Proposition of a Faceted Classification Model to Support Corporate Information Organization and Digital Records Management

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Abstract

The employees of an organization often use a personal hierarchical classification scheme to organize digital documents that are stored on their own workstations. As this may make it hard for other employees to retrieve these documents, there is a risk that the organization will lose track of needed documentation. Furthermore, the inherent boundaries of such a hierarchical structure require making arbitrary decisions about which specific criteria the classification will be based on (for instance, the administrative activity or the document type, although a document can have several attributes and require classification in several classes).

A faceted classification model to support corporate information organization is proposed. Partially based on Ranganathan's facets theory, this model aims not only to standardize the organization of digital documents, but also to simplify the management of a document throughout its life cycle for both individuals and organizations, while ensuring compliance to regulatory and policy requirements.

1. Introduction

Despite recent technological advances, most large organizations still face significant information management problems. These problems are often related to the means of describing and organizing digital documents in order to enhance findability, shareability, usability and lifecycle management.

To respond to the need of managing, finding and using digital documents, records managers have advocated for the use of the already available paper-based corporate classification scheme [10] [12] [19]. With this tool, based on a hierarchical structure of descriptive categories related to functions and activities of the organisation, it is possible to physically regroup all documents pertaining to the same activity or project. It is recognized that the corporate classification scheme helps organize documents in the immediate or long term and facilitates the search and retrieval of documents by all employees [12] [21].

Even if its usage is strongly promoted, it has been demonstrated that the corporate classification scheme is rarely used by employees to organise and find digital documents on their own workstations. Employees prefer more "personalized" classification schemes that are closer to their day to day needs rather than a scheme that reflects the corporate view [16] [38] [42] [44]. The individualism that prevails in such a context is nurtured by different factors such as the absence of leadership, resources or corporate motivation, the quasi-absence of policies, standards, methodologies and procedures for the management of digital documents, the absence of employee training and mentoring and the belief that digital documents are not "official" documents or corporate records.

The inherent complexity related to the usage of the corporate classification scheme must be added to all of these elements [16]. Classification schemes originally designed to organize paper documents are difficult to apply to an electronic environment due to many existing a priori constraints. Firstly, the terminology used in the scheme's structure is often too generic and does not correspond to what is used by employees in their work environment. Users name their directories and documents according to a personal semantic often related to their domain of expertise. Secondly, the rigidity of the corporate classification scheme and its irregular or inexistent maintenance [37] does not motivate individuals to use it in an electronic environment. Finally, the time and cognitive effort required by the classification act [5] [32] incites individuals to favour the usage of a personal classification scheme to organize digital documents. Users are not required to justify logical division rules or classification conventions they are using; they also have no difficulty remembering their own classification rules, changes and exceptions [41].

Without an integrated and systematic digital documents organization system, it becomes increasingly difficult for enterprises to manage their documentary heritage, to comply with legislation related to information access and documentation of the

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decision making process and to ensure they protect themselves against any litigation and keep a trace of their activities [19] [42].

These concerns have driven documents managers to review their approach and propose solutions to harmonize the organization of corporate digital documents to prevent future retrieval problems. Since the beginning of the 90's, many organizations, workgroups and professionals have studied the subject, formulated recommendations and developed standards to improve organization of documents on personal computers [9] [11] [45]. Various proposals have been enunciated to simplify and facilitate the implementation and the usage of the corporate classification schemes in an electronic environment: naming conventions for files and directories, metadata standards, decrease in the number of hierarchical levels and personalization of class titles.

Faceted classification, a non-hierarchical classification strategy that can be applied to digital documents within large enterprises, has rarely been studied in this context, even though it has already been identified as a promising potential alternative to a strictly hierarchic classification structure [20]. Existing research has confirmed the positive impact of a facet based classification system for the organization and retrieval of information [18] [26], and it also appears to be promising for indexing and navigating through a collection of documentary resources on the Web [48].

Consequently, there is a definite need for more research to explore the possibility of replacing the hierarchical directory structure with a faceted classification system to organize digital documents in a work environment. In this article we will present the development of an innovative faceted classification model that aims not only to standardize the organization of digital documents, but also to simplify the management of documents throughout their entire life cycle for both individuals and organizations, while ensuring compliance with regulatory and policy requirements.

2. Documentary Classification

Documentary classification refers to the organization of documents by class based attributes or common division criteria [25] [33]. The first common division criteria is also the most important as it is this criteria that is used to describe and organize information holdings in logical classes [29]. However, even the most simple documents have many attributes (e.g., type of document, topic) that can be used to group them under various classes. The number of possible groupings can be infinite and the same documents can be classified in different ways [30] [31].

Since the advent of micro-computers, users have been using a hierarchical interface to organize administrative digital documents. This hierarchical interface has cognitive advantages for the individual as it enables him to locate a document through local browsing of a tree-structure directory representing the spatial location where the document is classified [3] [4]. However, inherent limits to such a structure, already noted by many researchers [2] [13], compel users to choose a classification based on personal criteria that will sometimes reflect either the document type, the document topic or the activity the document is attached to, where the document in actual fact could be classified in many places simultaneously [20].

In [34], it has been confirmed that documents on individual workstations organized by using very personal criteria or by using personalized application rules are not always understandable by others. Results based on a detailed analysis of 21 hierarchical classification schemes created and used by employees show a number of differences between personal and institutional classification schemes [34]. While institutional classification schemes organise documents according to administrative and operational functions and activities within which they are created or received, personal classification schemes tend to organize documents by topic (28% of main classes), format or by classes representing many topics (e.g., *Dossiers étudiants A-2003*).

This significant variation observed in folder names is consistent with the results of previous studies. A conceptual analysis of 31 folder structures realized by [6] indicates that the most common types of file folders were *project* (e.g., "ucl presentation") (34%), *document class* (e.g., "letters") (17%) and *role* (long-term activities, e.g., "teaching") (9%). A similar research study on digital documents found that the concepts most commonly used in folder names were: *genre* (e.g., "lecture notes") (24%), *task* (e.g., "evaluation") (15%), *topic* (e.g.,"database architecture") (11%), *time* (e.g., "2005") (8%) and *multiple* (e.g., "recruiting 2003") (8%), among others concepts [20].

The practice of mixing various concepts or principles of division in developing a hierarchy is contrary to principles of classification because it creates classes of documents that are not mutually exclusive [7] [27] [29], thus "causing uncertainty for the browser when he has to select a category" [46]. Such a mix is found at the first two-levels in all examined personal classification schemes, making the structure less efficient for organization, retrieval and update [22] [36]. The inherent and ongoing process of

updating personal classification schemes is one of the major problems raised by employees during interviews.

Results from these research projects confirmed the interest of exploring the possibility of using faceted classification as a multidimentional means of organizing administrative digital documents.

3. Preliminary identifications of facets applied to digital documents organization

3.1. Facets theory

Traditional institutional hierarchical classification schemes are enumerative schemes. They have to include all existing subjects within a given domain and anticipate the emergence of new subjects.

Excerpt from a classification scheme:

- **Human Resources Appraisal**
  - Regular employees appraisal
  - Contract employees appraisal
  - Casual employees appraisal
- **Human Resources Recruitment**
  - Regular employees recruitment
  - Contract employees recruitment
  - Casual employees recruitment

In such a classification scheme, repetition of certain concepts such as the different *categories of employees* that are the object of *Appraisals* and *Recruitment* is inevitable and necessary.

A facet, by contrast, is "a part of a subject" [39]. Faceted classification can be seen as a combination of complementary conceptual groupings rather than a long structured list of subjects. The concept of faceted classification applied to a document's subject was introduced by S.R. Ranganathan [39]. Ranganathan's classification scheme, and the sufficiency of this faceted classification scheme when applied to digital documents in a business context, will be discussed further in section 4.2.2.

Compared to a simple hierarchical and uni-dimensional documents organization mode, faceted classification systems are much more efficient as they have the capacity to integrate descriptions reflecting various dimensions of the information object. This permits an easier access to information by providing multiple navigation paths to any document.

For example, in the excerpt above we can see that the Human Resources process is composed of at least two different concepts: *Appraisal* or *Recruitment* (Action) and *Employees* (Object of the action). We could decompose the previous example into two distinct facets: *Action* and *Object*.

Action	**Object**
Appraisal	Regular employees
Recruitment	Casual employees

Concepts represented by terms, are enumerated within each facet, independently from each other, and combined, on demand, in a clause for a given situation. When saving a document, the employee can choose between one or many pre-established values within one or many facets with the help of a drop down menu.

3.2. Identification of mandatory facets

A preliminary exploration of the possible usage of facets applied to digital document organization was conducted within the Government of Quebec in an effort to develop an integrated paper and digital document classification system [24]. After the completion of this project, we tested the feasibility of using faceted classification to organize personal documents of a University of Montreal employee [35]. With these two studies we were able to identify essential facets that should be part of a faceted classification system. We were also able to observe the influence of the user's position on the selection of candidate facets for the model. The results of these two research projects will be discussed in some detail in this section in order to provide support for the proposed facet model in section 4. For additional study details please see [24] and [35].

An initial study conducted in 2001 for the Workgroup on classification and indexation of the Quebec Government's documents came to the conclusion that the hierarchy of traditional classification systems had to be "broken down" and that one of the most efficient ways of doing this was to use a set of facets. In [24] we tried to develop a more detailed and rigorous facet analysis approach for the "Business Process" and "Type of document" facets. These facets had already been identified as potential facets by the Workgroup. The main objective of our analysis was to better characterize the nature of the suggested facets and clarify their definition. We also verified that the set of facets covered all elements of the corporate classification scheme. For example, we had to preserve the context of creation of the information object (e.g., identify the administrative activity to which the document is related).

The analysis was done by using classification schemes samples provided by six departments and agencies pre-selected by the Workgroup. We limited our study to three business domains common to all departments and agencies: human resources management, finances management and real property

and materiel management. We were able to study high level facets ("Business process", "Type of document", etc.) by conducting intra and inter scheme analysis. However, we had insufficient data to analyse lower level facets- those that do not normally appear in the classification scheme but in the content of the document (e.g., "Time"). The analysis led us to believe that new auxiliary or marginal facets such as "External Agent" or "Document Status" (e.g., Draft, Final) would be useful for many employees.

This preliminary analysis raised many questions: Can the selected facets properly represent the context in which all digital documents are created? Can the selected facets properly represent subjects of all digital documents? Are there any important elements missing? How do we identify required facets with their values? In an attempt to answer these questions, the second phase of our work focused on exploring the possibility of replacing the hierarchical classification structure of digital documents with a faceted classification scheme.

3.3. Influence of the employee's position on facets selection and values

The second part of the project consisted of an exploratory study to substitute the hierarchical classification structure of the digital documents used by an internship coordinator at the University of Montreal. The hierarchical classification was replaced by a faceted classification structure that could represent the creation context and function of the documents, as well as the subject conveyed [35].

For this exploratory study, a top-down and bottom-up approach analysis was adopted, given that these kinds of analyses are commonly employed when designing a document classification scheme. On the one hand, logical conventions were followed to structure the conceptual domain, regardless of the content of the business documentation. The deductive (top-down) approach subjacent to this logical structuring of the domain made possible the development of the classification scheme and ensured the coherence of the classification scheme [15] [33].

On the other hand, *literary warrant* required taking into consideration the given number of documents on each subject to guarantee that the classification scheme would be created according to the specifics of the documentation set [27] [30]. In other words, in a specific domain, a facet list can't be created *a priori* using a static formula. Facets must be researched in a pragmatic way by examining the documents pertinent to the domain and by conducting conceptual analysis that can convert a theoretically unlimited number of terms used in a given domain to a limited number of fundamental categories [47].

This study determined that in order to gather the required information, an analysis of the formal and informal activities performed by the employee (e.g., internship coordinator) must be done as a preliminary stage of the identification and selection of the related facets in order to meet institutional demands (to associate documents to the activities within the framework where they have been received or created) and the particular needs of the employee (represent the subject of the document).

For instance, at the University of Montreal, internship coordinators can be asked to participate in different activities of an administrative, professional or educational nature that are linked to their job. Thus, internship coordinators are not exclusively responsible for activities related to the general coordination of internships; they can also be in charge of organizing meetings with students, planning internships sessions, assigning students to vocational training and even planning visits to the workplaces. In addition, internship coordinators play an intermediary role between the workplace (for example, health institutions), the employers (public or private sector) and the students (subscribed or not to the internship program).

The range of activities performed by the internship coordinator suggests that an employee may have the need to access more frequently and more promptly certain specific types of documents. The interviewed internship coordinator confirmed that he managed on a regular basis (e.g., from year to year or every semester) a variety of documents and correspondence, internship offers, employment offers, data banks, as well as numerous receipts and invoices. In addition, he worked frequently with templates or generic documents (e.g., application forms); reference documentation about different topics (e.g., plagiarism), and he was asked to deal with more specific documents such as minutes and students reports.

The analysis of the concepts represented in the tree-structure directory and the terminology used to explicitly name these concepts allowed for validation of the pertinence and the sufficiency of the identified facets. The observation of the employee's general classifying practices showed that each file contained more than one subject (for example, Student files F-2003). These results supported the initial goal of replacing the one-dimensional hierarchical classification with a faceted classification.

After analyzing the standard activities and the concepts used by the employee to classify his documents, a classification model was created to offer the internship coordinator the possibility to classify and locate his documents using facets almost identical to diplomatic analysis [14] and archival metadata

(InterPARES project). The facets, listed below, were built according to the coordinator's informational needs:

1. Activity
2. Document type
3. University semester
4. Origin of the document
5. Recipient of the document
6. Student status

A first glance and use of the prototype by the internship coordinator gave encouraging results. In the opinion of the employee, the assessment of the faceted classification validated the relevance and exhaustiveness of the identified facets for the organization of his documents, facilitated keeping up to date the classification structure by actively engaging the participation of the employees in the construction of the classification, and exemplified efficient suggestions.

This preliminary study sought to explore the feasibility of a faceted classification within a university context and was restricted to a specific employee category. However, these results demonstrate the importance of having a thorough knowledge of the related activities of the employee to select the facets and the semantic relationship between some facet values (e.g., the relationship between activity and document type)

This first faceted classification scheme was restricted to a specific individual that held a particular position in an organization and has considerable routine in his work. The next research step was to create a faceted classification scheme that included in the structure the management, retention, disposition and location of records and documents at an organizational level.

4. Faceted classification model specifications

4.1. Model requirements

Results from these preliminary studies motivated the creation of a faceted classification model that could support corporate information organization and digital records management. To be functional, this faceted classification model, described below, has to meet various theoretical, methodological and practical demands. On a theoretical level, the model has to reflect a set of classification norms and principles related to document management (e.g., preservation of the development context and the creation of a faceted classification (relevance, permanence, exclusivity, etc.). From a methodological standpoint, the plan must be constructed according to rigorous methods and procedures that can respond to the problematic and specific record management needs of each organization (e.g., business analysis). From a practical standpoint, the plan must be able to sustain the functionalities of decision-making, research and information retrieval for an efficient organization and reliable records management.

4.2. Model components

The faceted classification model created to organize the digital documents for large organizations that consists of three basic elements: context facets, content facets and a "hybrid" facet (a facet that contains at the same time context and content elements as a file case or "dossier"). Context facets provide a classification that is related to organizational functions and activities, for example, whereas content facets are focused on classification of the document's subject. The hybrid facet connects these two aspects of the document categorization. Each of these elements will be described in detail below.

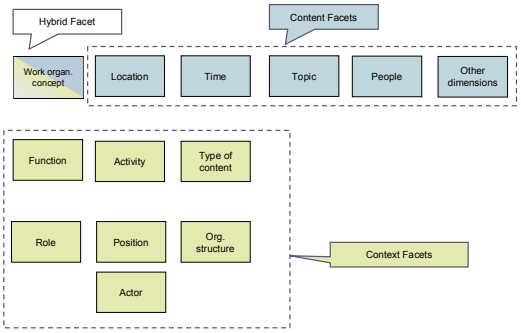

Figure 1. The faceted model components

4.2.1. Context facets. Context facets describe the links between the content of a document and the administration or operational background that are the functions and management production activities.

The suggested context facets are: 1) FUNCTION, 2) ACTIVITY, 3) CONTENT TYPE, 4) ROLE, 5) POSITION, 6) ORGANIZATIONAL STRUCTURE and 7) ACTOR.

A digital document is created within a specific context [23]. Digital documents originate from a voluntary intention of publishing [1] or are created within the framework of a specific function or activity. Context allows the reader to determine the sense of the

document and makes it possible to avoid reading or interpretation mistakes [8]. This notion of context is fundamental in an administrative or business setting where the digital document is not only a collection of data or information but is rather defined as the initiation or a consequence of a business process or activity. In this particular case, the context allows the document to be considered as a specific entity- a *witness* of an activity. In order to eyewitness an activity, the document must not only "encompass" the content but also the structure and the context [11]. In library and information sciences, the principle of preserving the background or the origin of the documents when regrouping documents and files based on organizational functions and activities allows the administrative context of the document to be maintained, ensures a better interpretation and authenticity, and illustrates the value of the information contained within these documents [8] [28].

The CONTENT TYPE, or standard representational mode of the information, creates expectancy in the reader and imposes a "canonical read". This means that there is usually an expected result at the time of creating a document. The usual content types allow communicating and locating the information more quickly [43]. They are indispensable for the identification of documents as well as for validating them.

The content type is the expression of a corporate body or association, but it is also the outcome of a collective data process- for example, a contract and its clauses, satellite data obtained by applying a scientific program, a filled opinion poll, a written or illustrated report, the blueprints for building a college, a bank receipt, test results, proceedings of a meeting, etc. The faceted classification model favors *named* content types (e.g., leave of absence).

Context facets are identified and selected using a functional method of representation and deconstruction. This method of downward analysis allows for the identification of the appropriate values for the context facets used to replace the document set within a production context. Principles of theoretical classification rules (for example, relevance, permanence, exclusivity, etc.), the establishment of models for the analysis of business processes (for instance OSSAD, UML) and document standards (such as ISO 15489, ISDF) are used to select the relevant values and to identify the adequate level of granularity for each facet.

4.2.2. Content facets. The content of a document can be divided into several parts: title, author, recipient (if applicable), date, reference to the information context (program, process, decision, etc.), the body text and operational or transaction data, as well as complementary information such as attachments or illustrations. The above mentioned elements describe what the document is about or what has been said or done with that document. These elements constitute the memory of the action and are added by the user in the order of their importance [40]. Part of the content of a digital document can be extracted automatically (e.g., author or date of creation) depending on the structuring level of the document. However, other parts are analyzed "manually" (e.g., the body of the text of message).

Ranganathan's facet theory [39] offers a possible syntax for the expression and "manual" representation of a subject. Ranganathan argues that the subject of a document touches at five elements of reality: PERSONNALITY, MATTER (substance, property, quality), ENERGY (main action, the action we are describing as it relates to the information object), SPACE and TIME. In a business context, a subject classification scheme based strictly and only on these five elements would have the benefit of being comprehensive, but it would also be overly general. As we have mentioned before, a facet must be researched in a pragmatic way by examining the documents pertinent to the domain and by conducting conceptual analysis that can convert a theoretically unlimited number of terms to a limited number of fundamental categories [47]. Consequently, content facets adapted directly from Ranganathan's 5 elements, (e.g., TIME, LOCATION, TOPIC, PEOPLE) are not sufficient to describe the organizational context, which demands more precision on thematic content. Furthermore, it would be necessary to add other dimensions to these facets to comply with organizational needs such as language of the content (particularly important for federal governments and international organizations), or the entity or agent (individual or organization) implied in the transaction.

In the proposed model, content facets are identified and selected using a document method analysis. This ascending method analysis similar to the index process (analysis of the content and translation of the document language) allows identifying content facets (such as place, entity, theme) used by the multidimensional representation and indexation of the subject of a given document in function of the particular organizational needs.

4.2.3. Hybrid facet. This type of facet is useful, for example, when a new project, committee, program or budget is created. The concept related to work organization is used as a medium to automatically derive, when classifying the document, content facet

values (e.g., TIME, LOCATION, TOPIC), associated with this project, committee, program, budget, etc.

4.2.4. Semantic relationships between facets values. To facilitate and accelerate the description and classification process of the documents used by the employees, facet values that are part of the scheme are linked semantically with each other. By establishing these relationships, the model is built dynamically as each of the facet values is selected. Furthermore, the management of the life-cycle of the documents becomes more transparent.

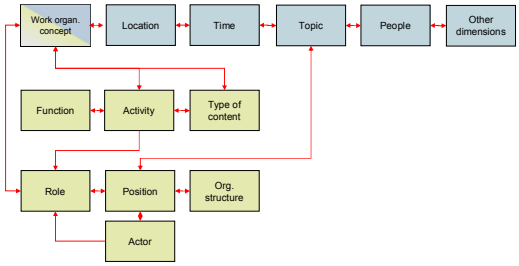

Figure 2. Semantic relationships between facets values.

For instance, by knowing the position of an employee (e.g., internship coordinator) other values could be automatically derived from the login information located in the system. That is, when an actor logs in his name (e.g., Joe Doe), other facet values such as role (e.g. coordinator, administration), topic (e.g., plagiarism) and activity (e.g., administration of internships, program evaluations), relevant to that particular position, as well as the content types (e.g., Student file) associated with these activities, will be calculated.

4.3. Foundation for records management services

The flexibility and the dynamism of a faceted classification scheme allow the integration of other functionalities related to the record management and life-cycle of a digital document.

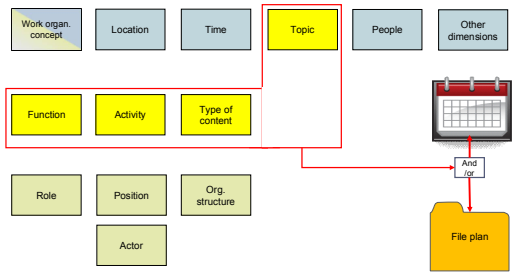

Figure 3. Links between the faceted model and records management tools.

The evaluation of documents and the disposition rules contained in the records schedules are usually put in place in relation to the creation context, subject and form [17]. Since the classification and the logging are associated, once these values are selected in the faceted plan, it will allow associating the index of classification of the organizational plan with the correspondent classification rule so as to determine the retention period and the disposition mode of a document.

The proposed faceted classification improves the description of the content of the informational object as well as the context in which it was created. By establishing semantic relations between the facet values, the faceted classification scheme supports a much larger automation process for the classification and organization of information.

4.4 Current deployment of the faceted classification model

The overall outcomes of studies discussed in Section 3 suggest that faceted classification can be a successful alternative to the hierarchical paradigm used for the organization of digital documents within organizations. Based on this, a technological implementation of the faceted classification model, Cogniva's Contextra tool, was created in order to allow organizations to develop and classify documents using the faceted classification model.

In Contextra, context and content facets appear in a menu tool bar situated on top of the screen. The user can select the facet values that describe the document using menus. The user is able to make suggestions or create new values or semantic relations between facets. A governance system allows for the approval or rejection of these suggestions.

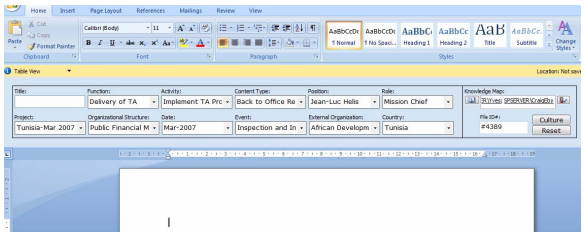

Figure 4. Implementation of Contextra in SharePoint.

The creation of the Contextra tool has made possible the performance and testing of several pilot projects that execute instances of the faceted model. This has helped greatly to verify the pertinence and exhaustiveness of the facets and the values obtained, as well as to limit the number of facets visible to the user (the results of these pilot projects will be discussed more fully in future publications).

5. Discussion and future work

The facet classification practices currently taking place inside many Canadian public organizations demonstrate the flexibility, expressiveness and simplicity of the faceted classification scheme. Set against the thematic content of digital documents (nearest to individual needs) and the context in which documents are created (inseparable from record management needs), faceted classification offers many advantages. Facet classification:

- Allows users of the classification system to overcome difficulties encountered when using hierarchical one-dimensional organizational classification schemes.
- Improves research accuracy and management of organizational information through its life-cycle.
- Creates a larger automation, organization and classification process with the intention of freeing the user from information management tasks that rarely get done well.

The use of faceted classification for the organization and management of organizational document legacy will require a novel methodology. For this methodology to work, it is necessary to combine:

1. Methods inspired by facet theory, library sciences and record management. This allows fulfilling, at the same time, long-term management of information, from both an organizational and legacy point of view, through an accurate content document analysis that draws on an administrative and operational perspective.
2. Methods for the creation and development of certain content facets. These are based on a top-down approach that allows the active participation of users in the definition of the basis and maintenance of the knowledge management system.

The goal of such an approach is to suggest a classification language that is unified, referential and stable through time, consisting of a limited number of predefined facets. This language allows for a multidimensional classification as well as a consensual and standardized set of documents at the core of the organization, performed by actors belonging to the same line of work. A standardized methodology that can instantiate this faceted model within an organizational context is currently being developed. This will be combined with the Contextra application to allow for the creation of organization-specific faceted classification systems.

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