Concept Maps as a Support for Learning:

A Proposal from the Consent for the Processing of Personal Data in Private Organizations

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Abstract. Knowledge Organization has Knowledge Organization Systems (KOS) to represent, organize and retrieve information. Among these systems are the concept maps, which represent ideas from the illustration of concepts that are linked together. Originating from pedagogy, concept maps began to be used in several areas as learning methods, including in the context of private institutions. Therefore, the demand to implement the rules of the Brazilian General Law for Personal Data Protection (LGPD in Portuguese) requires learning from agents involved in the treatment of this type of data, especially in corporations. The general objective of this article is to prepare a concept map that represents the main rules of the LGPD regarding personal data processed based on the consent of its data subjects. As specific objectives, it seeks to investigate the main characteristics and typologies of concept maps, in addition to analyzing the aspects and fundamental rules of the LGPD. The purpose of the proposal is to use the map to study the aforementioned law. The methodology of construction of input and output concept maps was used, in addition to Data Life Cycle, which interprets the "life" of data in four phases: collection, storage, retrieval and disposal. As a result, a simplified map was arrived at, but with a broad view of personal data management from collection to disposal. The constructed map serves as a representative model of the treatment addressed and can be adjusted according to the needs of each institution.

Keywords: Knowledge organization · Concept maps · General law for personal data protection

1 Introduction

Information Science, as a discipline that studies information and the reality that surrounds it [1], has the Knowledge Organization (KO) as one of its fields of theoretical studies and practical solutions for activities that have the information as object. Within the KO, Knowledge Organization Systems (KOS) are the instruments responsible for organizing information in order to represent and retrieve it [2]. Among these systems are the concept maps, which are alternatives created by the education researcher Joseph

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Novak to improve the learning process from the visual representation of concepts that are interconnected and generate propositions among themselves [3]. From this perspective, concept maps were added to the list of KO systems as an alternative to support people and institutions in the process of representing and organizing ideas in graphic supports. Thus, given the various demands in current organizations, which require the learning of employees involved, concept maps are interesting systems to represent information and build knowledge on various possible subjects.

In the Brazilian context, the General Law for Personal Data Protection (LGPD in Portuguese), which establishes rights and duties in relation to the processing of data referring to natural persons, is one of the emerging demands in organizations. Adapting to the requirements of this law requires knowledge on the part of organizational directors and professionals specialized in the area of information management and the legal sector, as well as all employees of an institution.

Therefore, using the Data Life Cycle as a theoretical support to understand the existence of data, the main objective of this work is to develop a concept map that addresses the main rules of LGPD influential in the four phases of this model: collection, storage, retrieval and disposal [4, 5]. In order to achieve this proposal, two specific objectives are outlined: a) to investigate the main aspects of concept maps and their best-known typologies; b) analyze the main characteristics and rules involving the LGPD. Given the extent of the law and the various possible treatment scenarios, the construction of the map only observed the rules referring to the hypothesis of treatment based on the consent of the data subject to collect data in private organizations.

After this introduction (Sect. 1), Sect. 2 turns to the literature review on concept maps (concept, purposes and construction method), while Sect. 3 studies the basic aspects of the LGPD. In Sect. 4, the Data Life Cycle is presented. Finally, in Sect. 5, the desired concept map is presented, accompanied by a brief explanation of its representation. As a result, it is understood that the illustrative structure of the concept map serves as a support for the learning of people involved and interested in the use of personal data.

2 Concept Maps

In the scope of Information Science, Knowledge Organization (KO) is the discipline responsible for ordering information so that it can be represented and retrieved [6–8]. In addition to its theoretical corpus, the practice of KO involves actions such as listing terms, controlling synonyms and ambiguities, defining hierarchies and associations between concepts, classifications, among other activities [9]. Knowledge Organization Systems (KOS) are responsible for operationalizing such procedures. For Hodge [10, p. 1], "the term knowledge organization systems is intended to encompass all types of schemes for organizing and promoting knowledge management". Souza, Tudhope and Almeida [2] associate the definition of KOS with models of information representation, so that they can be organized and retrieved. Among the KOS, we can mention classification schemes, taxonomies, ontologies, folksonomies, thesauri, indexing languages, among others.

From this perspective, it is noteworthy that the purpose of representing information in KO involves several tools that serve as support for the learning process, such as the organization of concepts in facets, arrangements and maps [11]. The latter constitute themselves as their own KOS called a concept map. Concept maps are systems that use visual resources to present ideas and, despite not being good KOS for information retrieval, they are useful for representing knowledge [7].

Interestingly, concept maps do not originate from KO as a discipline, but arise in the context of pedagogy. They were created by Joseph Novak in the 1970s during studies on the learning process among children. Novak's research was influenced by David Ausubel's theory of meaningful learning, which considers the mental construction of knowledge as a result of the encounter between new information and pre-existing concepts in individual consciousness. Since then, concept maps have been used to consolidate knowledge through the visual organization of concepts [3, 12, 13]. According to Lima [14, p. 135], "[…] concept map is a representation that describes the relationship of ideas of thought […]".

Within the structure of a concept map, fundamental elements for its construction and understanding are mentioned. The most basic entity is the concept, defined as follows: "[…] the perceived regularity in events or objects, or records of events or objects, designated by a label" [3, p. 1]. The label, which represents the concept, can be a word, a short sentence or a symbol. In turn, labels are connected by linking words or phrases that imply propositions (statements) that state something about concepts [3]. In this system, labels are found in icons, usually frames, which can be differentiated in color and format, for example. Linking words or phrases are accompanied by arrows. For example, to state that a cat is a species of mammal, one label has "cat", another has the concept "mammal", and both are connected by the phrase "is a species of". The connections between concepts can express relationships of different kinds, whether temporal, logical, hierarchical, etc. [12]. In this sense, Tavares [13, p. 72] states that "the concept map is a schematic structure to represent a set of concepts immersed in a network of propositions" (Fig. 1).

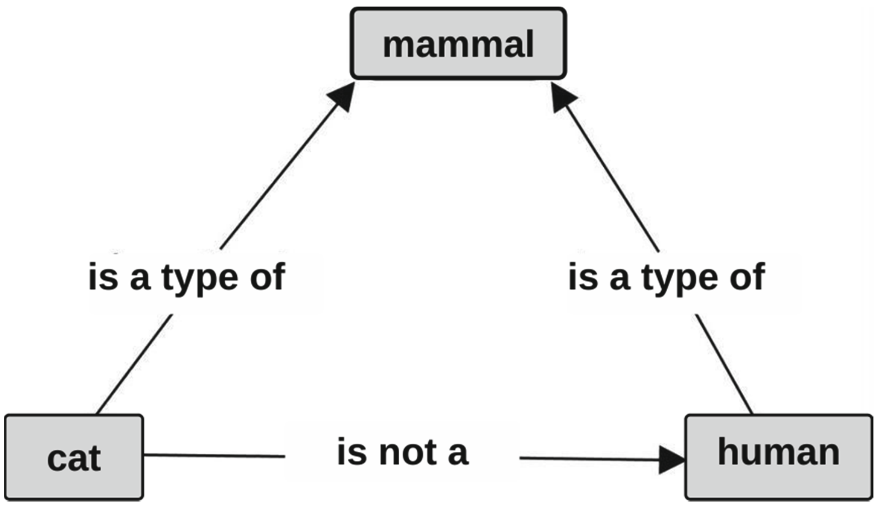

Fig. 1. Concept map example. (Source: Prepared by the author)

According to Dahlberg [15, p. 86], “our knowledge condenses itself in concepts by their informative content. Concepts are therefore knowledge units and form the elements of systems of knowledge”. Thus, relationships between concepts, evidenced in the map, allow the human mind to assimilate information to generate knowledge. In this perspective, with the organization of concepts in icons, both those who build the concept map and those who read it can better learn the information worked (developing the “iconic memory”) and, thus, build their knowledge about the topic covered in the map [3]. Because of this capacity, concept maps were instrumentalized by the Knowledge Organization [7] and started to be used in several areas, from the traditional pedagogical purpose to scientific research and in the administration sector [14]. Despite its advantages for representing information, the fact that its labels are summarized in a few words stands out as a major problem with this KOS, which can limit the reader’s understanding [14]. However, it is understood that its image organization still makes its use viable for learning purposes, especially if there is prior knowledge (albeit superficial) on the topic addressed or other support materials that delve into the concepts presented in the labels. Tavares [13] presents some of the different types of existing concept maps:

- “Spider’s Web” type map: Organized from a central concept that connects with other concepts, which orbit around it. It focuses on this concept, called “generator”, and the relationships formed from it, to the detriment of other types of propositions (such as hierarchical ones, for example).
- “Flowchart” type map: Its focus is the representation of processes, having start and end points.
- “Input and output” type map: It has a basic format similar to the flowchart, but has a greater richness in the number of relationships, as it imposes greater possibilities of inputs and outputs.
- “Hierarchical” type map: Organizes information in a hierarchical manner, with broader concepts at the top and more specific ones at the bottom.

Despite these typologies, Novak and Cañas [3] understand that a good concept map must be surrounded by a hierarchical structure (in the sense that specific concepts must come from broader concepts within the graphical representation of the system). Thus, observing this orientation, it is understood that, regardless of the type of concept map, the organization of concepts from the most generic to the most specific allows a better construction and understanding of the map, within the fundamental intentions of those who build it.

Novak and Cañas [3] present a concept map construction methodology, which is used for the purpose of this work. According to the authors, it is first necessary to define the area of knowledge that will be worked on (domain) and which fundamental question will be answered by the map (focal question). Afterwards, the key concepts of the map must be chosen and listed. From this list of concepts, these can be ordered from broadest to most specific (to serve as support for the organization). Once these initial steps have been taken, you can create a preliminary map. Soon, it can be revised (even more than once). New concepts and connections can be added or modified, until a desirable version of this system is reached. Also, you are advised to avoid large phrases in the icons. In the end, the map must undergo a final revision until it reaches its definitive version.

Finally, it is observed that, according to Tavares [13], what makes a map good or bad is its author's ability to create rich relationships between concepts.

3 General Law for Personal Data Protection

In the environment of an organization, there are several types of demands, whether constant or intermittent: organizational management, customer service, budget planning, logistics, institutional relations, definition and fulfillment of goals or commitments, etc. Any of these needs, undoubtedly, require knowledge for their execution, either from specialized collaborators or from the entire community involved. Within an organized society, laws are also demands that must be observed by institutions, when they are addressed to them. In this sense, it is important that organizations know the legal norms that must be observed and complied with within their scope.

In Brazil, the General Law for Personal Data Protection (Law n. 13.709/2018), known by the acronym LGPD, stands out. It defines rights and duties in relation to the handling of personal information, so that it obliges public and private institutions to implement security measures to guarantee the privacy of data concerning individuals. As a contextualization of this norm, it is observed that the current world is immersed in information whose traffic is potentiated by the performance of modern technologies [16]. Thus, personal data have become active in the present context of the digital economy [17], both for the private sector (commerce, industry, service provision, marketing, etc.) and for the public sector. Faced with the need to protect this type of data from possible abuses and violations (for example, leaks) and guarantee citizens' privacy and autonomy over their own data [18], the LGPD was enacted in 2018. Inspired by the European standard General Data Protection Regulation (GDPR), the LGPD is also a general law and therefore gives guidelines on how personal data must be protected in Brazilian law. People and institutions that comply with this standard must know it and know how its determinations influence their personal data management activities.

From this premise, it is understood the possibility of using concept maps as a support for learning the rules present in this regulation. Unlike other KOS, such as classification schemes (aimed at ordering concepts), thesauri (which perform vocabulary control) and indexing languages (aimed at retrieval), the focus of concept maps is to represent ideas. This representation has the ultimate purpose of building knowledge in the consciousness of those who have contact with its graphic structure. Thus, concept maps can be useful for learning how LGPD rules should be applied in environments that work with personal data. It would work, therefore, as a support for the study of its legal guidelines, contextualizing it with the reality of each institution.

In view of the central proposal of this work, it is necessary to present some relevant rules provided for in the LGPD, although, given the extent of the law, it is not possible to address all of them. First, some basic terms involving the matter of regulation of this law are presented. About the definition of personal data, according to its article 5, item I, it is said that they refer to "information related to an identified or identifiable natural person" [19]. It is observed that the concept of natural person is synonymous with physical person, that is, of a human individual. Still, there is a kind of this category of data called "sensitive personal data" (or just "sensitive data"), which concerns information of sensitive content, with greater potential for abusive or illegal discrimination [20]. As an example, article 5, item II, of the LGPD cites data related to “racial or ethnic origin, religious conviction, political opinion, union membership, […] referring to health or sexual life […]” [19] A data can be anonymized, so that it is not possible to identify who it refers to and, thus, the LGPD does not need to be applied to operations that have it as an object. The person to whom the data refers is called personal data subject [19].

The “processing of personal data” (or merely “processing”) is another expression recurrent in the text of the LGPD. According to article 5, item X, of the LGPD, the treatment refers to “any operation carried out with personal data […]” [19], whether collection, use, sharing, disposal, among other possible activities. The people responsible for these operations are called “processing agents”, which can be controllers or operators. The controller is a natural or legal person who decides on the essential aspects of data processing, such as which data will be processed and what the purpose of the treatment is. If a natural person is primarily responsible for the treatment, then he is the controller. If an organization, such as a company, is responsible, then its legal entity is considered to be the controller. The processor is the person (also natural or legal) who carries out the data processing operations, in accordance with the controller’s guidelines. Thus, it is a function performed by a hired person, by an outsourced company and even by the controller itself [21]. Although not a processing agent, the person in charge (or Data Protection Officer - DPO, according to the European model nomenclature) is also a mandatory actor in the processing of personal data. According to article 5, item VIII, of the LGPD, the function of the person in charge is “[…] to act as a communication channel between the controller, the data subjects and the National Data Protection Authority (ANPD in Portuguese)” [19]. Finally, according to article 5, item XIX, of the LGPD, the ANPD is a federal public body “[…] responsible for ensuring, implementing and monitoring compliance with this Law throughout the national territory” [19]. Among the powers of the ANPD, the application of administrative sanctions for those who fail to comply with LGPD rules stands out. Penalties range from warnings to fines and suspension of data processing activities [19].

As for the application of the LGPD, it is observed, firstly, that it regulates the processing of personal data in both the digital and analog contexts (such as information printed in documents, for example). Not only legal entities (public bodies, private institutions and companies) must observe the LGPD, but also natural persons when they are treatment agents. Regardless of the involvement of other countries in the processing of personal data, the LGPD should apply when [19]:

- the treatment operation takes place in Brazil;
- the processing has the purpose of offering goods or services in Brazil, or;
- the personal data is collected in Brazil (its data subject is in Brazilian territory at the time of collection) or the data subject is in the country during the treatment.

However, there are exceptions to these rules. When the processing of data has journalistic, artistic, academic, public security or State purposes, or for the purpose of investigation and repression of crimes, the application of the LGPD is waived. However, it is observed that, regarding the processing of data for academic purposes, agreement with the legal bases of articles 7 and 11, which will be addressed later on, is still required. Furthermore, the law is not applied when the data originate outside Brazil and are not communicated, transferred or shared with Brazilian processing agents [19].

As a way of protecting personal data, the LGPD establishes hypotheses that justify its treatment. These are legal circumstances that authorize operations with personal data, so that they can only be processed if the treatment agrees with any of these hypotheses [22]. These provisions of the law can also be called "legal bases" [23]. There is a list of legal bases that authorize the processing of personal data in general (in article 7) and another list especially dedicated to sensitive data (in article 11), as these require greater protection by law. Among the legal bases, it is possible to cite hypotheses of data processing for the execution of legal obligations of the controllers, for the execution of public policies by the Public Administration, for the protection of the life and physical integrity of data subject or another person, among other possibilities [19].

The hypothesis of consent for the processing of personal data, whether sensitive or not, stands out. According to article 5, item XII, of this law, consent is the "free, informed and unequivocal expression by which the data subject agrees to the processing of his personal data for a specific purpose". According to article 8, it must be "provided in writing or by another means that demonstrates the owner's expression of will". At the time of collection, the data subject must be informed about the purpose of processing the data granted. In addition, whenever the data subject wants, he can request the revocation of the processing of his data, through an express, free and simple request. Also, you have the right to request, free of charge, clear information about the treatment that has your data as object, including: purpose, identity of the controller, existence or not of data sharing, duration of treatment and way in which it is carried out. [19].

If the data subjects are children and adolescents (under 18 years of age), their parents or guardians must give consent for the use of the information [17]. Only contact data of these, for the request of consent, can be collected directly from the minors, but they must be used only once and cannot be stored, according to article 14 of that law [19].

Finally, according to article 15, the end of the processing of personal data occurs when: its purpose is achieved; operations are no longer needed; if the stipulated period for treatment has expired; or if the data subject requests the revocation of consent. However, data retention is allowed, even if one of the above requirements is met, when [19]:

- the controller needs the data to comply with any legal or regulatory obligation;
- the data are used by research bodies, preferably anonymized;
- there is a transfer to another person, provided that the requirements for data processing are respected (for example, definition of some legal basis);
- or the controller uses it, the data being anonymized and access to another person prohibited.

In addition to these rules, there are many others that could not be addressed in this work, given the scope of the LGPD. In this sense, the importance of adapting private institutions, especially companies, to the requirements of the LGPD is emphasized. Despite being a normative demand, it is understood that there are benefits caused by the implementation of the rules of the new law to the organizations submitted to it. Firstly, the very promotion of the security of personal data of customers, service users, contractors, among others, through the aforementioned rule. Adapting to the LGPD helps ensure the privacy of these people, which is of notable social importance. Secondly, as a result of the above reason, the corporation that respects the privacy of personal information will have a competitive point in the market compared to companies that remain inert in the face of this legal demand [24].

Therefore, it is understood that everyone benefits from the implementation of LGPD rules in a corporate organization. However, employees involved in the processing of personal data must be aware of the main requirements of the law, which radiate over the various phases of operations. For this reason, this article proposes a concept map model that organizes concepts related to data protection rules in the various moments of use of personal information by an organization. Knowing how this data should be managed in compliance with the LGPD is a learning need for agents in an institution. Thus, we seek to understand whether the concept map's ability to represent ideas through its graphic structure allows this KOS to be a support for private organizations. In this sense, the concept map could be used to study the LGPD, understanding its rules within the context of how personal data should be managed within an organization. As theoretical support for this objective, the Data Life Cycle proposed in [4, 5] is considered, for the management of this type of informational content.

4 Methodology

In view of the literature reviews whose objects of study were, respectively, the concept maps and the LGPD, we proceeded with the development of the construction of the concept map then proposed. It is considered that the execution of activities that have data as objects can be a real challenge, which requires knowledge of computing, Information Science and as many others as are necessary to meet the needs of this type of operation [4]. This difficulty is exacerbated by the requirement of the LGPD, which, as previously mentioned, imposes requirements aimed at protecting personal information. In this perspective, the proposal of this work passes through the observance of the phases of the Data Life Cycle as a theoretical and methodological reference for the definition of the treatment of data studied in stages.

Data Life Cycle is a theoretical tool that divides the existence of data into phases, each with its own needs. It uses the research of Sant'ana (2013; 2016), which has, among other concerns, the care with the protection of data managed in digital support, especially when present in large volume. The main characteristics of each phase of this model are presented below [4, 5]:

- Collection: It happens from the verification of the need to access or use the data for the satisfaction of some purpose. It is necessary to know, in advance, what data should be collected, its format and the way in which this collection should take place. Sant'ana [5] suggests that the data collected be described in metadata.
- Storage: If the person responsible for the data does not discard it after its first use, it is stored on a digital medium. In this circumstance, it is necessary to define which data must be stored, the physical and virtual structure for that, in addition to the definition of security measures that are necessary to avoid violations of the information. The intention is for the data to be stored so that it can later be used or made available for retrieval.

- Recovery: Occurs when there is an intention to make the data available to some public, so that it can be recovered. Sant'ana [5] advises the determination of certain guidelines, such as the definition of the recovery target audience, which data must be made available and the way to do so, period of availability, in addition to the possibility (or not) of returning to storage in banks of data.
- Disposal: Moment when it is verified that the data are no longer needed or that there is any other circumstance that imposes the deletion of the data initially collected. It must be well defined what data needs to be discarded, the ways to safely delete it and whether those responsible for the database have the right to delete it.

The map was structured based on the type of input and output, as the trajectory of the arrows represents processes (in this case, the "path" taken by the data in each phase of the Data Life Cycle) and, due to the multiple possibilities of operations with the data, there is more than one possible path to be traced. For example, as in the general Data Life Cycle model in [4], one can go from collection directly to disposal or, rather, go through the storage and retrieval phases. Furthermore, it took advantage of the guidelines for the construction of concept maps in [3]. The concepts that involve these processes were organized from the most comprehensive (which are the phases of data life) to the most specific (which are the special rules for each circumstance). As much as possible, specific rules (such as a list of requirements) were privileged at the bottom of the map and broader processes at the top. For the construction of the concept map, the CmapTools software, suggested in [3] was used.

5 Results and Discussion: Representative Concept Map of Data Life Cycle According to LGPD Rules

After studying the concept maps and the LGPD, the map built from the four phases of the Data Life Cycle and whose representative model was elaborated in the CmapTools software, reached the following resulting structure (Fig. 2):

On the map, the four phases of the Data Life Cycle (collection, storage, retrieval and disposal) are highlighted in green, different from the other labels. The map is read from the collection frame, which is the first phase of the cycle. According to the legal basis chosen to represent the treatment, data collection can only be done through consent, which is granted by the data subject or his guardians (if he is a minor). Remember that consent must be free (given at the will of the data subject or his/her responsible), unambiguous (given by means of proving such will) and informed (the data subject must be informed about the data collected and the purpose of the treatment). As with other legal bases, consent covers the data subject's right to request information about the processing of their data.

The collected data can go for disposal, after its use, or be stored. As the second phase of the Data Life Cycle, storage is the moment in which data is saved for use when necessary. According to the LGPD, it is prohibited to store contact data of a person responsible for a minor data subject. As previously stated, after using this information to contact those responsible for the minor, it must be discarded. Also, the possibility of sharing data with another person is highlighted. In this case, it is evident that sharing

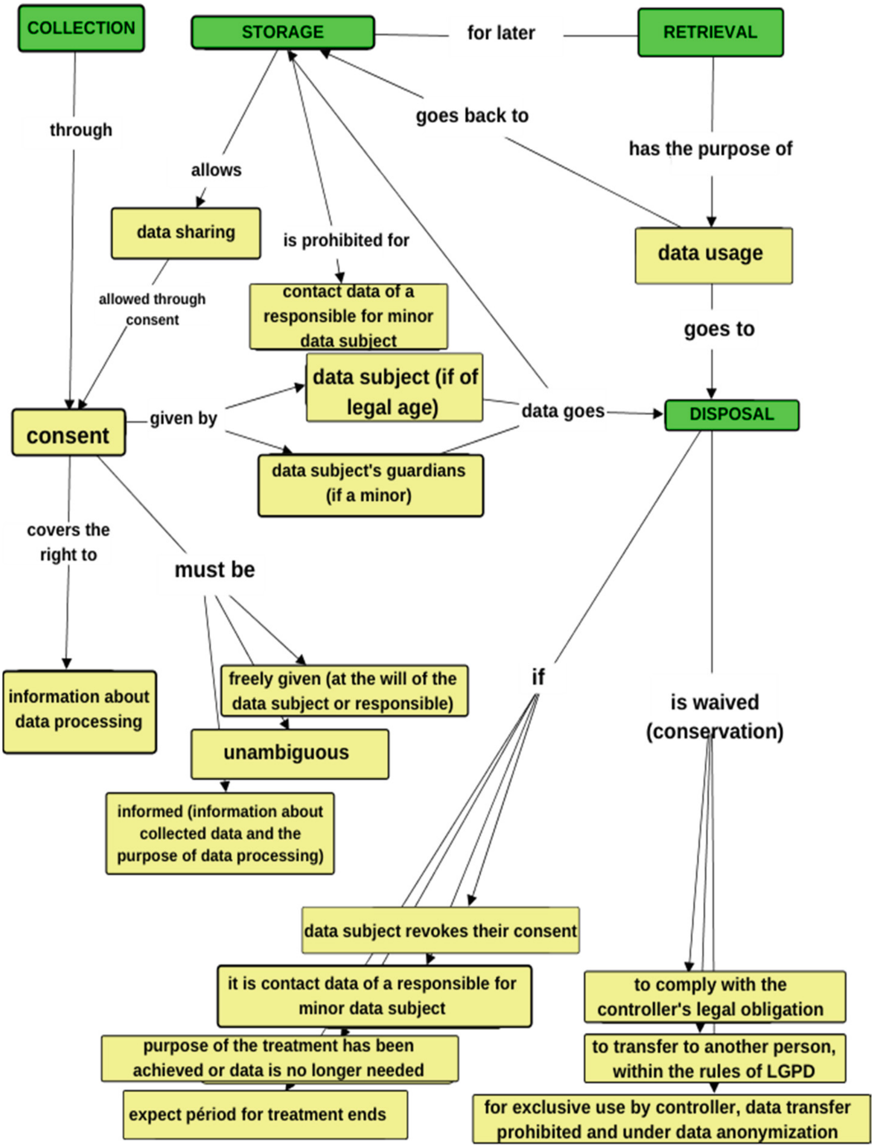

Fig. 2. Representative concept map of data life cycle according to LGPD Rules (Source: Prepared by the author)

requires the consent of the data subject, which can be granted from the moment the data were collected or through a new specific consent for this purpose.

On the left side of the "storage" label, the arrow leads to the recovery phase. In the processing of personal data presented as a model on the map, the agents themselves retrieve the data to use them. After its use, the data can be stored again or taken for disposal. The last phase of the Data Life Cycle refers to the deletion of data. Within the rules of the LGPD, as already seen, the disposal occurs in the following situations: after using the contact data of the person responsible for a minor data subject; if the data subject requests the revocation of consent; whether the purpose of the treatment is achieved; if the data is no longer needed or the predetermined period of treatment has expired. On the other hand, the data can be kept: to fulfill the controller's legal obligation; for transfer to another person (among the legal requirements, for example, if it is allowed by law or by the data subject to keep it through consent); or even for the exclusive use of the controller, under anonymization of this data, being forbidden the transfer to another person in this case.

In view of the analysis of the map, it is noticeable that its graphic structure is capable of representing the "life" of personal data according to the rules of the LGPD, from its collection for treatment to its disposal. A concept map structured in this way serves as a model for the organization to understand how this type of informational content should be managed so that it is adequate to legal requirements. His way of presenting concepts, in an accessible way, can be useful to all employees who need to know the rules for protecting personal information in an organization. Specifically, people in senior management, data management and legal sectors can benefit even more, as they decide on the purposes and directions for handling personal information in an institution.

Furthermore, although this general model is useful in demonstrating a panoramic view of the processing of personal data under the legal basis of consent in private organizations, it can be adjusted according to the needs of each specific corporation. For example, if the institution does not collect data on minors, there is no need to explain how this type of information should be treated in its concept map. Likewise, also by way of example, the concepts involving the sharing and use of data can be adjusted, in case there is an international transfer of them (which was not addressed in this work). Also, depending on the treatment to be performed, it is more advisable to build a new map than to use this model – for example, if the institution observes another legal basis, other than consent.

6 Conclusions

KO, as a discipline of Information Science, has its Systems (KOS) as tools for the representation, organization and retrieval of information in several areas. As for the possibility of image representation of organized information, concept maps stand out, linking concepts illustrated by labels and, thus, formulating propositions about a certain domain. As a result, concept map writers and readers are able to build knowledge about the area covered from the information represented.

In the Brazilian organizational context, LGPD has become a legal demand that requires knowledge from all employees of an institution, especially directors and those directly involved in the legal and information management sectors. Based on this assumption, the present work intended to build a concept map that would present the main rules involving the aforementioned law within a private organization (companies and other private institutions). Data Life Cycle, proposed by Sant'ana [4, 5], was used as a reference for the description of the "life" of the data (from collection to disposal), contextualizing it with the contents that bring information personal (referring to a natural person). For the delimitation of the subject, more specific rules of the law were omitted and only the processing of data collected through the consent of the subject was worked (since there are other "legal bases" that do not require such consent).

The result was a concept map whose format is "input and output", representing a process that can occur in different ways depending on the operations that involve the treatment and the nature of each data collected. Thus, while some data can be stored and retrieved, others must be disposed of immediately after being used (such as contact data of those responsible for a minor used to request consent to collect information from that child or adolescent).

Finally, it is understood that the concept map prepared can serve as a learning model about the aforementioned rules of the LGPD. It presents an overview (albeit simplified) of the main requirements that influence the life cycle of personal data. Still, it can be used as a basic model, so that adjustments are possible according to the reality of the organization (such as the existence of international transfer of these data, which was not addressed in this work). The guidelines given by Sant'ana in relation to each phase of the Data Life Cycle can also be used in the management of personal information. Furthermore, it is emphasized that other legal bases, which are not covered by the proposed map, can change the dynamics of how personal information is treated. In this case, the construction of a new concept map is more viable, although the guidelines indicated in this work can be used. Finally, it is understood that it is feasible to use this type of KOS, not only for the representation of the Data Life Cycle in the scope of this article, but also to support the learning of processing personal data influenced by other rules of the LGPD. There is no way to adjust the processing of personal data to the rules of this law without knowing how the management of this type of information should work, and this can be inferred through concept maps.

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