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M4law and its structure: domain modeling possibilities from the perspective of a KOS

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ABSTRACT

Introduction: In institutions, the interaction between information and technology is strategic, decisive and often competitive, making it essential to find solutions to improve this management. Digital technologies and the internet offer resources to improve information and knowledge organization, but they also generate a massive volume of information that complicates these processes. The analysis and evaluation of systems aimed at structuring and retrieving information represent a valuable contribution to the field in a practical and theoretical way. Objective: This article aims to describe the macrostructure of the M4law software, analyzing its elements from the point of view of a knowledge organization system (SOC), specifically relating it to ontologies and their constructs. Methodology: To this end, a brief literature review contextualized knowledge organization, SOC, and ontologies. The M4law analysis started from its most basic elements: objects, going through its hierarchical structure, creating a representation model, and verifying its properties and potential relationships between elements. Results: The analysis found that the system uses structure and language that refer to ontologies, and a comparison was created between the main ontological constructs and the types of objects in M4law. Conclusion: Finally, it was considered that although there is no explicit ontology in the software environment, it operates based on ontological principles and can be identified as a SOC

KEYWORDS

Knowledge organization. Knowledge organization systems. Ontologies. M4law.

M4law e sua estrutura: possibilidades de modelagem de domínio sob a perspectiva de um SOC

RESUMO

Introdução: Nas instituições, a interação entre informação e tecnologia é estratégica, decisiva e frequentemente competitiva, tornando essencial encontrar soluções para melhorar esse gerenciamento. As tecnologias digitais e a internet oferecem recursos para aprimorar a organização das informações e do conhecimento, mas também geram um volume massivo de informações que complicam estes processos. A análise e a avaliação de sistemas direcionados à estruturação e recuperação da informação representam uma valiosa contribuição para o campo de forma prática e teórica. Objetivo: Este artigo tem como objetivo descrever a macroestrutura do *software M4law*, analisando seus elementos sob o ponto de vista de um sistema de organização do conhecimento (SOC), mais especificamente relacionando-o às ontologias e seus constructos. Metodologia: Para tal, realizou-se uma

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breve revisão de literatura contextualizando a área de organização do conhecimento, os SOC e as ontologias. A análise do *M4law* partiu de seus elementos mais básicos: os objetos, passando pela sua estrutura hierárquica através da criação de um modelo de representação, bem como a verificação de suas propriedades e potenciais relacionamentos entre elementos. Resultados: A partir da análise, verificou-se que o sistema faz uso de estrutura e linguagem que remetem às ontologias, e criou-se um comparativo entre os principais construtos ontológicos e os tipos de objetos do *M4law*. Conclusão: Por fim, considerou-se que apesar de não haver uma ontologia de forma explícita na ambientação do *software*, ele opera com base em princípios ontológicos, podendo ser identificado como um SOC.

PALAVRAS-CHAVE
Organização do conhecimento. Sistemas de organização do conhecimento. Ontologias. *M4law*.

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1 INTRODUCTION

In the current context, humanity produces and consumes information at an astonishing speed, and concerns about its handling, organization, and efficient retrieval pose rising challenges for Information Science (IS). Through the organization of information, it becomes possible to describe and represent these elements so that they can modify contexts and transform them into knowledge. Knowledge organization, in turn, is the foundational area of LIS (Library and Information Science) that, through constructing models, can generate representations of information and thus build conceptual schemes across various domains. These representations are achieved by developing knowledge organization systems (KOS), which consist of systematizing concepts and their relationships in a given domain (Brascher; Café, 2008).

However, for LIS to develop, stay current, and remain relevant, including technology in its research agenda is inevitable. The work between LIS and On the Computer Science has been happening since the inception of information systems and is increasingly present and necessary for knowledge organization. Ontologies are one of the linking elements between these two areas and have been gaining more prominence in research and applications.

Within institutions (public and/or private), the relationships between information and technologies are also present and take on a strategic, decision-making, and often competitive context, reinforcing the need to find solutions that can assist in this processing. Digital technologies and the internet have both negative and positive impacts: on one hand, they qualify the processes of knowledge organization, information representation, and the development of more powerful KOS; on the other hand, they facilitate the massive production of information and complicate the organization processes.

Thus, the study and evaluation of systems aimed at organizing and retrieving information is an important contribution to the field in its empirical and applied dimensions. This article briefly outlines a contextualization of ontologies as a KOS. It presents the context of a master's research in development by one of the authors, aiming to describe the structure of the M4law software and analyze it from the perspective of knowledge organization, seeking to answer the following question: does the M4law software have characteristics comparable to a KOS such as ontologies? To this end, a comparison of the system elements with the principles and constructs provided in ontologies. Section two will present KOS and ontologies; section three will describe the M4law software and its structure of organizing informational objects; and section four provides the final considerations regarding comparing the software and ontologies.

1.1 Methodological approach

The methodology used can be characterized as applied in nature with a qualitative approach, and in terms of objectives, it can be understood as an exploratory and descriptive case study. The methodological procedures consisted of a literature review gathering books, articles, theses, and dissertations related to the area of Knowledge Organization with an emphasis on ontologies to construct the theoretical framework. Most of the works were collected from databases such as BRAPCI, the CAPES journal portal, the Digital Library of Theses and Dissertations (BDTD), and Google Scholar. The selection of works primarily focused on ontologies and their characterization. Thus, the terms ontology, ontologies, ontologies, and ontologies were the most used in the searches.
Additionally, documentary research was conducted with the M4law software as its object, in both its Desktop version (intended for users) and Admin version (developer environment), as well as its documentation contained in public user guides and private access content of M-Files

to which the authors had access. This allowed for a comparative analysis of the system from the perspective of ontologies and their characteristics.

2 KNOWLEDGE ORGANIZATION SYSTEMS (KOS)

Representing a set of concepts within a domain is not a simple task. Moreover, it becomes quite challenging when this is combined with the complexity of operating a computerized system for organizing and retrieving information within a group of users in a specialized area. For Morville and. Rosenfeld (2015, p. 24):

> We're talking about the challenges inherent in language and representation. No document fully and accurately represents the intended meaning of its author. No label or definition totally captures the meaning of a document. And no two readers experience or understand a particular document or definition or label in quite the same way. The relationship between words and meaning is tricky at best

The field of Knowledge Organization (KO) is an area of study, teaching, and practice grounded in two central pillars: the processes of knowledge organization, such as cataloging, classification, indexing, and thematic analysis, and Knowledge Organization Systems (KOS), such as classification systems, subject headings, thesauri, ontologies, metadata systems, among others. In its breadth, KO encompasses exploring and enhancing information services, with a reach that permeates the entire society (Hjorland, 2018). According to Dahlberg (1978), the interaction of individuals with the objects of the world leads to the need to define the elements with which they interact, culminating in the formation and analysis of concepts through the structured combination of these elements, facilitating the establishment of relationships between them and resulting in the construction of conceptual representation models.

KOS are representation tools intended to create models that synthesize the conceptual structures of areas, along with their distribution and interconnections. Thus, they directly influence how information is retrieved and knowledge is organized (Hodge, 2000; Hjorland, 2018; Schiessl; Shintaku, 2012). Mazzocchi (2019) understands that the notion of KOS encompasses a variety of tools developed at different times and with diverse objectives, yet all aim to contribute to the development of KO.

The representation of a domain depends on language, which is broad and varied, creating a need for terminological standardization focused on the context of use and the lexicon of users. Knowledge representation, in turn, is more comprehensive and has roots in both Information Science and Computer Science, focusing on constructing world models and generating KOS through this. As Souza (2017, p. 23) States:

> The development of a Knowledge Organization System (KOS) involves modeling knowledge. Modeling is creating a model, which means outlining according to a model, creating or reproducing something to emphasize its relief or contours. It provides simplified descriptions through models created from the cognitive process of making abstractions of reality segments, focusing on theories or observed phenomena.

Thus, constructing a Knowledge Organization System (KOS) involves modeling a knowledge domain, aiming at its representation in a conceptual structure, which is widely used to assist in information retrieval. Within the categories of KOS, thesauri, and ontologies stand out as they offer extensive semantic coverage and greater applicability to digital scenarios, sharing modeling stages (Souza, 2017). Thesauri are related to vocabulary control and indexing in knowledge areas. Ontologies, on the other hand, are representational artifacts that can address problems of representation and interoperability in information systems and will be better described below.

3 ONTOLOGIES

The term ontology originates from philosophy and refers to the study of being and the elements that exist in the world. However, as it is used in various fields of knowledge, it presents different interpretations and meanings, as stated by Ramalho (2010). In the context of Library and Information Science (LIS) and Computer Science, it can be understood as a representational artifact, endowed with structure and rules to reflect elements of reality (Almeida, 2014; Krebs, 2016).

Over time, its use has expanded to other areas of knowledge. Since the 1960s, Computer Science has appropriated ontology with an application specifically aimed at areas such as software engineering, aiding in the modeling of systems (Almeida, 2014). In this field, the growing development of programs and databases to organize information led to new challenges, motivated by the diversity of recording methods, languages, and terminologies in scientific and professional communities, thus hindering the progress of technologies as a solution to contain the growing informational flow (Arp; Smith; Spear, 2015; Almeida, 2020).

Ontologies were seen as a potential solution to these issues, as they could assist in data integration and information reuse. According to Guarino (1998), they directly influence information systems, becoming a central point in their development, and their use can range from serving as a basis in the process of creating application programs to designing user interfaces and database design.

In LIS, ontology began to be used from the 1990s, in a rapprochement of research between computer science and classification methods (Ramalho, 2010). It can be viewed from various perspectives, the most common being related to knowledge organization, considered a type of documentary language and, therefore, a type of KOS (Nascimento; Correa; Pinho, 2019). According to Ramalho (2010, p. 35):

> [...] Ontologies present themselves as a new category of knowledge representation instruments, enabling the formal description of the relationships between concepts and facilitating improvements in the representation, organization, dissemination, and retrieval of documentary content.

According to Almeida (2014), the use of ontologies in Information Science (IS) is not limited to their development as Knowledge Organization Systems (KOS). Their reach extends beyond the application, serving as a foundation to understand and model domains and functioning as an informal theory that is not always adequately acknowledged in the field. Minghelli and Chishman (2012) view them as a technological product.

Despite the diverse perspectives across the three areas, the ontological principles are the common elements that connect them, providing the theoretical bases for their understanding and use. These principles are grounded in studies on categories for the representation of structures of reality, notably the Aristotelian method, characterized by "genus" and "differentia" (Sowa, 2001; Almeida, 2014).

As Almeida (2020, p. 46) states [...] ontology, in its contemporary understanding, is a formal artifact for representing information and knowledge. Its advantages include rigorous, unambiguous definitions and the potential for computational implementation.

According to Arp, Smith, and Spear (2015), ontology can be considered a "sophisticated" taxonomy that consistently describes data. Its definitions are textual for humans and logical for machines. Regarding its product, Batres et al. (2005, p. 76) state that ontologies aim to [...] providing a conceptual system expressed by a set of terms and their relationships that allow, from a given term, the location of broader or more generic terms, synonyms, antonyms, and generally associated terms.

Complementando, Noy e Mcguiness (2004, p. 1, tradução nossa) entendem que a ontologia "[...] define um vocabulário comum para pesquisadores que precisam compartilhar informações em um domínio. Inclui definições interpretáveis por máquina de conceitos básicos no domínio e relações entre eles.”.

Therefore, an ontology can be understood as a formal representational artifact comprising a structured set of concepts within a domain, standardized through a taxonomy that accommodates various relationships among its elements, with explicit definitions to be readable by machines and humans. In the definitions, it is evident that although philosophy, Information Science (LIS), and Computer Science are distinct areas, their paths are intertwined concerning ontologies and their development, as it is impossible not to evoke references to all three simultaneously.

From a representational perspective, an ontology is composed of the following constructs (Almeida, 2014; Krebs, 2016; Souza, 2017; Nascimento; Correa; Pinho, 2019):

a) Universals/Entities: Elements that describe reality.
b) Concepts: Definitions/mental representations.
c) Types/Categories/Classes/Subclasses: Sets that group or delineate elements by similarities.
d) Instances: Represent special elements of classes and subclasses.
e) Properties: Describe the characteristics of classes and subclasses.
f) Rules/Axioms: Logical determinations that regulate conditions among elements.
g) Relations: Describe the relationships among elements in the hierarchy.

The number of objects and the diversity (and ambiguity) of their definitions to compose an ontological structure can generate dissonance in understanding during construction. Ramalho (2010) synthesizes the main components of an ontology to reduce complexity, characterizing them as follows: classes and subclasses, which group things/objects of reality according to their similar characteristics; descriptive properties, which describe the characteristics of the classes; relational properties, which enable relationships among classes within the same hierarchy or not through labels; rules and axioms, which are the logical rules for the insertion of values, allowing automatic inferences; instances, which represent the values of the classes and subclasses, characterizing the elements of the domain; and values, which record concrete information related to the descriptive properties (Ramalho, 2010). The following table (Chart 1) systematizes and compares some elements found in the literature on ontologies to better understand the constructs.

Chart 1. Comparação entre construtos de ontologia com base em autores sobre o tema.

Componets	Almeida (2014); Krebs (2016); Souza (2017); Nascimento; Correa e Pinho (2019)	Ramalho (2010)
Structural	Universals/Classes/Subclasses	Classes Subclasses
	Properties	Descritive Properties Relational Properties
	Relations	
	Rules/Axioms	Rules/Axioms
Assign Information	Instances	Instances
		Values

Source: Elaborated by the authors based on the cited authors.

Almeida (2020) states that the diversity of constructs, the terms used, and their meanings often become confused with their colloquial use, contributing to the challenge of understanding these crucial elements. Therefore, the author compiled the main terms and uses to define and situate them within the representational context of ontologies (Chart 2)

Chart 2. Basic Representation Constructs and Their Definitions According to Almeida (2020)

Terms as Colloquial Synonyms	Informal and Provisional Sense	Examples of Use	Definitions
Entity Thing Reference	Anything in the World	Sun, person, color, fruit, tree, student, building, etc.	An entity is a term used to indicate any object whose ontological status can be defined, exemplified, and compared with others. The term "thing" is used as a synonym. "Referent" includes entities and the universe of ideas, objects, facts, subjects, properties, etc.
Type Category Class Concept Universal	Sets of entities exhibiting similar characteristics	Trees perform photosynthesis, gold has atomic weight X, tomatoes are red, etc.	Type corresponds to the type of predication, i.e., the type of characteristics used to predicate entities. Category is the bearer of the characteristics applied to things and states of affairs in categorization. Class is the set of individuals grouped by characteristics without the ontological requirements of the category. Concept is a knowledge unit encompassing the characteristics of the referent of a term or name. Universal corresponds to the set of characteristics, repeatable and exemplifiable, only when instantiated in its respective particular
Instance Individual Object Particular	The entity itself, part of the world and reality	Maria is an instance of a person, José's BMW is an instance of a car, etc.	Instance and particular can be considered synonyms, but object is defined as a universal. Individual maintains a sense close to instance and particular. Particular is an entity that inhabits reality, is not repeatable, and remains a unique instance of a universal.
Property Attribute Quality	A characteristic of the entity	The color of the dress, the capacity of the bucket, the smell of bread, etc.	Properties make distinct particulars similar from a qualitative point of view, even if they bear common characteristics. Their distribution determines the qualitative identity and difference between entities. They can be identified because they are predicable and exemplifiable. Attribute and quality are synonyms for characteristic.

Relations Relationships	The connection of one entity with another	João married Maria, the pen is on the table, the car has tires	Relation is used as a synonym for relationship. Relationship describes how entities are connected.
Arity	Number of entities in a relationship	Color (of the dress) has arity 1, Marry (João and Maria) has arity 2	Identifies the number of arguments or operands of a function or operation. Refers to the number of entities involved.
Cardinality	Number of members in a set	{A, B} has cardinality 2	A mathematical property that identifies the number of elements in a set.

Source: Elaborated by the authors based on Almeida (2020).

The element that will guide the structuring of an ontology's constructs is its ontological commitment, which is the definition/conceptualization/description of the domain that will guide the choice of categories and model construction (Guarino, 1998; Minghelli; Chishman, 2012).

Based on the definition of its constructs, it is possible to develop various types of ontologies according to the intended purpose of the representation, namely, high-level or generic ontology, which gathers general concepts of a domain and serves to unify categories and their relationships across large communities, aiming to improve information integration; domain or task ontology, which, stemming from the high-level ontology, describes generic concepts of a domain/task, making terms more specific; application ontology, which is a specialization of domain/task ontologies for task execution (Guarino, 1998; Ramalho, 2010); and reference ontology, which aims to comprehensively represent the elements of a domain to consolidate knowledge (Arp; Smith; Spear, 2015).

With the success of their adoption in both IS and Computer Science, there has been a growth in the construction of ontologies. However, this growth, combined with the lack of standards for their creation, can lead to new integration problems and difficulty reusing information, undermining the primary reason for using ontologies: interoperability (Arp; Smith; Spear, 2015; Souza, 2017). Noy and McGuinness (2004) state that building an ontology is a creative process with no correct method. Souza (2017) argues that the lack of consolidated international standards indicates the level of maturity of ontologies compared to other KOS, for example.

Nevertheless, this scenario may change through the development of studies aimed at creating standards for construction, such as the Unified Foundational Ontology (UFO) (Guizzardi, 2005) and OntoForInfoScience (2015), and the publication of two ISO standards that provide recommendations for the process: ISO/IEC 21838-1:2021 Information technology — Top-level ontologies (TLO) — Part 1: Requirements (2021) and ISO/IEC 21838-2:2021 Information technology — Top-level ontologies (TLO) — Part 2: Basic Formal Ontology (BFO) (2021), which may gradually contribute to the unification of methods.

From the perspective of knowledge organization, the issue of ontology versus thesauri is frequent, comparing their applications as KOS, construction methodologies, and underlying theories, among other topics. Their definitions do not necessarily overlap, as it is possible to identify elements that differentiate them, such as structure, purpose, and application. Notably, there is mutual influence between the two, so much so that Souza (2017) questions whether thesauri are undergoing an "ontologization" and suggests that ontologies should adhere to the theoretical foundation of IS in their construction.

In summary, ontologies have followed an evolutionary path influenced by interdisciplinary factors and can be seen as a new category of KOS. They share characteristics and foundations with their predecessors but are presented as the most capable of dealing with the advancements in technology impacting the area of knowledge organization (Ramalho, 2010).

3 ANALYSIS AND DISCUSSION OF RESULTS

The M4law software is a system developed by Br-IT Softwares, presented as an intelligent content and document management platform tailored for the legal field, operating in the cloud and with artificial intelligence (AI) resources. The company is one of the licensed representatives in Brazil for marketing M-Files, from M-Files Corporation. M-Files is defined as an Enterprise Content Management (ECM) solution that improves the way companies manage documents and other information, focusing on efficient organization and retrieval. It differs from a traditional Electronic Document Management System (EDMS) as it goes beyond using technology to organize documents traditionally and focuses on managing structured content to encompass information more comprehensively (M-Files Corporation, 2022).

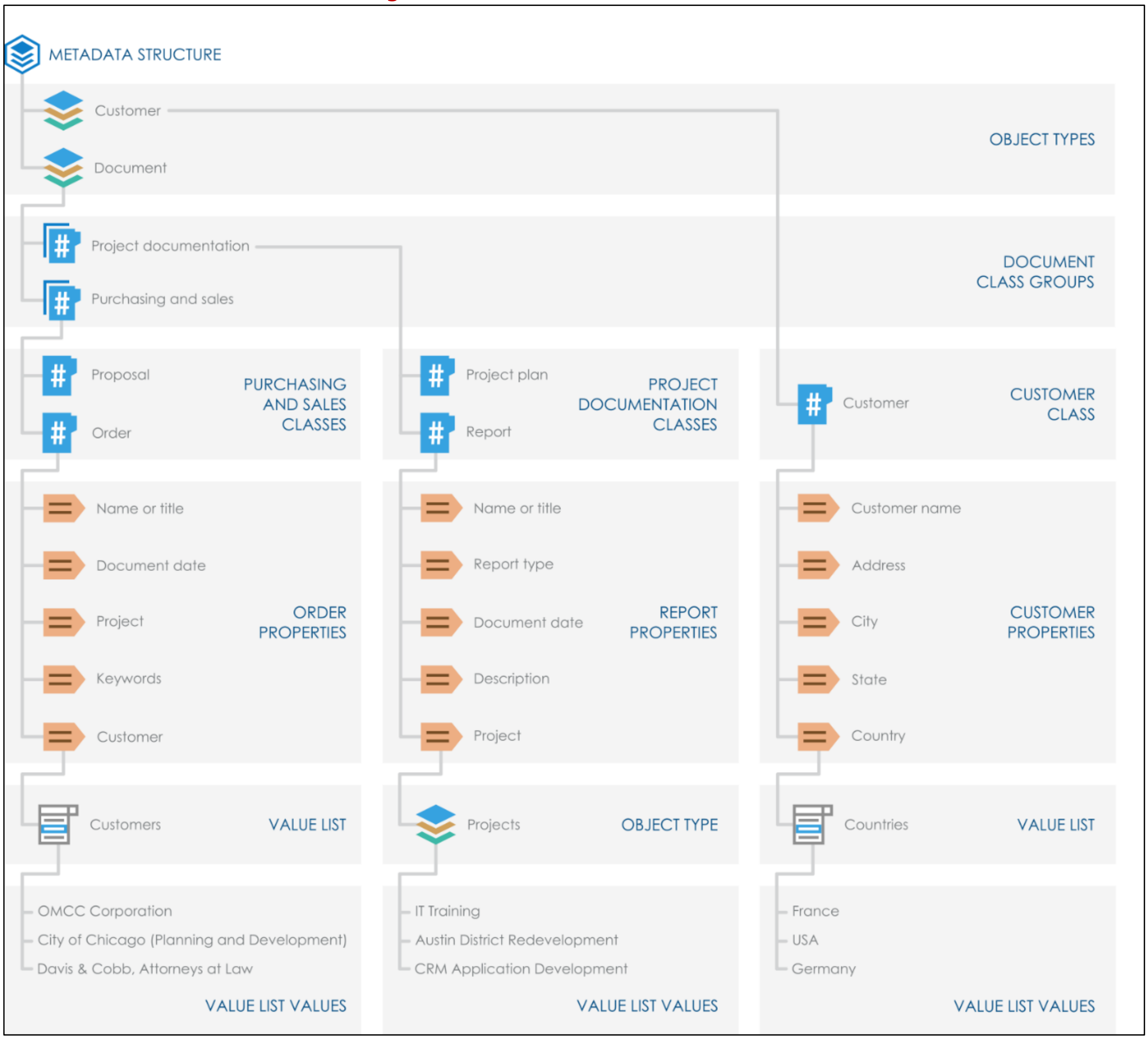
M4law is a metadata-driven system and understands metadata as information that describes various facets of an informational object. The organization is based on the object itself through the description of its properties, considering them as "pieces" of metadata, allowing the connection of information by its context (M-Files Customers, 2022).

From the perspective of knowledge organization, these corporate systems not only can but should be analyzed, either to identify elements that deviate from the principles of the field for studies or to suggest paths and improvements in these applications, enriching the research agendas of the field in both cases.

Thus, one of the authors of this article has been using the M4law platform in their professional activity since 2019. Due to their master's research, which focuses on the system, they accessed the M-Files Admin environment (translated for M4law use) to evaluate the structural elements as they appear to developers, providing an opportunity to analyze the system and its elements. This led to the possibility of examining the structure of M4law/M-Files from a comparative perspective with ontologies.

Initially, due to its clearly visualized hierarchical structure, a taxonomy was identified as the tool most like its initial presentation (Figure 1). However, a significant component in the system's operation is its ability to create relationships between objects through their properties. This makes a simple taxonomy comparison less viable and brings it closer (from a comparative perspective) to more elaborate semantic tools, such as thesauri and ontologies.

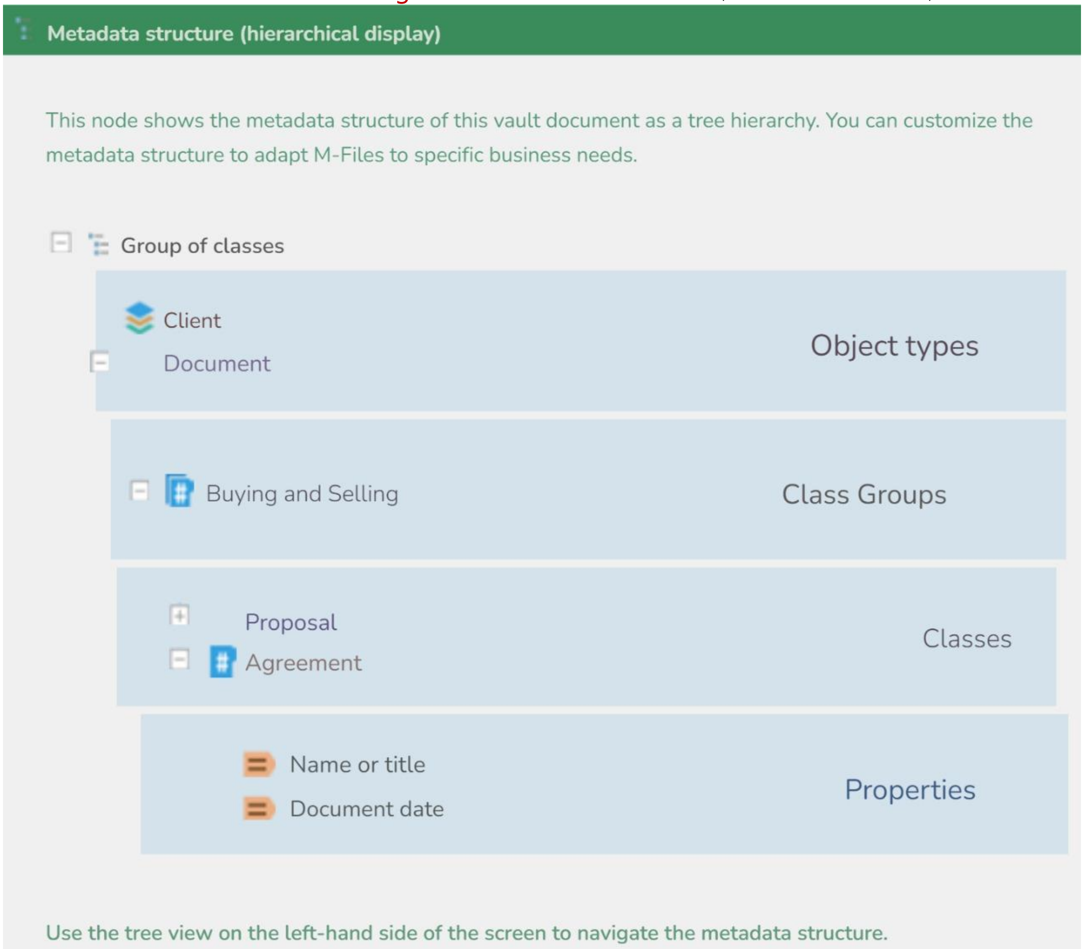
Figure 1. M-Files Metadata Structure



Source: M-Files Userguide (2022).

By observing the presentation of the M4law structure in its hierarchical display (Figure 2), we identified the main elements that compose the objects in the system: object types, which group all the objects found in the most general categories and distinguish them within the organization, ranging from documents, clients, processes and/or consultations to a specific task, among others; class groups, which could be seen here as superclasses, of a more generic nature, in the case of a document object, it could be subdivided into departments that produce them, such as legal, administrative, financial, for example; classes, which serve as aggregators of more specific, yet still somewhat general, objects, such as a document class titled petition, for instance; and finally properties, which consist of the actual metadata, each describing a particular aspect of the object, allowing for the creation of relationships between the various objects contained within the system environment.

Figure 2. Metadata Structure (Hierarchical View)



Source: *M-Files Admin* (2022).

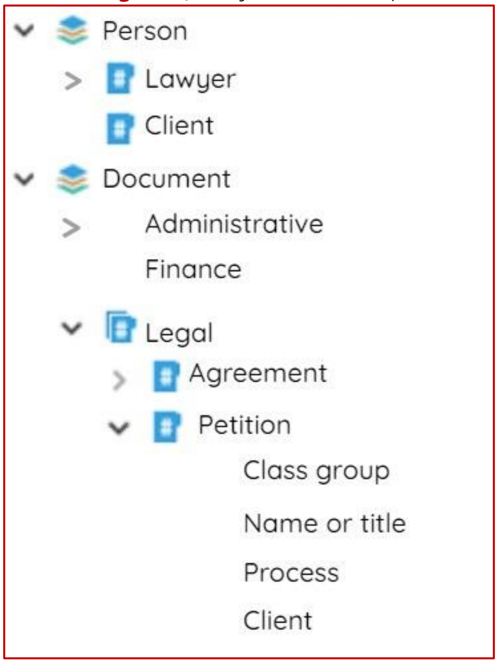
By examining the presentation of the elements in its flat view (Figure 3), we have access to some definitions that the system assigns to the functioning of its objects. The item "object type" is considered a high-level concept and it is through this that the modeling of more comprehensive objects occurs; value lists are parameters that will define the structure of the objects' properties and their filling; property definitions serve to define the standard metadata forms assigned to each class and object; and the classes will group object types into more specialized categories. The system itself considers classes to be of great relevance to the document object, which is indeed verified in practice, but it still applies to other objects within the system.

Figure 3: Metadata Structure (Flat View)

Source: *M-Files Admin* (2022).

For demonstration purposes, a simple representation model was created to exemplify how the hierarchy of objects is presented in the context of legal documentation, the scope in which M4law is applied. Starting from the high-level objects Person and Document, class groups Lawyer and Client, and document types related to their areas (Administrative, Financial, Legal) were created. Expanding the segment Document > Legal, the class Petition was created, which includes the properties Class Group, Name or Title, Process, and Client (Figure 4)

Figure 4. Object Hierarchy



Source: M-Files Admin (2022).

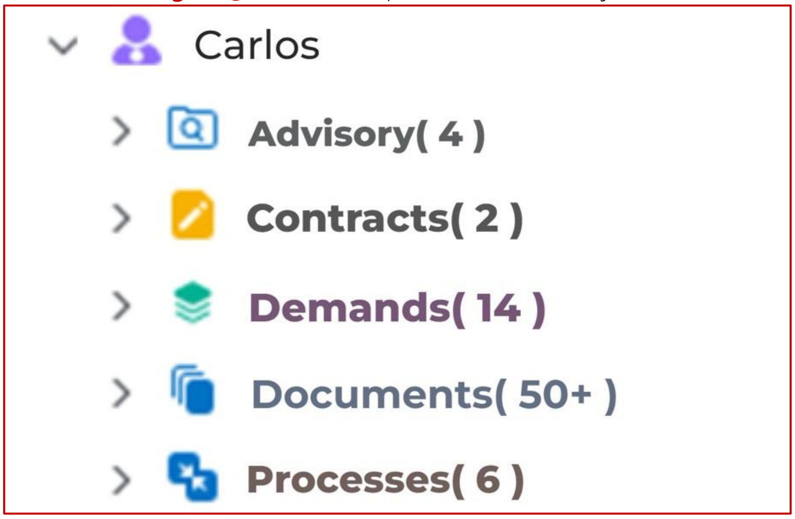
As an example, a document object from the legal class group, in the petition class, can be related to the process and client objects through the completion of its properties in the metadata form (Figure 4).

Figure 4. Relationships Through the Metadata Form

Source: M-Files Admin (2022).

Each object can be linked to various others. A Client can have relationships with various objects, such as contracts, consultations, demands, documents, and processes, as shown in the following example from a real operational environment of M4law (Figure 5)

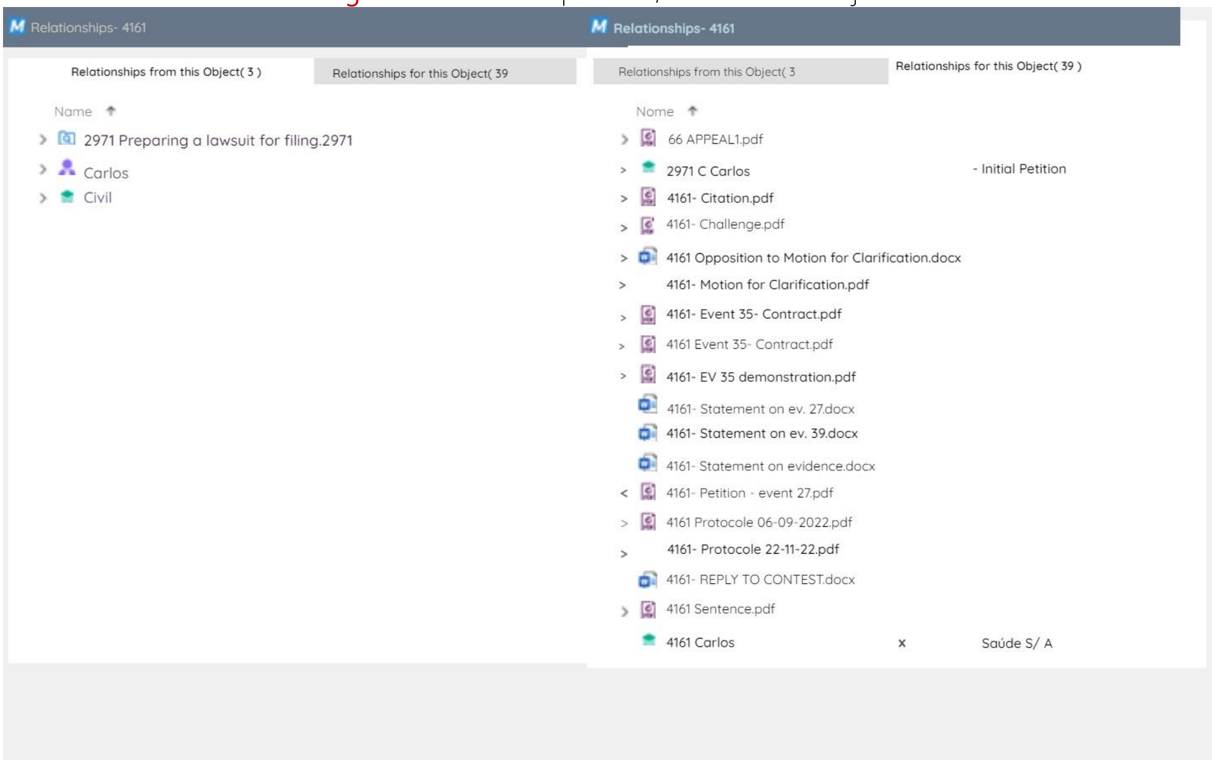
Figure 5. Relationships of the Client Object



Source: M-Files Admin (2022).

In addition to displaying relationships through dropdown menus, it is possible to visualize them using the Relationships command, which shows the number of links for each object and from it, like a web of suspended references (Figure 6).

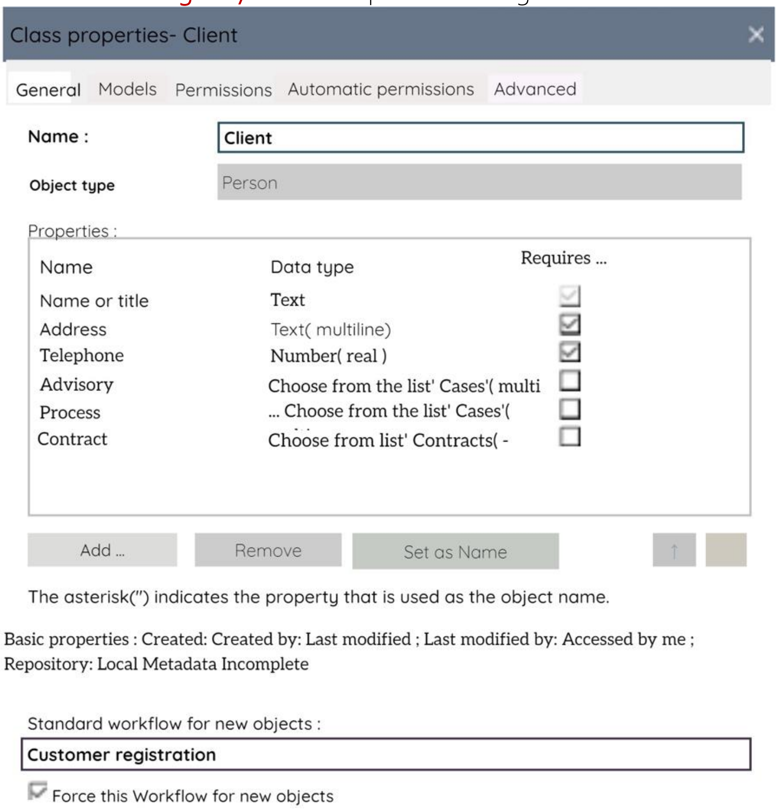
Figure 6. Relationships From/To a Process Object



Source: M4law (2023).

Many of the relationship assignments can be predefined (with fixed fields in each object's metadata form) or through free manual addition of properties, creating a network of relationships among objects at various levels. Additionally, it is possible to add rules to automate actions from each class. It is worth noting that the initial classification structure is configured in advance by internal M4law administrators, but the system allows customizations according to various usage scenarios (Figure 7).

Figure 7. Class Properties Configuration Screen



Source: M-Files Admin (2022).

It is important to highlight that users can actively create, modify properties, and assign relationships between objects, partially responsible for structuring the network of information circulating in the system. This fact can open precedents for occurrences such as incorrect classifications and/or linkages, which, combined with factors such as the presence of ambiguities in structures and the absence of terminological standardization, can impact the search and retrieval of information later on. Therefore, the time dedicated to modeling the objects of M4law and its structure during the pre-implementation phase is crucial for the organization, classification, and retrieval of information in the system.

Throughout the research conducted on the software (both M-Files and M4law), the term ontology was not identified in any documentation or system environment, whether for free access and consultation or within the user and administrator environments to which the author had access. As it is a commercial resource, access to the technical and structural information of the system's modeling may be restricted to its developers and partners, making it impossible to attest whether there is a high-level ontology as a foundation or if M-Files Corporation developed its own structure, which complicates the understanding of its constitutive bases.

Despite this, some elements suggest an implicit ontological structure in the platform, such as using a language like that used for ontology specification. It is possible to see the software in the context of a representational artifact, with its central taxonomy and endowed with subsumption relationships among its items. Starting from its presentation in a hierarchy that includes object types, class groups, classes, properties, and their relationships, it was possible to draw a comparative parallel with the constructs of an ontology (Chart 3).

Chart 3. Comparison Between Representation Constructs and Elements of the M-Files/M4law Structure

Almeida (2020)	*M4LAW/M-FILES*
Universal	Object Type
Category	Class Groups
Class	Class
Instance	Subclass
Properties	Properties
Relations	
Rules/Axioms	Auto-Fill Rules, Workflows
Arity	Relationship Between Objects
Cardinality	Grouping of Objects

Source: Elaborated by the authors based on Almeida (2020).

It was also found that the system's properties can fit into Ramalho's (2010) division between descriptive and relational properties. Besides quantifying values for the classes, they allow the assignment of relationships with other objects through metadata.

According to Guarino (1998), any information system is guided by an ontology, and Almeida (2020) corroborates this statement, viewing ontologies as a type of representation meta-model used in systems for knowledge representation. M-Files, being an intelligent content management system, has the premise of presenting structured information from a domain (in the case of M4law, the legal field) with a focus on the organization and retrieval of structured information. For this reason, it can be seen as a knowledge-based system that uses the interaction between an ontology, an inference engine, and its interface in an expert system for its user (Almeida, 2020).

One aspect that receives less emphasis in the system is the visual presentation of objects. Although it displays example images of the hierarchical structure in the administrator environment, it does not allow for complete visualization of the item structure and their relationships, which is common in ontologies and aids in understanding what is being represented in the domain.

4 CONCLUSION: M-FILES/M4LAW VERSUS ONTOLOGIES

This article aimed to describe the structure of M4law and compare it with ontologies to understand it as a Knowledge Organization System (KOS). It is understood that there is much to explore in the context of the software, not ruling out the development of further studies on the subject, considering the richness of the theme and its contribution to the field of Knowledge Organization (KO). As seen, the platform's potential for constructing and parameterizing objects is extensive, allowing for the creation of workflows that can reproduce various realities. This can be challenging when directed at scenarios that do not seek adequate prior conceptual modeling as a basis.

We consider that conducting applied research towards the construction of an instrument like a thesaurus or an ontology integrated into the system, aiming for terminological standardization and conceptual modeling, can further qualify the system's organization and the delivery of retrieved information.

Finally, although M-Files/M4law does not explicitly refer to itself as an ontology, ontological principles are present in its operation, given its hierarchical presentation and categorization for representing domain information, as well as the similarity of its elements with ontological constructs. Moreover, it can be viewed as a KOS, as it aims to represent a knowledge domain through its structure, concepts, and relationships, focusing on the organization and retrieval of information.

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