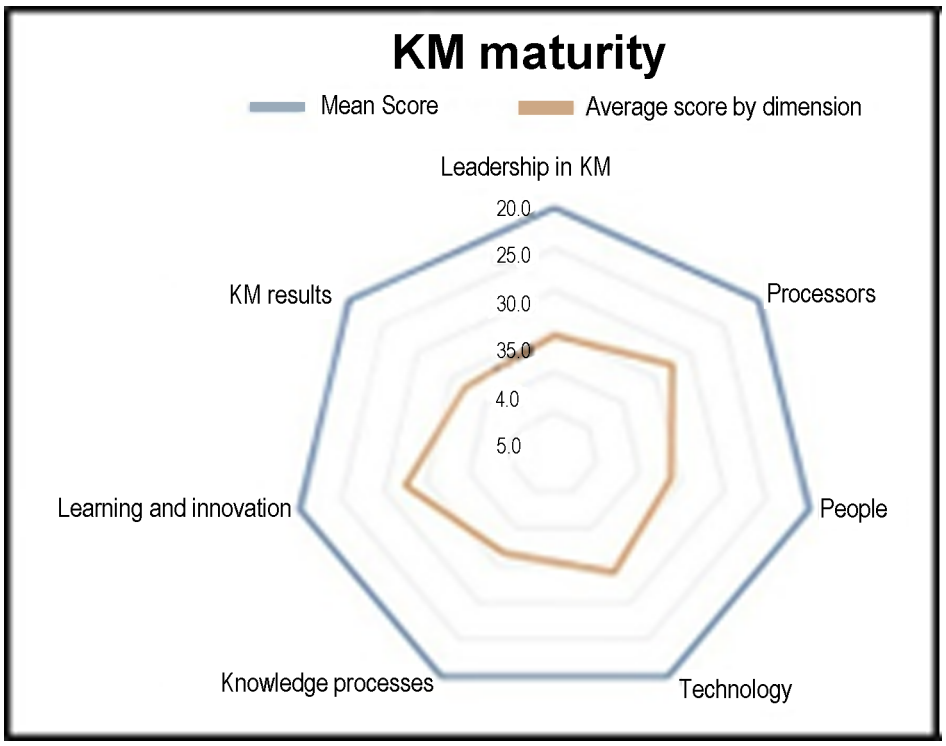
Table 2. Average score by Dimension

Dimension	Description	Maximum score	Average score by dimension
1	Leadership in KM	30,0	14,5
2	Processes	30,0	17,4
3	People	30,0	13,7
4	Technology	30,0	16,0
5	Knowledge Processes	30,0	13,3
6	Learning and Inovation	30,0	17,4
7	KM Results	30,0	13,0
		SUM	105,3

Source: Created by the authors (2022).

Figure 2 shows the metrics and scores related to the identified maturity level. These scores for the different criteria of each dimension are applied on a scale from 1 to 5, in order to award the scores to the criteria, according to each description, namely: 1 – the actions described are very poorly performed or not yet performed; 2 – the actions described are poorly performed; 3 – the actions described are carried out properly; 4 – the actions described are well performed; 5 – the actions described are very well performed.

Figure 2. Level of Maturity in Knowledge Management
Source: Created by the authors (2022).



Regarding dimension 1 (Leadership in KM), it assesses whether the knowledge management initiative is driven by the organization; whether the alignment of knowledge management with strategy and projects is guaranteed, with the organization's mission and vision; and whether support and resources are provided for the implementation of knowledge management projects (APO, 2009). For Helou (2015), the leadership dimension is: [...] the recognition of the importance of creating and sharing knowledge as a strategic resource; factors that lead to the establishment of a KM culture and architecture; importance of aligning KM strategies to the organization's strategies; organizational arrangements to formalize and elaborate the KM self-assessment; empowerment of middle managers for the elaboration and follow-up of KM.

Table 3 shows that in the Leadership in KM dimension, criterion 1.4 (information and knowledge protection policy) had the best evaluation (average of 3.4) and criterion 1.3 (allocation of financial resources) had the lowest performance (average of 1.8).

These results indicate that the respondents consider that, with the exception of the issue of information and knowledge protection policy, the other aspects evaluated are below the appropriate level (level 3), with most being concentrated in levels 2 and 1, respectively., "poorly performed" or "very poorly performed and not yet done". Therefore, aspects such as the alignment between the KM vision and strategy with the organization's strategic drivers, the existence of organizational arrangements to formalize KM initiatives, the allocation of financial resources in KM initiatives, senior management and middle managers serve as model of knowledge sharing and collaborative work and whether these promote, recognize and reward performance improvement, learning, knowledge sharing and creation and innovation were considered not being carried out, at least, adequately.

Table 3. Average Score in Leadership in KM

Dimension 1 - Leadership in KM									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
1.1	The organization shares KM knowledge, vision and strategy strongly aligned with the organization's vision, mission and strategic objectives.	2,0	2,5	1,9	1,9	2,6	2,3	1,7	2,1
1.2	Organizational arrangements were put in place to formalize KM initiatives (examples: a central information/knowledge management coordination unit; quality improvement teams; COPs; and knowledge networks).	2,0	2,6	2,0	2,0	2,0	1,7	1,8	2,0
1.3	Financial resources are allocated to knowledge management initiatives.	1,6	2,1	1,9	2,1	1,8	1,8	1,5	1,8
1.4	The organization has an information and knowledge protection policy (examples: protection of intellectual property, information and knowledge security and policy on access, integrity, authenticity and confidentiality of information).	3,4	3,5	3,2	3,5	3,2	3,8	3,0	3,4
1.5	Top management and middle management serve as a model in putting into practice the values of knowledge sharing and collaborative work. They spend more time disseminating information to their teams and facilitating the horizontal flow of information between their teams and teams in other departments.	2,3	2,9	2,1	2,9	2,9	2,6	2,5	2,6
1.6	Senior management and middle management promote, recognize and reward performance improvement, individual and organizational learning, knowledge sharing and knowledge creation and innovation.	2,1	2,7	2,2	2,6	2,8	2,3	2,1	2,4
Average		2,2	2,7	2,2	2,5	2,5	2,4	2,1	

Subtitle: BOA/ ADV = Board/ Advisors; VDOP = Vice Director of Operations and Production; VDERI = Vice Director of Education, Research and Innovation; VDQA = Vice Director of Quality Assurance; VDIM = Vice Director of Institutional Management; VDWM = Vice Director of Work Management; TDC = Technological Development Coordination.

Source: Created by the authors (2022).

Regarding the Processes (Dimension 2), we seek to understand how the organization works with its essential competences, in addition to observing how the work processes and their modeling are being treated, as well as whether it uses tools to manage crisis situations or of unforeseen events (see Table 4).

In this dimension, the results obtained indicate that there is work aimed at mapping processes, even though it is not at a high level of maturity. When we look at Table 3, we can see a practically linear result in the results of the six criteria. And these results bordering the level 3 of the scoring scale, which indicates that the respondents consider that the level of these criteria is adequate.

As for Dimension 3 (People), there is a discrepancy between the different criteria. As can be seen in Table 5, criteria 3.1 and 3.6, regarding the treatment of education and training and on the formation of small teams and structure by processes, respectively, received an average score of 2.9 and 2.8. On the other hand, at the lower end, criterion 3.3, had an average score of only 1.6, where it mentions the formal processes of mentoring, coaching and mentoring. This indicates that the respondents consider that these aspects are not addressed by the organization.

Dimension 4, referring to Technology, assesses whether the knowledge process is accelerated through effective technology tools; whether tools such as groupware and collaborative workspaces enable participation over time and distance; and whether a platform is provided for the retention of organizational

Table 4. Average Score in Processes

Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
2.1	The organization defines its core competencies (strategically important capabilities that give the organization a comparative advantage) and aligns them with its mission and the organization's objectives.	2,9	3,2	2,7	3,2	3,3	2,6	2,9	3,0
2.2	The organization models its main work processes to achieve high institutional performance.	2,8	3,1	2,9	3,1	3,2	2,9	2,6	2,9
2.3	The organization continuously evaluates and improves its work processes to achieve better performance, reduce variation, improve products and services and to keep up to date with best management practices.	2,6	3,1	2,9	3,2	3,2	2,8	2,7	2,9
2.4	In process modeling, the following factors are considered: new technologies, knowledge sharing, flexibility, efficiency, effectiveness and social effectiveness.	2,5	3,0	2,7	2,7	3,2	2,7	1,9	2,7
2.5	The organization has its own system to manage crisis situations or unforeseen events that ensures continuity of operations, prevention and recovery.	2,5	2,7	2,7	2,8	3,0	2,7	2,4	2,7
2.6	The organization continually evaluates and improves its supporting and end-to-end processes to achieve better performance, reduce variation, improve products and services, and keep up to date with best-in-class management practices.	2,6	3,1	2,6	3,3	3,3	3,0	2,5	2,9
Average		2,7	3,0	2,7	3,0	3,2	2,8	2,5	

Subtitle: BOA/ ADV = Board/ Advisors; VDOP = Vice Director of Operations and Production; VDERI = Vice Director of Education, Research and Innovation; VDQA = Vice Director of Quality Assurance; VDIM = Vice Director of Institutional Management; VDWM = Vice Director of Work Management; TDC = Technological Development Coordination.

Source: Created by the authors (2022).

Table 5. Average Score in People

Dimension 3 - People									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
3.1	Education and training programs, as well as career development programs, expand the knowledge, skills and capabilities of employees, support the achievement of the organization's objectives and contribute to high organizational performance.	2,5	2,7	2,8	2,9	3,0	3,3	3,1	2,9
3.2	The organization systematically disseminates information about benefits, policy, strategy, plan and KM tools to new employees in the organization.	2,2	2,6	1,7	2,2	2,7	2,3	1,8	2,2
3.3	The organization has formal mentoring, coaching and mentoring processes.	1,6	1,9	1,3	1,3	1,9	2,0	1,4	1,6
3.4	The organization has a bank of competences of its employees.	1,8	2,3	1,5	1,9	2,0	2,7	1,3	1,9
3.5	Collaboration and knowledge sharing are actively recognized and rewarded/corrected.	1,9	2,2	1,8	1,9	2,4	2,7	1,7	2,1
3.6	The organization of work includes the formation of small teams/groups (example: working groups, commissions, quality circles, work process improvement teams, cross-functional teams, interdepartmental teams, COPs) and the structure by processes to address the concerns and problems in the workplace.	3,0	3,1	2,5	2,9	2,9	3,1	2,2	2,8
Average		2,2	2,5	1,9	2,2	2,5	2,7	1,9	

Subtitle: BOA/ ADV = Board/ Advisors; VDOP = Vice Director of Operations and Production; VDERI = Vice Director of Education, Research and Innovation; VDQA = Vice Director of Quality Assurance; VDIM = Vice Director of Institutional Management; VDWM = Vice Director of Work Management; TDC = Technological Development Coordination.

Source: Created by the authors (2022).

Table 6. Average Score in Technology

Dimension 4 - Technology									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
4.1	The IT Department has the technology and IT infrastructure necessary for the effective implementation of KM.	3,4	3,5	2,5	3,6	3,7	3,2	3,2	3,3
4.2	The organization portal is used as the main source of communication in the IT Department and supports the transfer and sharing of information.	3,2	3,4	2,6	3,3	3,4	3,1	3,3	3,2
4.3	The IT Department's IT infrastructure is aligned with the organization's KM strategy.	2,5	2,7	1,7	2,0	2,6	2,2	2,0	2,2
4.4	The IT Department has an efficient and effective IT architecture, as well as KM systems, which support the entire organization.	2,5	2,9	1,8	2,2	2,7	2,6	1,9	2,4
4.5	Existing systems are continually improved and IT and KM are perceived in the IT Department as interdependent and irreplaceable.	2,2	2,5	1,7	2,1	2,7	1,8	1,6	2,1
4.6	The IT architecture is able to extrapolate the limits of the organization, making it possible to share not only data and information, but the knowledge and experience of employees with all the organization's stakeholders in its value chain.	2,3	2,6	1,7	2,7	2,8	1,9	2,0	2,3
Average		2,7	2,9	2,0	2,6	3,0	2,5	2,3	

Subtitle: BOA/ ADV = Board/ Advisors; VDOP = Vice Director of Operations and Production; VDERI = Vice Director of Education, Research and Innovation; VDQA = Vice Director of Quality Assurance; VDIM = Vice Director of Institutional Management; VDWM = Vice Director of Work Management; TDC = Technological Development Coordination.

Source: Created by the authors (2022).

Table 7. Average Score in Knowledge Processes

Dimension 5 - Knowledge processes									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
5.1	The organization has systematic processes for identifying, creating, storing, sharing, and using knowledge.	2,0	2,5	2,0	2,4	2,5	2,0	1,7	2,2
5.2	The organization relies on a knowledge map and distributes the knowledge assets or resources throughout the organization.	1,8	2,3	1,4	1,7	2,2	1,9	1,2	1,8
5.3	The knowledge gained after performing tasks and completing projects is recorded and shared.	2,3	2,5	2,0	2,6	2,8	2,4	2,5	2,4
5.4	Essential knowledge of public servants who are leaving the organization is retained.	1,8	2,4	1,7	2,1	2,0	2,0	1,5	1,9
5.5	The organization shares best practices and lessons learned across the organization so that there is no constant "reinventing the wheel" and rework.	1,8	2,4	1,6	2,2	2,5	2,2	2,0	2,1
5.6	Benchmarking activities are carried out inside and outside the organization, the results are used to improve organizational performance and create new knowledge.	2,0	2,7	1,9	2,9	2,7	2,8	1,9	2,4
Average		2,0	2,5	1,8	2,3	2,5	2,2	1,8	

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Source: Created by the authors (2022).

Table 8. Average Score in Learning and Innovation

Dimension 6 - Learning and Innovation									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
6.1	The organization continuously articulates and reinforces learning and innovation as values.	2,8	2,9	2,9	2,9	3,2	2,8	2,6	**2,9**
6.2	The organization considers the attitude of taking risks or the fact of making mistakes as learning opportunities as long as it does not happen repeatedly.	2,4	2,9	2,5	2,9	3,0	2,4	2,4	**2,6**
6.3	Cross-functional teams are formed to solve problems or deal with worrying situations that occur in different management units of the organization.	2,4	2,9	2,6	2,9	2,9	2,2	2,7	**2,7**
6.4	People feel that they receive autonomy from their superiors and that their ideas and contributions are generally valued by the organization.	2,5	3,1	3,2	3,0	2,9	3,0	2,8	**2,9**
6.5	Middle managers are willing to use new tools and methods.	2,8	3,5	3,0	3,3	3,2	3,0	3,1	**3,1**
6.6	People are encouraged to work together with others and share information.	2,5	3,3	2,5	3,3	2,8	2,9	2,9	**2,9**
	Average	**2,6**	**3,1**	**2,8**	**3,0**	**3,0**	**2,7**	**2,8**	

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Source: Created by the authors (2022).

Table 9. Average Score in Knowledge Management Results

Dimension 7 - KM Results									
Criterium	Description	BOA/ADV	VDOP	VDERI	VDQA	VDIM	VDWM	TDC	Average
7.1	The organization has a track record of successful implementation of KM and other change initiatives that can be demonstrated with performance indicator results.	2,1	2,2	1,6	1,9	2,2	2,1	1,9	**2,0**
7.2	Indicators are used to assess the impact of KM contributions and initiatives on the organization's results.	2,0	2,3	1,5	1,7	2,1	1,8	1,5	**1,8**
7.3	The organization has improved – thanks to the contributions and initiatives of GC – the results related to the quality indicators of products and services.	2,4	2,8	2,1	2,2	2,4	2,1	2,0	**2,3**
7.4	The organization has improved – thanks to GC's contributions and initiatives – the results relating to efficiency indicators.	2,1	2,7	2,1	2,0	2,2	2,1	2,0	**2,2**
7.5	The organization has improved – thanks to the contributions and initiatives of GC – the results related to the indicators of social effectiveness.	2,1	2,4	2,2	2,1	2,3	2,0	2,1	**2,2**
7.6	The organization has improved – thanks to the contributions and initiatives of GC – the results of the indicators of legality, impersonality, publicity, morality and development.	2,3	2,6	2,0	1,6	2,4	2,0	1,5	**2,1**
	Average	**2,2**	**2,5**	**1,9**	**1,9**	**2,3**	**2,0**	**1,8**	

Subtitle: BOA/ ADV = Board/ Advisors; VDOP = Vice Director of Operations and Production; VDERI = Vice Director of Education, Research and Innovation; VDQA = Vice Director of Quality Assurance; VDIM = Vice Director of Institutional Management; VDWM = Vice Director of Work Management; TDC = Technological Development Coordination.

Source: Created by the authors (2022).

knowledge (APO, 2009). In this sense, Table 6 shows more robust results in the criteria that address aspects that do not mention KM. This indicates that respondents consider that the IT structure does not address KM. This gap is consistent with the fact that KM is not yet part of the institutional strategy, as shown in Dimension 1 (Leadership in KM).

In the Knowledge Management Process Dimension (Dimension 5), it is evaluated whether the organization has a systematic process aimed at knowledge management, whether there is a knowledge map formulated in the organization; if the phases of knowledge are observed (APO, 2009). Table 7 shows these aspects, in general, below the level "properly performed", since the scores obtained are situated between 1.8 and 2.4.

The Learning and Innovation dimension (Dimension 6) aims to assess whether the knowledge process allows learning and innovation at all levels and areas of the organization - whether the knowledge process is considered for new products, services, processes, markets, technologies and business models (APO, 2009). Thus, the results indicate that the institution articulates and reinforces learning and innovation, as well as aspects such as granting autonomy to subordinates and encouraging joint work were identified by the respondents. In the same way, the referring aspect was observed as positive, that the middle managers were willing to use new tools and methods. Table 8 shows the leveling of results on the scale "properly performed".

Finally, the Knowledge Management Results dimension assesses the organization's history in the implementation/implementation of knowledge management and whether indicators are used to assess the contributions of knowledge management in the organization's results (APO, 2009). Therefore, it refers to the outputs of a GC carried out strategically or, even, considering isolated initiatives that are in a GC scope, even if not yet carried out in a strategic way. The score for this dimension is placed in Table 9 and indicates the lowest score among all dimensions. Bearing in mind the peculiarity of this dimension as it deals with KM Results, the result obtained shows consistency with the results of the previous dimensions.

Therefore, through Table 8, it can be seen that when thinking about KM Results, the respondents understand, for the most part, that there are no results represented by indicators that can be related to contributions and initiatives from a KM.

CONCLUSION

Public Pharmaceutical Laboratories (PPL) are a strategic institution for the Unified Health System (SUS) to enable, through public production or public-private arrangements, the expansion and qualification of access to medicines and other health technologies. The LFO object of this research has complexity and specific characteristics, as it encompasses the production of medicines, scientific research, technological development and education as activities, forming an integrated chain aimed at fulfilling its institutional mission within the Brazilian SUS.

The research identified the level of maturity in KM in the LFO through the evaluative dimensions proposed in Batista's (2012) model, namely: leadership, people, processes, technology, KM process, learning and innovation and KM results. Therefore, it was identified that the public LFO evaluated fits the expansion level, with 105.3 points in total (out of a possible maximum of 210 points), that is, it is aware of the KM in the organization. However, it is still an incipient process, since knowledge management practices are observed in some areas in isolation, as can be inferred from the intermediate scores obtained in each dimension.

In relation to the Leadership dimension, the respondents pointed out the existence of strategies and management initiatives that are adequate to the initiatives for the protection of information and knowledge as the strongest point. On the other hand, the allocation of financial resources aimed at KM initiatives was pointed out as the weakest point. In the Processes dimension, the results obtained indicate that there is work aimed at mapping processes, even though it is not at a high level of maturity. In the People dimension, the education and training programs were recognized as adequate, as well as those for career development, expanding the knowledge, skills and abilities of employees and, also, the organization of work contemplate the formation of small teams/groups and the process structure for addressing workplace concerns and problems. However, inadequacy was observed in relation to the existence of formal processes of mentoring, coaching and tutoring. Another aspect considered weak was related to the existence of a competence bank. In the Technology dimension, the most robust results are found in the criteria that address aspects that do not mention KM. This indicates that, although the perspectives are adequate regarding the IT infrastructure, the respondents consider that the IT structure still does not address KM. In relation to the Knowledge Processes dimension, all aspects were evaluated below the "properly performed" level. In the Learning and Innovation dimension, respondents consider that the institution articulates and reinforces learning and innovation. And also, that aspects such as granting autonomy to subordinates and encouraging joint work were identified by the respondents. Another aspect observed refers to middle managers being willing to use new tools and methods. Finally, the Knowledge Management Results dimension indicates the lowest result among all dimensions. This result, due to the peculiarity of this dimension, due to the fact that it deals with GC Results, shows consistency with the results of the previous dimensions.

Finally, it is emphasized that identifying the level of maturity in KM in a public institution is the first step towards improving the techniques used, as well as the advances necessary for the institutionalization of organizational knowledge, with a view to the continuous improvement of processes and the achieving better results and the quality of services provided.

FUTURE RESEARCH DIRECTIONS

For future research it is suggested the identification of KM practices in organizations with the same profile or even a comparative case study. Finally, it is suggested to deepen the study, through the analysis of knowledge management practices and/or implementation of a KM base in the studied organization.

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KEY TERMS AND DEFINITIONS

Data: Documented observations or measurement results. The availability of data provides opportunities for obtaining information. Data can be obtained by perception through the senses (e.g., observation) or by performing a measurement process.

Information: Structured, organized, and processed data, presented within context, which makes it relevant and useful to the person who wants it.

Information Science: A field devoted to scientific questions and professional practice concerned with the problems of effective communication of knowledge and its records among human beings, in the social, institutional, or individual context of information use and needs.

Information Technology: Is a field that uses computing as a means to produce, transmit, store, access, and use diverse information.

Knowledge: Is the fact or condition of knowing obtained through experience, living, or association. We can see knowledge as a state of self-consciousness, about properties, sensations, behaviors, states of the most varied domains of reality.

Knowledge Management: The process of creating, sharing, using, and managing an organization's knowledge. This concept refers to a multidisciplinary approach to achieving organizational objectives through the best practices of knowledge use.

Maturity Model: Is a way to assess how adept an organization is at managing its projects. This means that it enables the identification of the level of maturity in project management and thus helps the manager to define the best way to achieve full success.