DELIVERABLE

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AUTHOR(S)	
Name(s)	Organisation(s)
António Higgs	Instituto Superior Técnico – Universidade de Lisboa
João Cardoso	
Diogo Proença	
Ricardo Martins	
Nuno Reigota	
Ricardo Vieira	
José Borbinha	
REVIEWER(S)	
Name(s)	Organisation(s)
Kuldar Aas	National Archives of Estonia
Clive Billenness	University of Brighton

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Executive Summary

This deliverable details the Knowledge Centre Service - an aggregator of services developed under the scope of the E-ARK Project[1] and available at http://kc.dlmforum.eu. These services aim to provide a comprehensive, but simple and easily understood, set of services that allow users to understand, contribute to and validate Information Governance good practices. The Knowledge Centre is divided into: The Resources Centre and the Assessment Services.

The Resources Centre is where users can learn more about Information Governance terms, requirements and practice. It is composed of the Vocabulary Manager Service (entitled EVOC) and the Reference Requirements Management Service (entitled REQs). EVOC allows users to (1) learn more about Information Governance terms and definitions, (2) contribute to the development of the current Information Governance terminology, and (3) create their own reference vocabularies based on the existing terms and definitions of the service. REQs allows users to learn more about Information Governance requirements and practices by consulting and analysing reference documents. Additionally, REQs supports the evolution and maintenance of knowledge through a set of functionalities such as revision and feedback management.

The assessment services allow users to assess their Information Governance practices. It is composed by the MoReq Schemas Validator Service, the MoReq Assessment and the Maturity Assessment. MoReq Schemas Validator allows users to validate XML data files according to the MoReq2010 Export Schema. MoReq Assessment supports the process of assessing if record management systems are MoReq2010 compliant. Finally, Maturity Assessment allows organizations to assess their digital archiving maturity level according to the information governance maturity model defined in deliverable D7.5 of E-ARK.

This deliverable describes the goal and intent of each service and functionality as it explains how those can be used. Additionally, it briefly describes how data is stored in the services, which technology is behind them, and which future developments are planned for the next versions of the Knowledge Centre. The deliverable is an updated version of deliverable 7.3 that described the first functional prototype of the Knowledge Centre Service.

[1] http://www.eark-project.com/

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1. Introduction

Nowadays, many business and technical references emerge to guide the processes of ingesting, managing, preserving and accessing information. In terms of designing the processes, standards such as ISO15489[2] ("Records Management") or ISO30300/1[3] ("Management systems for records") already exist. For implementing tools and services references such as MoReq2010 and ISO16175[4] ("Principles and functional requirements for records in electronic office environments") are well known. For assessing organizations and tools one can refer to ISO16363[5] ("Audit and certification of trustworthy digital repositories") or ISO18128[6] ("Risk assessment for records processes and systems"). Also, it is important to note that the examples above are international references. As stated above, due to lack of standardization, several countries have also been defining national practices and procedures that should not be discarded and constitute relevant knowledge to the field. Despite the lack of standardization in such processes, archival management and more broadly Information Governance (IG) has been the subject of extensive research and practice in the past years.

The E-ARK project contributed to the solution to harmonize currently fragmented archival approaches for ingest, preservation and re-use through the definition of the E-ARK SIP, AIP and DIP. However, the proliferation of standards and references together with the recognition that problems should be analysed from different perspectives, motivations and communities has raised the need for a knowledge system that allows stakeholders to get a consolidated view of existing knowledge. The E-ARK Knowledge Centre is the representation of such a system. This deliverable describes the Knowledge Centre. Chapter 2 starts by introducing the idealized architecture of the Knowledge Centre and the services that characterize and compose the system. Chapter 3 describes the Vocabulary Manager (EVOC), and the Reference Requirement Manager (REQs) respectively in Chapter 3.1, and 3.2. The chapter concludes by describing how data is stored in both EVOC and REQs (Chapter 3.3) services. Chapter 4 describes the assessment services namely the MoReq Export Validator Service (Chapter 4.1), the MoReq Assessment (Chapter 4.2) and the Maturity Assessment (Chapter 4.3). Chapter 5 describes the changes from the prototype version (detailed in deliverable 7.3) and presents the sustainability plans for the Knowledge Centre that will be carried by the DLM-Forum after the end of the project. Finally, Appendix A briefly describes the technology behind the developed services.

Note that the E-ARK Knowledge Centre intends to be a "living system", i.e. a flexible system that can only reach its full potential with a strong adoption from the Information Governance community. Furthermore, the services described in this deliverable should be seen as proof of concept, i.e. they demonstrate the utility and value of the services but they should evolve according to community demand and needs. For example, the MoReq Export Validator Service and the MoReq Assessment use MoReq as reference but they are, in abstract, services that validate schemas and supports the assessment of system compliance through test cases. The same flexibility applies to all services provided in the knowledge centre.

[2] http://www.iso.org/iso/catalogue_detail?csnumber=31908
[3] http://www.iso.org/iso/catalogue_detail?csnumber=53732
[4] http://www.iso.org/iso/catalogue_detail.htm?csnumber=55790
[5] http://www.iso.org/iso/catalogue_detail.htm?csnumber=56510
[6] http://www.iso.org/iso/catalogue_detail.htm?csnumber=61521

2. Knowledge Centre Service

The Knowledge Centre (or KC) is an aggregator of services developed under the scope of the E-ARK Project[7]. These services aim to provide a comprehensive, but simple and easily understood, set of requirements for Information Governance. These requirements are elicited from existing reference documents. The KC infrastructure is flexible and extensible, meaning that new services can be easily added. For more details about immediate plans please check Chapter 5. Conclusions and Future Work. The main goals of the E-ARK Knowledge Centre are to provide organizations services to:

- Support the definition of Information Governance practices;
- Contribute to the existing body of knowledge of Information Governance;
- Assess existing Information Governance practices;
- Lastly, provide an access hub for Information Governance products developed under the E-ARK Project scope.

The Knowledge Centre can be used in many ways, including:

By businesses:

- As a reference source for learning more about Information Governance;
- As a guide to the audit of existing Information Governance practices; and
- As a guide to improve existing Information Governance practices.

By academia:

- As a reference glossary for Information Governance terms and their meanings;
- As a teaching resource for academic institutions; and
- To contribute to the existing body of knowledge of Information Governance.

By industry:

- To guide the development of Information Governance tools and techniques; and
- As a reference source for testing and compliance of existing Information Governance tools and techniques;

To achieve the aforementioned goals, the Knowledge Centre services are categorised into the:

- **Resources Centre** – containing services to store, view and manage vocabulary, requirements and requirement based documents.
- **Assessment Services** – containing services for assessment and validation of existing Information Governance practices and tools.
- **E-ARK General Model** – a product of the E-ARK project, containing an interactive general model and general reference for the tools and specification developed within E-ARK.

Figure 1 presents an idealized architecture for the KC. The services are supported by a Data Store component, which includes the databases and necessary access management to keep all the data of the services safe and ready for usage.

[7] http://www.eark-project.eu/

Finally, a View Manager acts as an entrance door to all the services, providing a gateway user interface and API (programming interface) to access them.

A web interface was developed to serve as an aggregator for all the Knowledge Centre services. This is the user interface part of the View Manager component represented in **Figure 1** that is currently available at http://kc.dlmforum.eu and is illustrated in **Figure 2**. This user interface represents the Home page of the Knowledge Centre. The webpage shortly describes each existing service and the benefits that users can get from them.

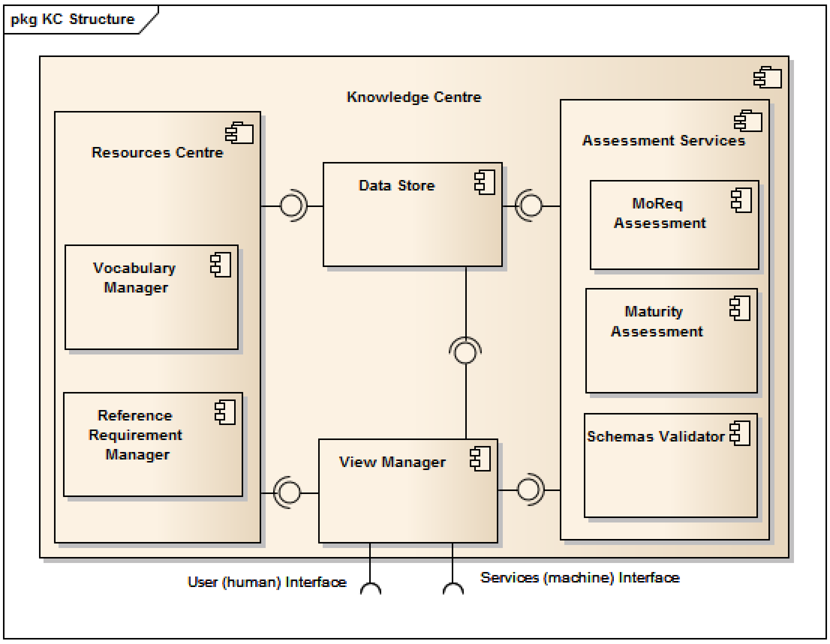


Figure 1. The E-ARK Knowledge Centre Architecture Model.

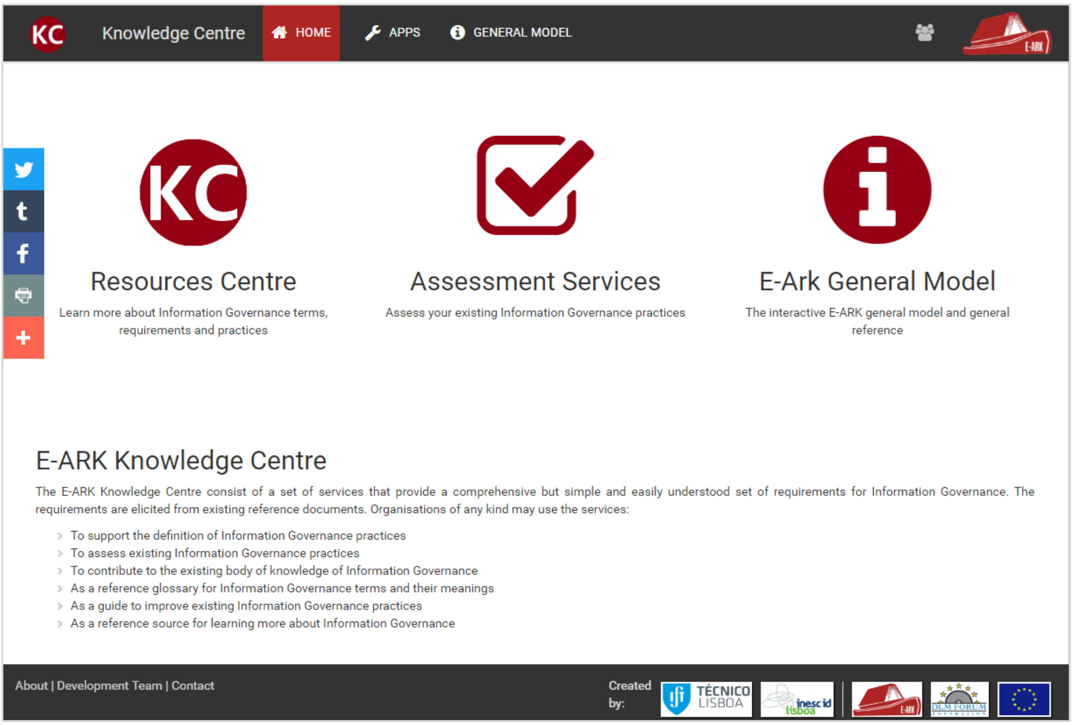


Figure 2. The Knowledge Centre Services Aggregator home page.

The Knowledge Centre interface also allows users to register and authenticate using a DLM Forum account, to be able to access further functionalities of the services. This central authentication is available for most of the main services, with the notable exception being the Vocabulary Manager (EVOC), which was developed in the earlier stages of the project with its own authentication database. Migration to the central authentication is planned in future work.

3. Resources Centre

The Resource Centre (**Figure 3**) is the component of the Knowledge Centre containing services to store, view and manage vocabularies, requirements and requirement based documents. Two services were developed: The Vocabulary Manager, to view and manage vocabularies, and the Reference Requirement Manager to view and edit reference requirements documents. The following sub-sections describe the concepts and functionalities of EVOC and REQs.

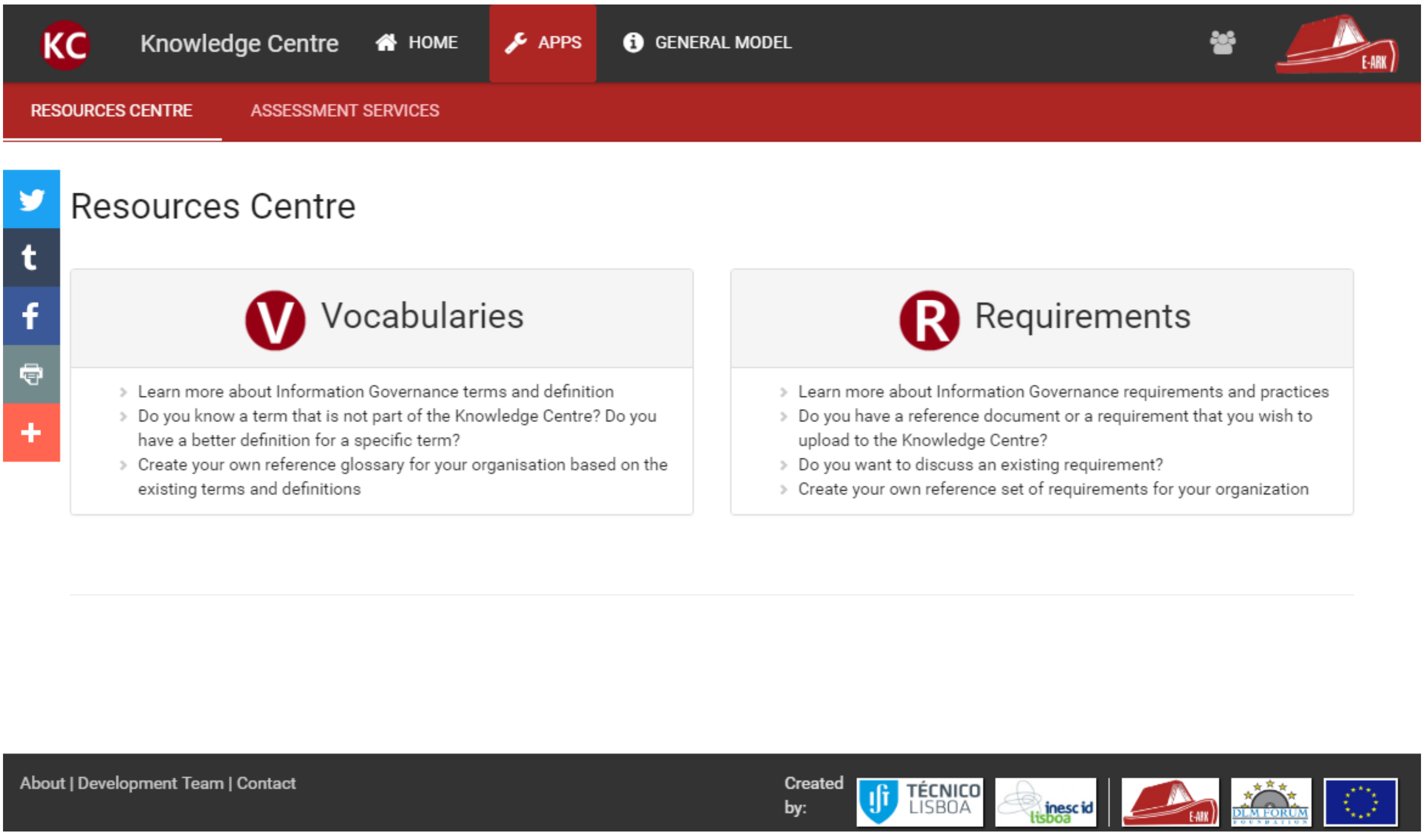


Figure 3. Resources Centre Page

3.1. Vocabulary Manager (EVOC)

EVOC is a service that allows users to create, manage and view vocabularies. Any type of vocabulary can be created in EVOC as the service allows the definition of different **Vocabulary Types**, i.e., vocabularies characterized by different metadata (Ex. glossaries or acronyms lists). Vocabularies can also have terms in different languages. A vocabulary node is the generic name given to each entry of the vocabulary. A **Vocabulary Type** defines the specific name for the nodes of that type, and the metadata fields that compose each node. A **Node Attribute Type** represents the metadata fields that can be used in one or more **Vocabulary Types**. (Ex. title or definition) They define the name of each metadata field, the type of field (e.g. text area, checkbox, etc.) and the mandatory status of the field (defines if the field is mandatory or not). Using the mentioned concepts a User can create a **Vocabulary Type** entitled “Glossary” with nodes named “Terms”, and with “Name”, “Definition” and “Language” as fields defined by **Node Attribute Types**. Additionally, **Vocabularies** are organized by **Spaces** and **Groups**. A **Space** represents a context and it can be, for example, an organization, a project, a person, etc. **Spaces** can be divided into **Groups** for better organization of the existing vocabularies.

For example, the E-ARK Glossaries are under the "E-ARK" **Space** and divided into two **Groups:**

- "Deliverables", where all vocabularies from the deliverables are inserted, and
- "Others", where reference vocabularies that were used in the project are inserted (can be seen in Figure 13).

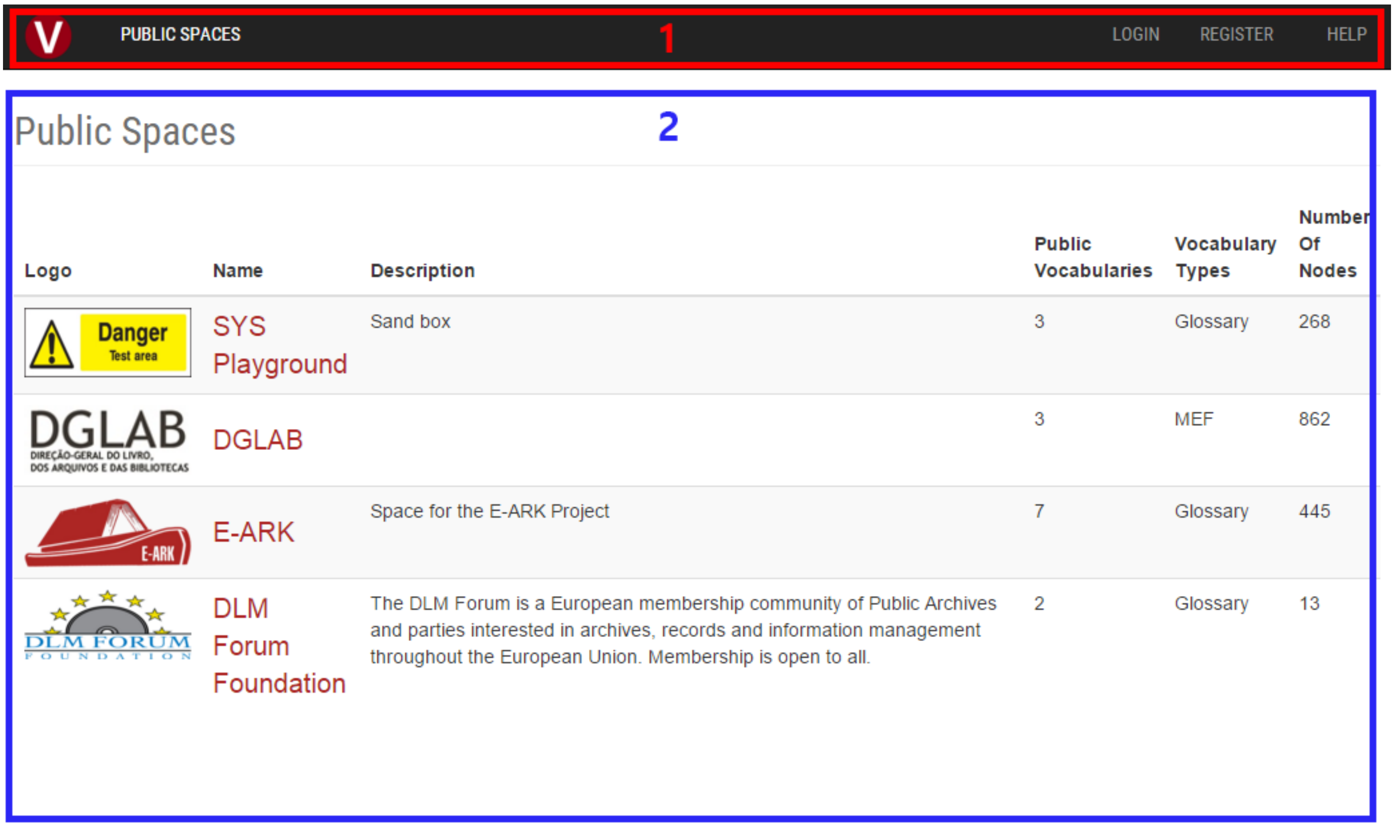


Figure 4. EVOC Main Layout.

The service is composed by a set of views: Public Spaces View, Vocabulary Management View, Configuration View, and Users' View. Each view allows access to a set of functionalities. Users have access to different views depending on their role (the roles are further described in Chapter 3.1.1). The main layout of the application is composed of two main sections (Figure 4):

1. The **top toolbar**, common across all the application, providing easy access to its features and views available to the user (which depend on the associated role); and
2. The v**iew display**, where the selected view is presented.

The **top toolbar** can be used to access the various features and views of the application (**Figure 5**):

1. The EVOC logo that allows the user to instantly go to the Public Spaces View;

2 to 5. The various views of the application, availability of which depends on the current user's role.

6. The username, when a user is logged in. Can be used to access the User Settings and Logout (**Figure 6**).
7. Help button, allowing the users to send an email to the EVOC support team.

Figure 5. EVOC Top Toolbar

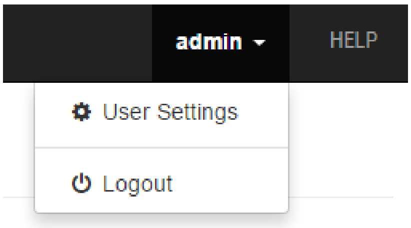


Figure 6. EVOC User Options Menu.

3.1.1. User Roles and Login

There are currently three user roles available in the EVOC application, each with access to different views and their functionalities:

- **Public** – unregistered users who have only access to Public Spaces View and consequently can only consult the vocabularies that are publicly available (see Chapter 3.1.4 Public Spaces);
- **Expert** – registered users who have access to the Public Spaces and Vocabulary Management Views. The latter allows the user to manage their (public and private) vocabularies. Additionally, Expert Users can create new Spaces, Groups and Vocabularies (see Chapter 3.1.5 Vocabulary Management); and
- **Admin** – registered users with administrator privileges who have access to all views including the Configuration and Users Views. The former allows the definition and management of Vocabulary Types. The latter allows to define and management User Accounts (see Chapter 3.1.3 Configuration and 3.1.2 User). The administrators are the maintenance team of EVOC. This is the IST development team for the E-ARK project and, when the project concludes, it will pass to DLM Forum administration.

As mentioned before, EVOC operates currently on a different user management system that the rest of the Knowledge Centre (with plans to change that in the near future). As such, when no user is logged in, the top toolbar presents two other options (**Figure 7**):

1. Login button, granting access login menu (**Figure 8**). Here it's also possible to retrieve lost passwords.
2. Register button, granting access to the registration menu (**Figure 9**).

User logout is available by clicking the username in the toolbar (6 from **Figure 5**) and selecting 'Logout' (**Figure 6**).

Figure 7. EVOC Top Toolbar without a user logged.

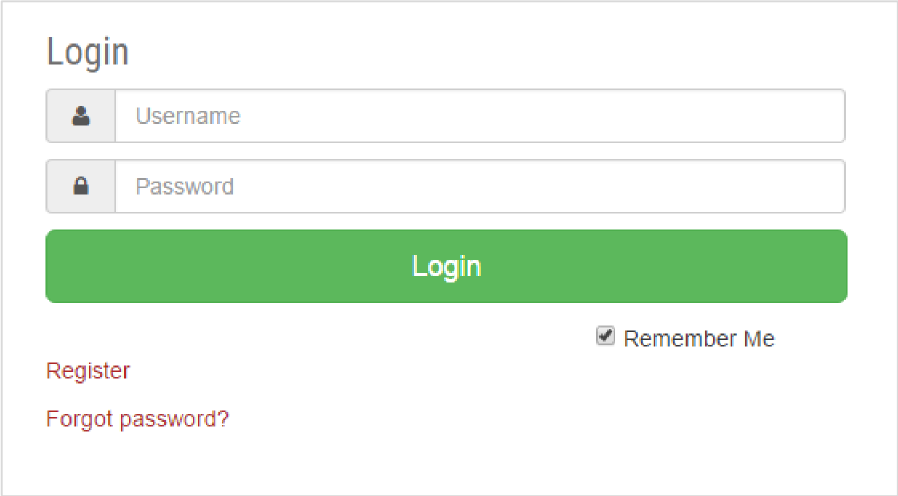


Figure 8. EVOC User Login Menu.

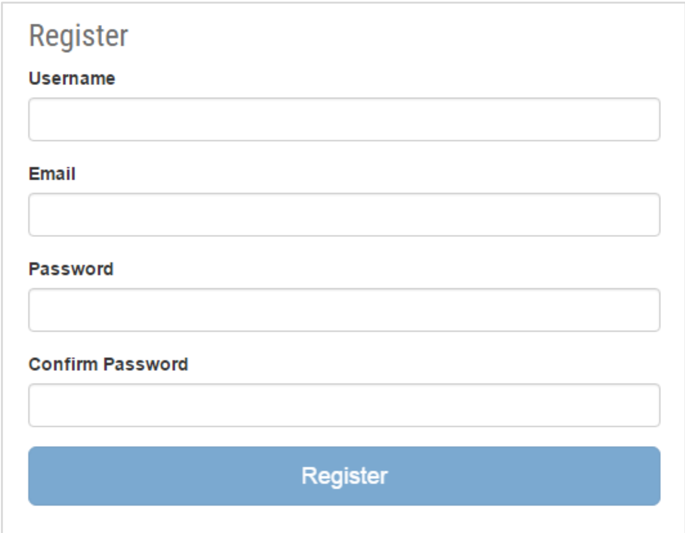


Figure 9. EVOC User Registration Menu.

3.1.2. User Management

The Users View is available only to 'Admin' Users and allows access to the User Management menu (**Figure 10**):

1. List of registered **Users** in EVOC. The list can be order by 'Username', 'Roles', or 'Email'. **Users** can be deleted using the cross in the 'Delete' column. Users can be validated using the letter button in the 'Validate' column. Validation sends a User a notification email with the username and instructions on how to recover the password if needed;
2. It allows the definition of a new **User** by defining its 'username', 'email', and 'Role' (for more information on user roles please refer to Chapter 3.1.1 User Roles and Login). If a **User** is selected in 1, then you can use this menu to edit the selected **User**. The 'Clear' button will deselect the current selected **User**. Please also note that the 'Update' button will change to 'Add' if no User is selected in 1.

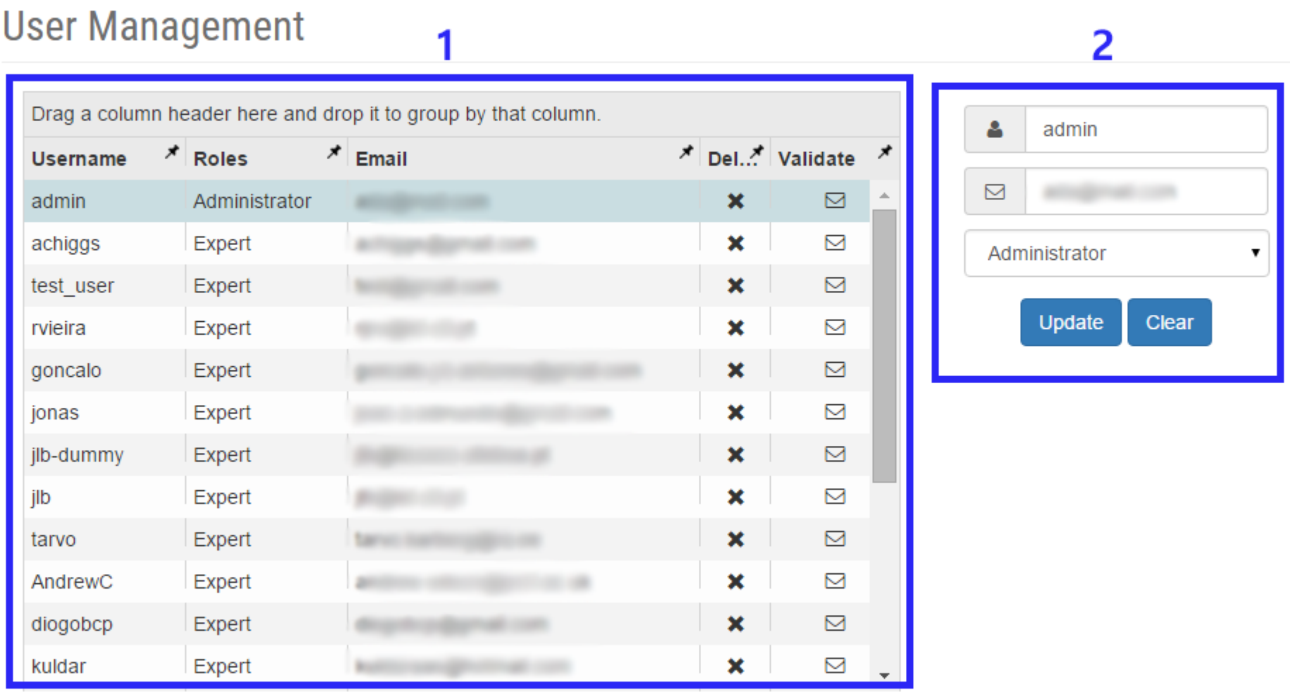


Figure 10. EVOC User Management menu.

Users may also be grouped by a common attribute for convenience, which is achieved by dragging a column header to the designated area in the top of the table. For instance, this allows grouping the users by 'Role' (**Figure 11**) to easily find out which users have administrator permissions.

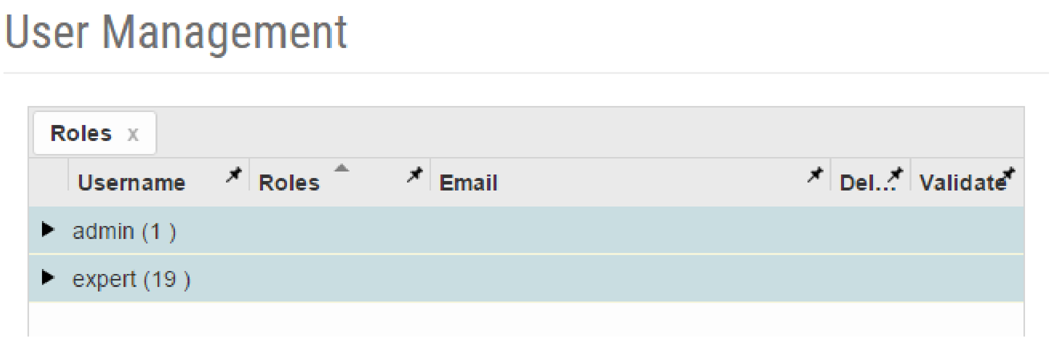


Figure 11. EVOC User grouping.

3.1.3. Configuration View

As described in Chapter 3.1 Vocabulary Manager (EVOC), **Vocabularies** in EVOC can have different **Vocabulary Types**, i.e., vocabularies characterized by different metadata. A vocabulary node is the generic name given to each entry of the vocabulary. A **Vocabulary Type** defines the specific name for the nodes of that type, and the metadata fields that compose each node. A **Node Attribute Type** represents the metadata fields that can be used in one or more **Vocabulary**

Types. They define the name of each metadata field, the type of field (e.g. text area, checkbox, etc.) and the mandatory status of the field (defines if the field is mandatory or not).

The Configuration View is available only to 'Admin' Users and allows the definition of **Vocabulary Types** through the Vocabularies External Setup menu[8] (**Figure 12**):

1. It allows the definition of a new **Node Attribute Type** by defining its 'Name', 'Type', and whether the node attribute type is mandatory or not ('Required'). If a **Node Attribute Type** is selected in 2, then you can use this menu to edit the selected **Node Attribute Type**. The 'Clear' button will deselect the currently selected **Node Attribute Type**;
2. List of defined **Node Attribute Types**. The list can be order by 'Name', 'Type', or 'Required'. **Node Attributes Types** can be deleted using the cross in the last column of the list;
3. Similarly, to 1, it allows the definition of a new **Vocabulary Type** by defining its 'Name', 'Node Name' and 'Node Attribute Types'. **Node Attribute Types** are selected by dragging from menu 2 to 3. If a **Vocabulary Type** is selected in 4, then you can use this menu to edit the selected **Vocabulary Type** (as illustrated in **Figure 12**). The "Clear" button will deselect the current selected Vocabulary Type;
4. Similarly, to 2, it presents the list of defined **Vocabulary Types**. The list can be order by 'Name', or 'Node Name'. **Vocabulary Type**s can be deleted using the cross in the last column of the list.

Please note that menu 3 also contains a 'Has Concepts?' option that if selected allows multiple Terms to be grouped into a Concept. This functionally allows admin users to define that multiple terms are used to describe the same concept.

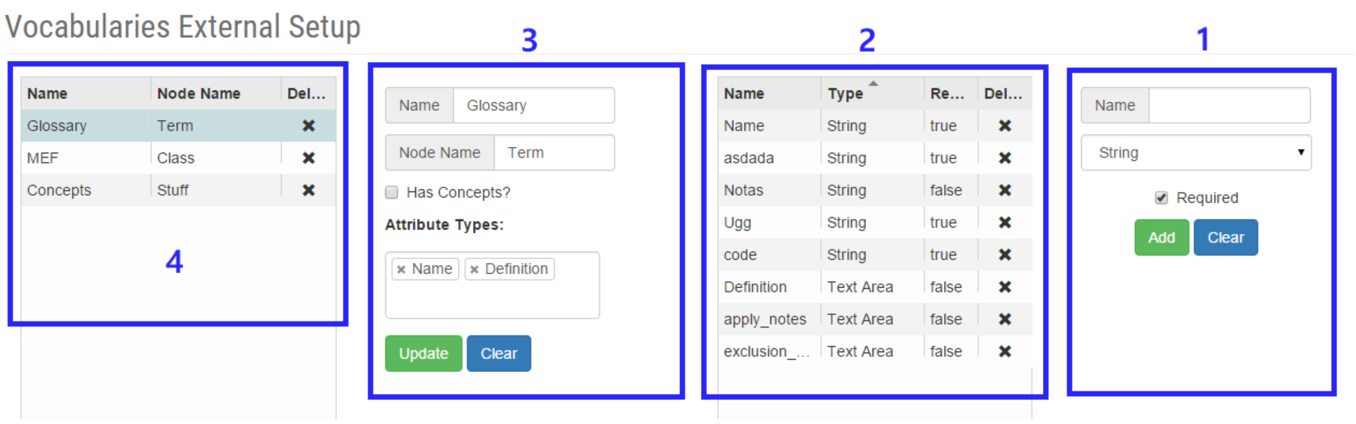


Figure 12. EVOC Configuration View - Vocabularies External Setup.

[8] For understandability and due to the dependencies between concepts, we describe the definition of a **Vocabulary Type** from the **Node Attribute Type** to the **Vocabulary Type** itself.

3.1.4. Public Spaces View

The Public Spaces view (2 from **Figure 5**) is available to all users. It presents all public vocabularies available in EVOC. The view starts by listing all the spaces with public vocabularies (2 from **Figure 4**), detailing their logo, name, description, number of public vocabularies, the vocabulary type and the number of vocabularies nodes in that space.

Clicking on a space name will open its contents view (**Figure 13**). On the left side panel of this view (2 from **Figure 13**) is displayed the list of public vocabularies of the selected space, which may be organized by groups. These are indicated by icons:

-  : represents a Group;
-  : represents a Public Vocabulary.

Figure 13 show the view presented when a vocabulary group is selected, divided in parts:

1. **Public Space** name, logo and group name;
2. The list of **Public Vocabularies** and their **Groups**;
3. The list of all **Terms** of the **Vocabularies** in the selected **Group**;
4. Allows the user to filter the list of all **Terms** (3) by **Vocabulary Type**. Please note that this option exists because a **Group** can contain different **Vocabulary Types**;
5. Allows the user to search a selected **Vocabulary Node** for a specific text.

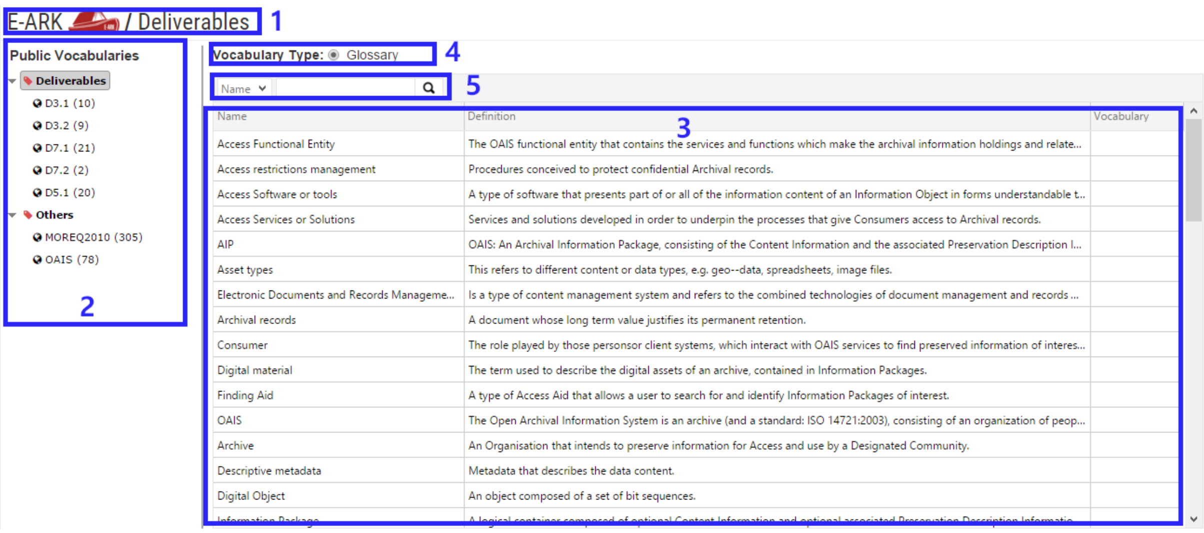


Figure 13. EVOC Public Space when a Group is selected.

On the other hand, when a specific **Vocabulary** is selected, other options are available (**Figure 14**):

1. **Public Space** name, logo and vocabulary name;
2. The list of **Terms** in the selected **Vocabulary**;
3. Allows the user to hide or show **Vocabulary Nodes** from the **Terms** list (2).

4. Allows the user to filter the list of **Terms** (2) based on specific text. Different text can be specified for different **Vocabulary Nodes**.
5. **Detailed View** and **Export**. By default, when a **Vocabulary** is selected, the list of **Terms** (2) is displayed in a compact format with only one line per term and hiding overflowing text in each cell. The '**Detailed View**' button expands each cell to show all the text of each field. The '**Export**' button exports a vocabulary to XSLX format (Excel file).

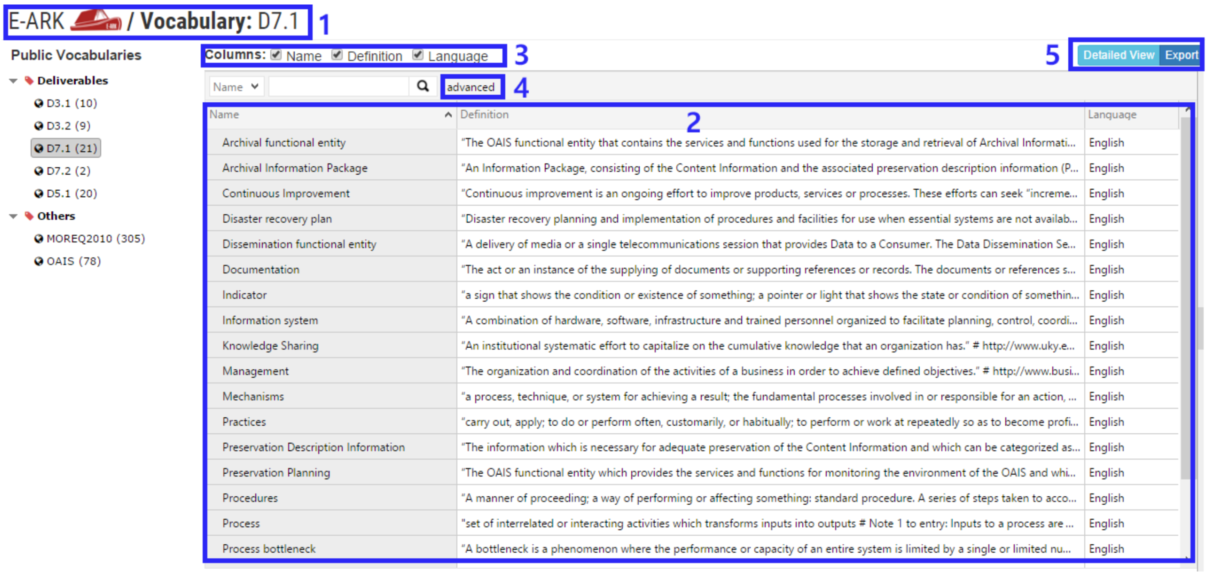


Figure 14. EVOC Public Space when a Vocabulary is selected.

Any term in the **Terms** list of a **Vocabulary** can be selected, which will prompt the appearance of a right panel with further details about that term (**Figure 15**). This panel can be collapsed by pressing the arrow button (1 of **Figure 15**). Also note that, the URL of the EVOC application changes depending on the selected vocabulary and term, allowing the sharing of links that point directly to a term or vocabulary. These URLs persist as long has the vocabulary\terms exist.

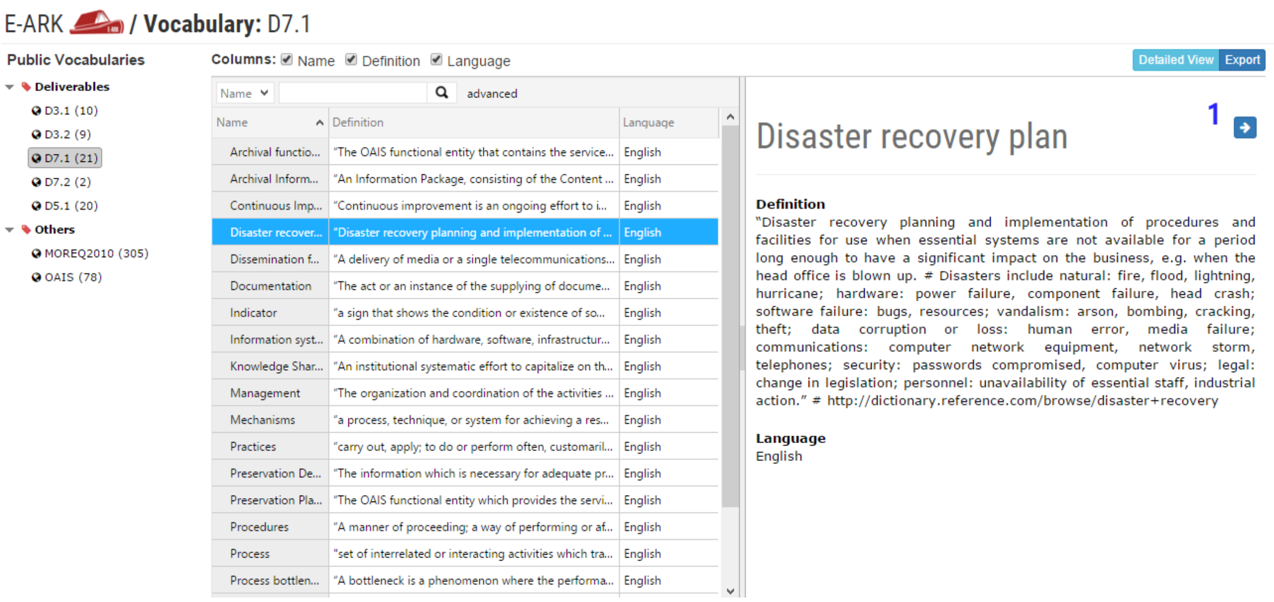


Figure 15. EVOC Public Space when a Term is selected.

3.1.5. Vocabulary Management View

Registered users in the EVOC system (**Administrators** or **Experts**) have access to the **Vocabulary Management View**, where they can explore and edit vocabularies. Note that users only have access to vocabularies they have created, or those which the owner (a registered user) of the vocabulary has granted them access.

The layout of the **Vocabulary Management View** is divided in two main areas (**Figure 16**):

1. The left panel, listing all the **Spaces**, **Groups** and **Vocabularies** available to the user, as well as the buttons to manage them;
2. The right panel, showing all the **Terms** of a **Vocabulary**, **Group,** or **Space** depending on which is selected in 1, as well as the buttons to manage them.

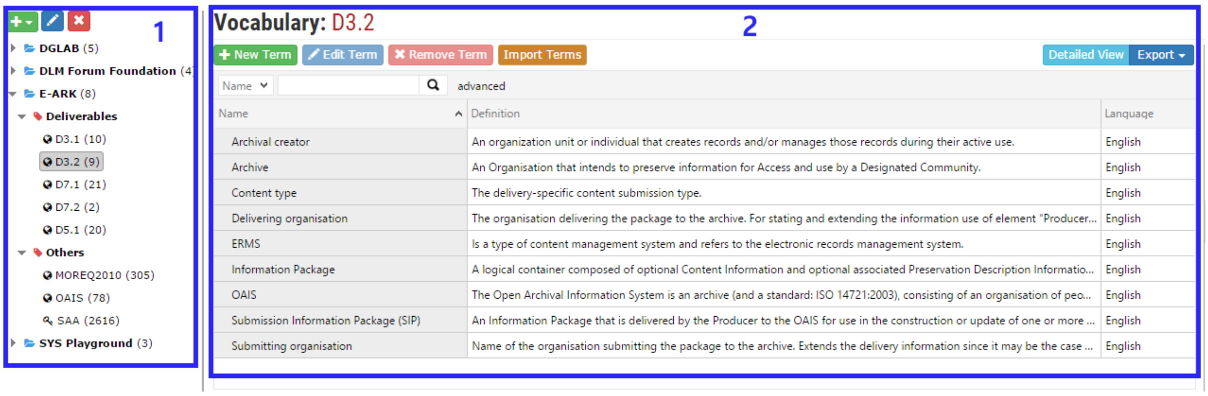


Figure 16. EVOC Vocabulary Management View layout.

A user can manage **Spaces**, **Vocabularies** and **Groups** in his Vocabulary Management view, through the tool buttons on the top side of the left panel of the screen (**Figure 17**):

1. The "Create" menu (**Figure 18**), with options to create new **Spaces** (**Figure 19**), **Groups** (**Figure 20**) and **Vocabularies** (**Figure 21**);
2. The "Edit" button, available when a **Space**, **Vocabulary** or **Group** is selected. allows the editing of the selected item proprieties;
3. The "Delete" button, available when a **Space, Vocabulary** or **Group** is selected, deletes the selected item.

Figure 17. Space, Group and Vocabulary management buttons.

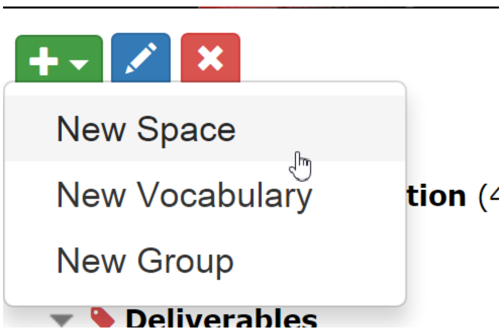


Figure 18. Space, Group and Vocabulary create menu.

To create a new **Space**, the following metadata needs to be defined (**Figure 19**): 'Name' (required), 'Description', 'Users' who will have access to the space, the confidentiality of the **Space** ('Public' or Private), and an image to serve as the **Space** 'Logo'.

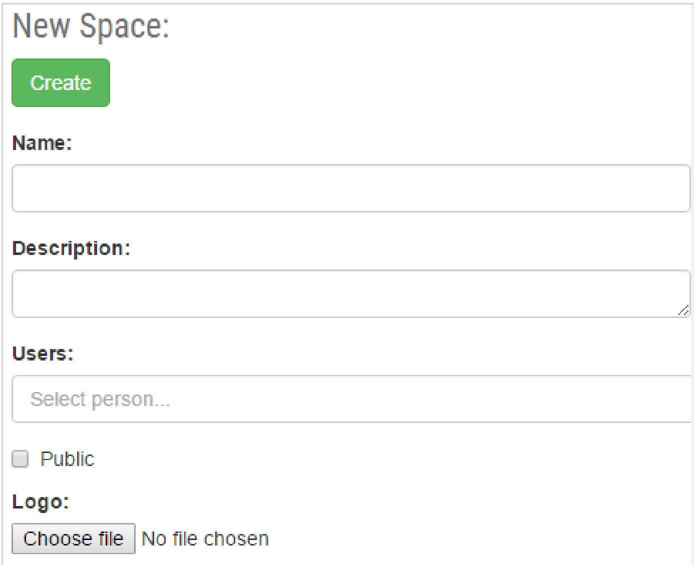


Figure 19. Form to create a new Space.

To create a new **Group** (**Figure 20**), users need to define a name, the **Space** of the **Group** being created, and, if relevant, another **Parent Group**. If a parent group is defined, the new Group will be classified under the parent group. This functionality allows users to define a hierarchy of groups if they wish so.

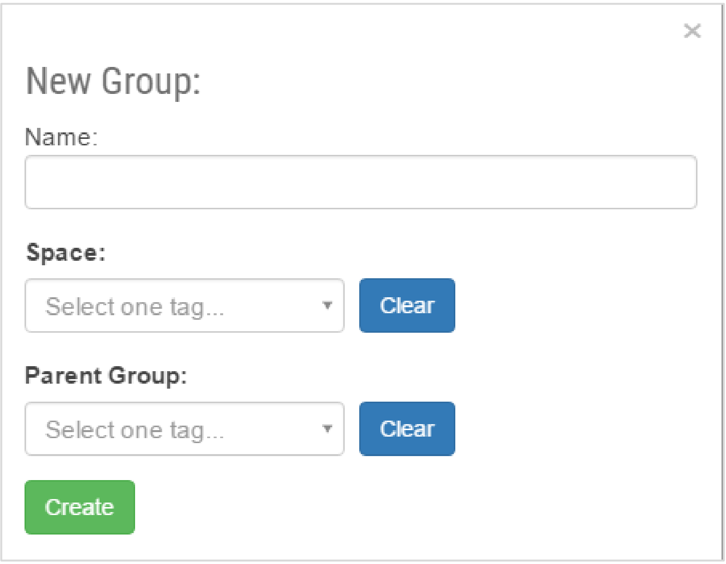


Figure 20. Form to create a new Group.

To create a new Vocabulary, EVOC allows the following metadata (**Figure 21**):

- *Acronym* (required), a small, unique name that will serve to identify the **Vocabulary** through EVOC;
- *Name* (required) of the **Vocabulary**;
- The confidentiality of the **Vocabulary** – *Public* or *Private* (not public);
- *Description* of the **Vocabulary;**
- *External References* of the **Vocabulary**. To be used when the Vocabulary is based on a website, document, or other reference source. *External References* are shown next to the **Vocabulary** name. Multiple *External References* should be separated by a new line (EVOC reads each line as a reference). If Users wish to provide an URL to the *External Reference* the following syntax can be used <name>___<hyperlink> where <name> should be the name of the *External Reference*, '___' should be three underscores in succession, and <hyperlink> should be the URL you wish Users get redirected when clicking the *External Reference*. **Figure 22** is an example of a **Vocabulary** where an *External Reference* with an URL was defined;
- The **Vocabulary** *Type* (required) to be chosen from the existing **Vocabulary Types** defined in the Configuration View (see Chapter 3.1.3 Configuration View for more details);
- The *Space* (required) and the *Parent Group* of the **Vocabulary** being created; and
- The *Import Vocabulary.* Instead of creating a **Vocabulary** from scratch, Users can import a vocabulary from an Excel spreadsheet. In order to do so, the columns of the spreadsheet need to match the **Node Attribute Types** of the **Vocabulary Type** selected, and the language of the imported terms needs to be selected (all imported terms will be marked as from that language, but this can be edited once the vocabulary is imported). As an example: for the "Glossary" **Vocabulary Type** (seen in **Figure 12**), the spreadsheet would need 2 columns with the first cell of one being named "Name" and of the other "Definition", the **Node Attribute Types** of "Glossary".

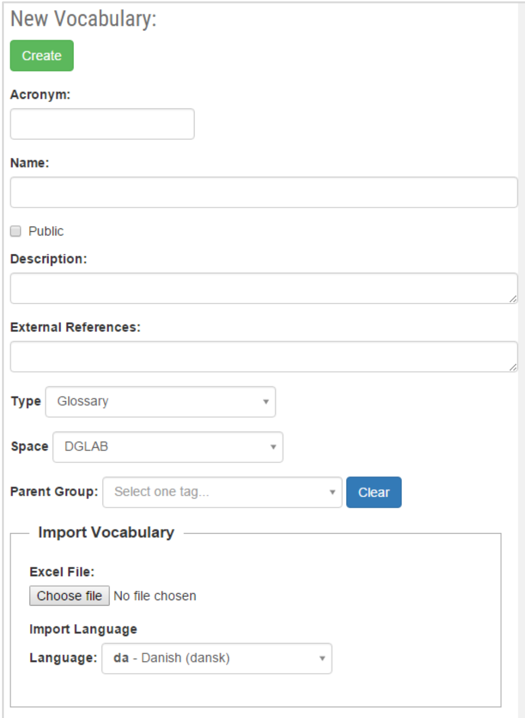


Figure 21. Form to create a new Space.

When a **Vocabulary** is selected in left panel of the Vocabulary Management View, all the **Terms** of that **Vocabulary** are shown in the right panel. The viewing options are similar to those of the **Public Spaces View** (see Chapter 3.1.4 Public Spaces View for more information). **Figure 22** presents the general layout of the right panel when a vocabulary is loaded. Please note:

1. The buttons to manage the **Terms** in a **Vocabulary**;
2. The **Terms** list. In the Vocabulary Management View selecting a term will give access to different options in the management controls (1 in **Figure 22**); and
3. The Export options (**Figure 23**). Apart from the export functionality already described in the Public Spaces View (Chapter 3.1.4 Public Spaces View), the Vocabulary Management View allows Users to export the Excel Template, i.e. the spreadsheet already matching the Vocabulary Nodes of the Vocabulary Type being edited. This functionality allows to have a spreadsheet file that can be used for future imports.

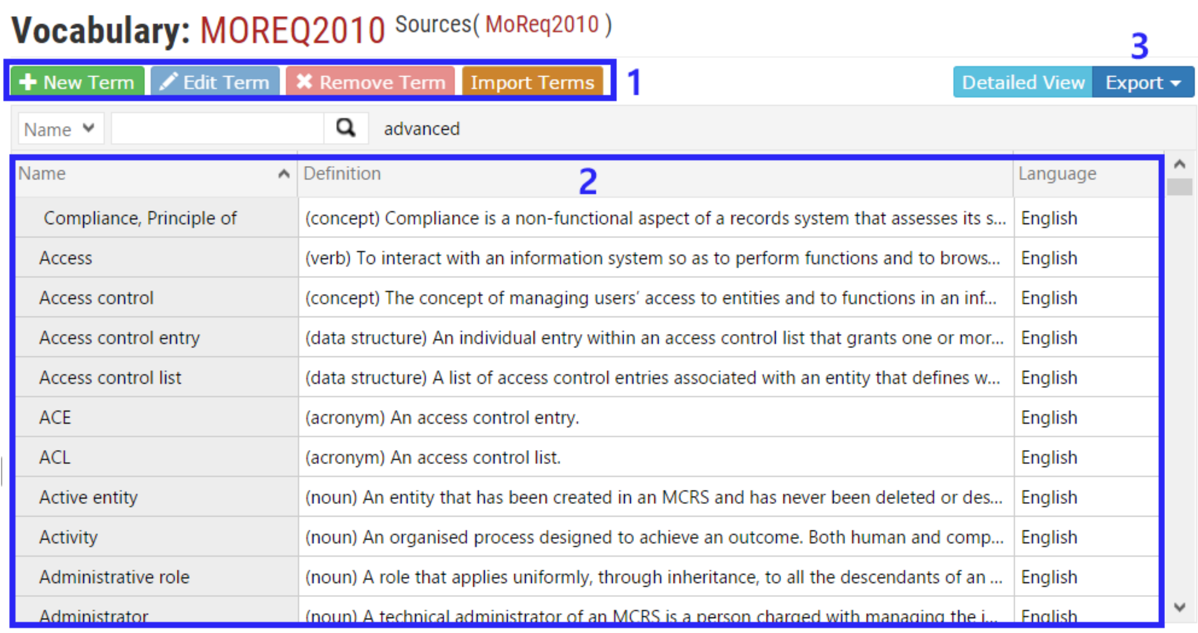


Figure 22. EVOC Vocabulary Management View right panel layout.

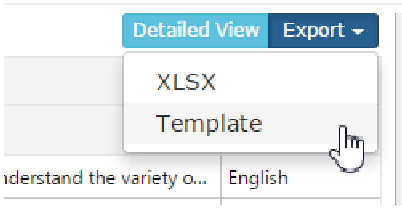


Figure 23. EVOC Vocabulary Management View Export options.

There are four buttons to manage terms in a vocabulary (**Figure 24**):

1. The 'New Term' button gives access to the new Term (node) form (**Figure 25**) to create a new **Term**. The required metadata to create a Term will vary depending on the **Vocabulary Type**.
2. 'Edit Term' button, available when a **Term** is selected.
3. 'Remove Term' button, available when a **Term** is selected. If the **Term** is imported from another **Vocabulary,** then the **Term** is only removed in the selected **Vocabulary**.
4. 'Import Terms' button that allows the import of **Terms** from other **Vocabularies** (1 from **Figure 26**).

Figure 24. Term Management buttons.

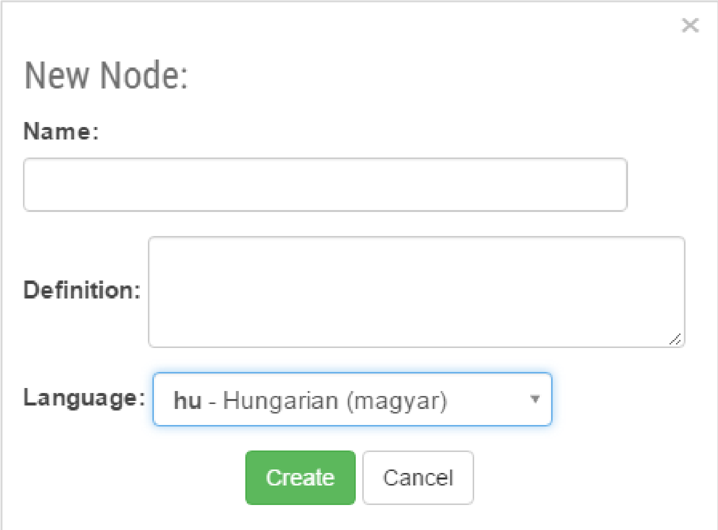


Figure 25. Form to create a new Term.

Selecting the 'Import Terms' button will open the import terms panel (**Figure 26**). **Figure 27** shows a close-up of the controls available in this panel, which are:

1. The 'Copy' button, to copy the selected **Term** from another **Vocabulary**;
2. The 'Copy All' button, to copy all **Terms** from another **Vocabulary**;
3. The 'Source Vocabulary' combo box, where the **Vocabulary** to import terms from is selected. It includes all the Vocabularies of the current space;
4. 'Hide' button, to hide the import terms panel and return to the default right panel layout (**Figure 22**).

Please note, that you can only import terms from **Vocabularies** in the same **Space** and with the same **Vocabulary Type**.

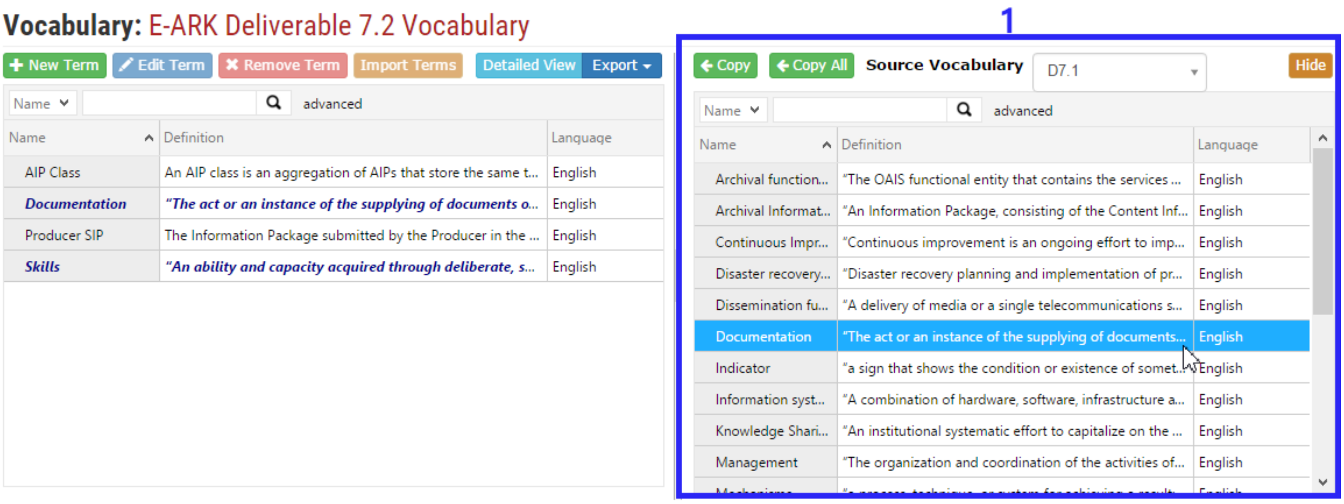
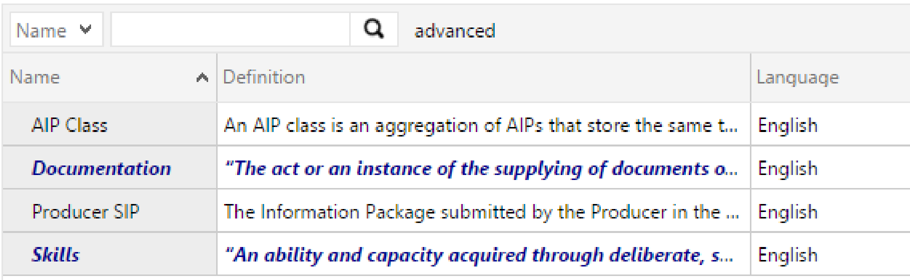


Figure 26. Import terms layout.

Figure 27. Import terms management buttons.

When a **Vocabulary** has an imported **Term**, that **Term** will appear in blue text on the **Terms** list (**Figure 28**). Editing an imported **Term** will unlink it from the original **Vocabulary's Term**, making them effectively two separate terms. However, changes on the origin **Vocabulary** will be reflected in all the **Vocabularies** that **Term** is imported to. Similarly, deleting an imported **Term** from a **Vocabulary** will have no effect on the original **Vocabulary's Term**. However, deleting a **Term** in the origin **Vocabulary** will remove it from all the **Vocabularies** that term is imported to.



Name	Definition	Language
AIP Class	An AIP class is an aggregation of AIPs that store the same t...	English
Documentation	*"The act or an instance of the supplying of documents o...*	English
Producer SIP	The Information Package submitted by the Producer in the ...	English
Skills	*"An ability and capacity acquired through deliberate, s...*	English

Figure 28. Terms representations.

3.2. Reference Requirement Manager (REQs)

The Reference Requirement Manager (or REQs) is a service that allow **Users** to view and manage reference documents – in this case Information Governance reference documents. The service intends to allow an easy and understandable navigation to the reference documents. Additionally, the service will allow the identification of requirements and the documents so that Users can manage and relate Information Governance requirements. Users will also be able to comment and participate in future revisions of the documents. The final goal is that users can consult and contribute to the body of knowledge of Information Governance.

3.2.1. User Roles

There are four user roles available in the REQs service, limiting functions and accessible documents. From the very restricted Public to the all-access DLM Reviewer, the roles and their permissions are the following:

- **Public** – unregistered users who can only view and navigate public documents.
- **User** – users registered in the Knowledge Centre, who can view, navigate and comment public documents.
- **DLM User** – registered users who can view, navigate and comment public and private documents.
- **DLM Reviewer** – registered users who, besides the functionalities of the DLM User, can also review comments and edit documents.

The different permissions of each user role affect the functionalities and interface of the application, as will be seen in the next sections.

3.2.2. Main layout and Top Toolbar

When a user first opens REQs no document is original selected (**Figure 29**). They can then use the top search bar to search and select a document in the database (**Figure 30**). **Figure 31** presents the main layout of the REQs application with a document selected, which can be divided in the following parts:

1. The top toolbar, with important quick-to-access functions.
2. The document navigation panel, to navigate inside documents'.
3. The content panel, to view, edit and comment document' sections
4. The PDF view panel, to view the current document in PDF format.

The size of the panels can be adjusted by dragging the separation bars between each of them. More details about the top toolbar follow in this section, while details about the navigation panel are available in section 3.2.3, about the document content panel in 3.2.4, 3.2.5 and 3.2.6, and about the PDF view panel in 3.2.7.

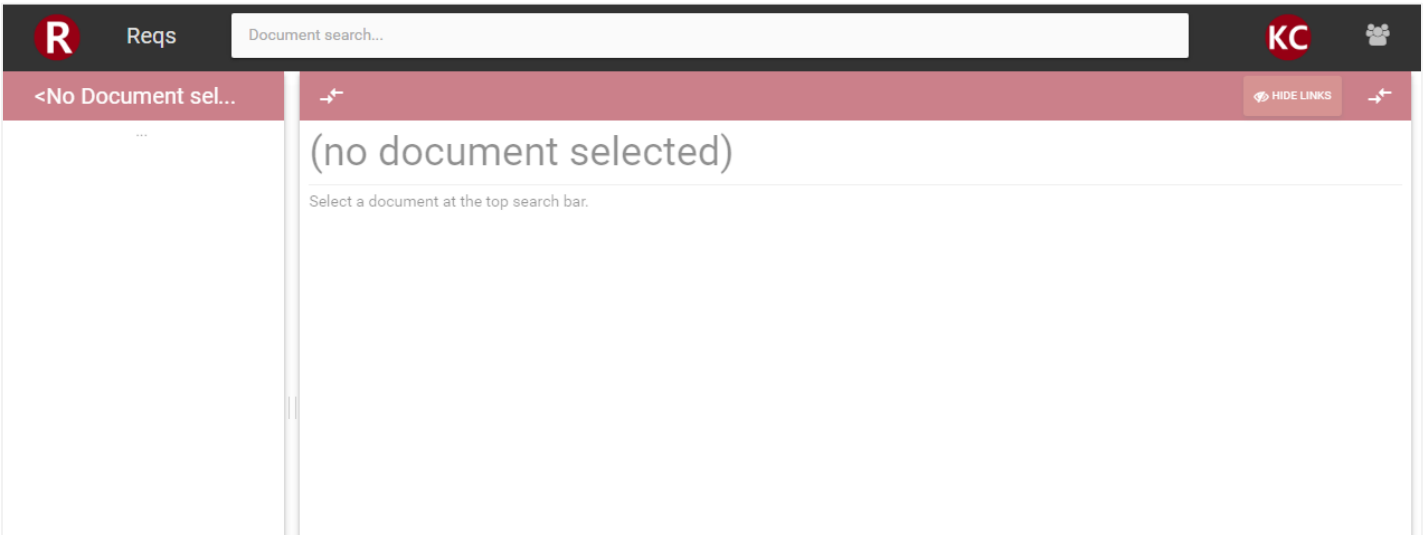


Figure 29. REQs No document selected.

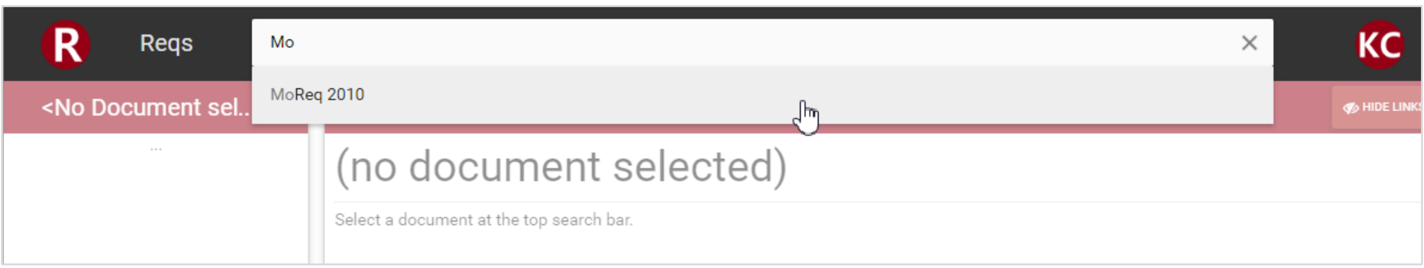


Figure 30. REQs Document search.

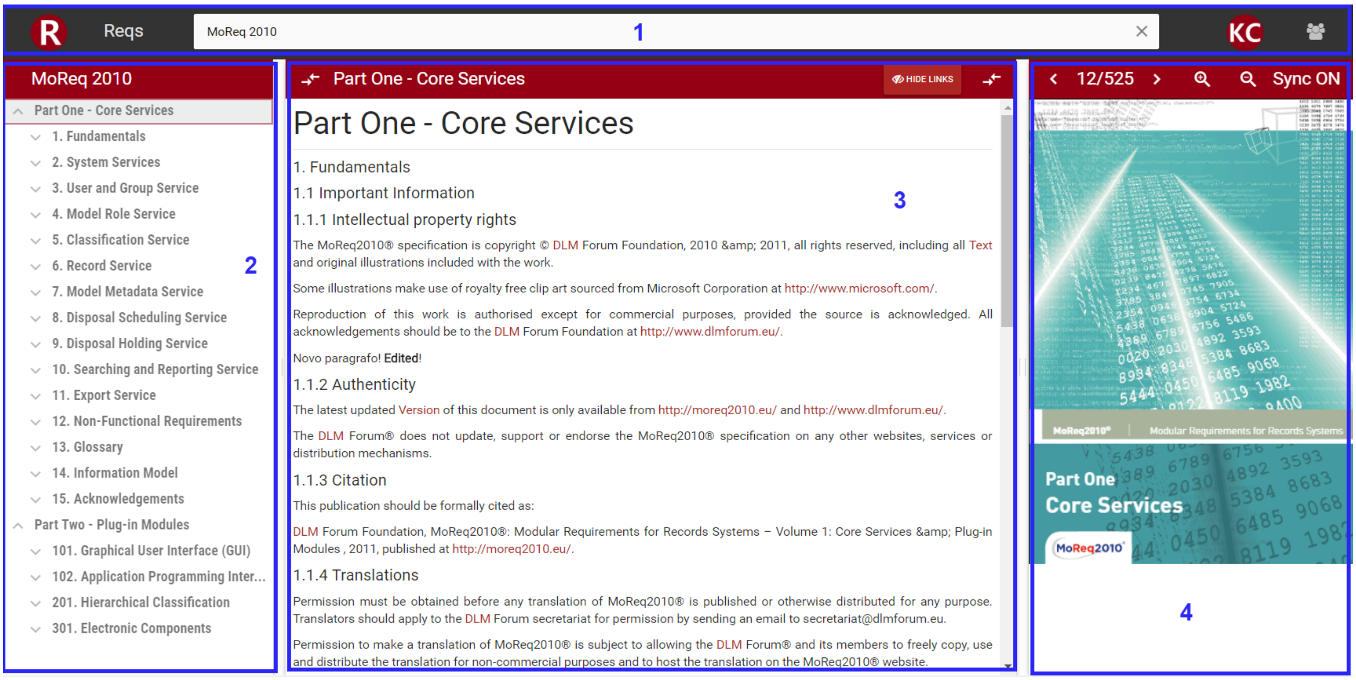


Figure 31. REQs main layout.

The top toolbar provides easy access to many functions of the application (**Figure 32**):

1. The REQs logo and title, can be used to refresh the page.
2. The document search bar, where the user can find and select all documents available to him.
3. The Knowledge Centre logo, allowing the user to quickly access the Knowledge Centre main page (**Figure 2** in Chapter 2 Knowledge Centre Service).
4. The user options, providing options to login or register in the application.

Figure 32. REQs Top toolbar logged out.

When a user is logged in, the bar slightly changes (**Figure 33**):

1. The current user's username and role (between parentheses).
2. The logout button.

Figure 33. REQs Top toolbar logged in.

3.2.3. Document Navigation

In the navigation panel (**Figure 34**) the user can navigate between the sections of any previously selected document from the search in the top toolbar (see 3.2.2 Main layout and Top Toolbar). The documents' sections are shown on a tree-list representation, replicating the selected document index. The sections can be expanded and collapsed, showing and hiding their subsections. Clicking on a section in the navigation panel will cause it to expand or collapse, and it will also select the section consequently loading its contents into the content panel. Hovering over a section will show a tooltip with its full title (**Figure 34**).

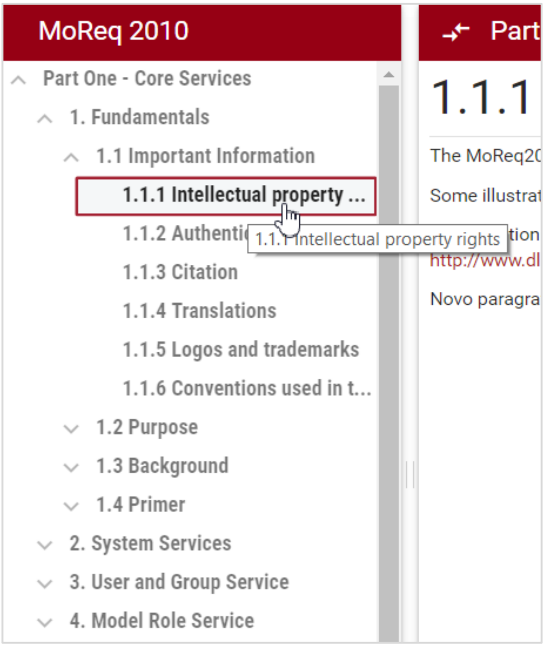


Figure 34. REQs Document navigation panel.

3.2.4. Content Panel Layout and Read Mode

After a section is selected from the navigation panel (see 3.2.3 Document Navigation) its contents are displayed in the content panel. The base mode of the panel is read mode and its base layout is (**Figure 35**):

1. The content panel header (more details below).
2. The title of the current section.
3. The textual content of the current section.

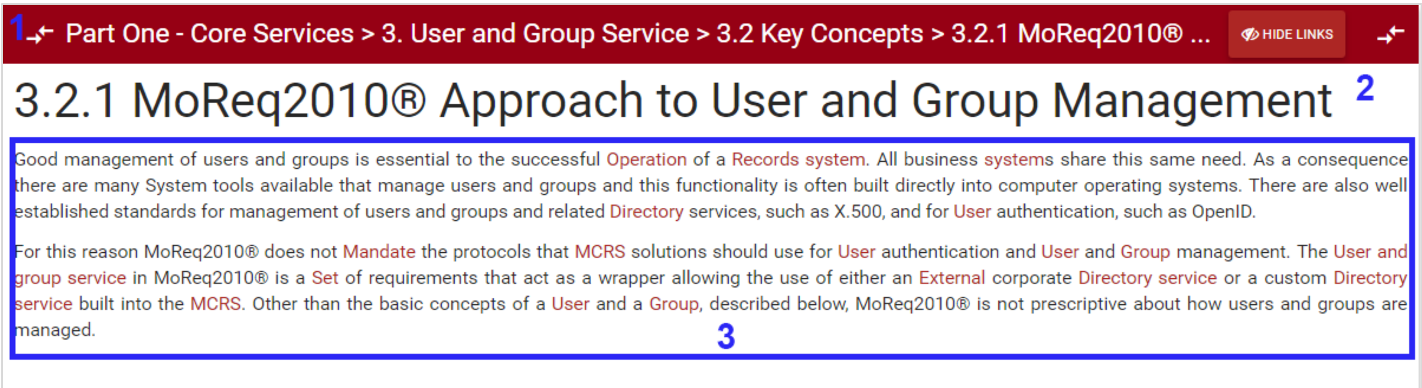


Figure 35. REQs Content panel layout.

The header of the content panel provides important functions and information (**Figure 36**):

1. The show\hide button for the navigation panel (see 3.2.3 Document Navigation), used to trade the navigation panel space for more room for content.

2. The path (composed of sections and subsections) to the current section.
3. The show\hide links button, used to enable and disable the links navigation and styling in the content.
4. The show\hide button for the PDF viewer (see 3.2.7 PDF Viewer), used to trade the PDF viewer space for more room for content.

More options appear in the content panel header when the user has permissions for commenting (see 3.2.6 Comments and Log) and editing (see 3.2.5 Edit Mode).

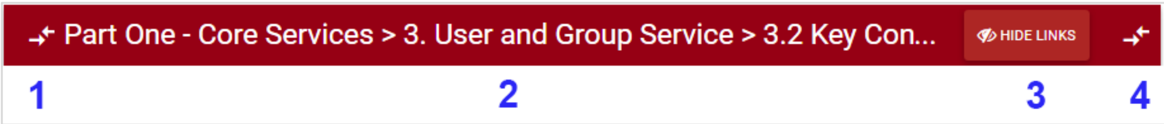


Figure 36. REQs Content panel header.

Note that if a user selects a high-level section in the navigation panel, the content panel will display the content of the selected section and its respective sub-sections (**Figure 37**). To keep the loading time of large high-level sections short, a dynamic loading technique was employed. Therefore, when a section is selected, only a predetermined size of its subsections' content is loaded to the content panel. As the user scrolls down in the content panel, the remaining content will be loaded.

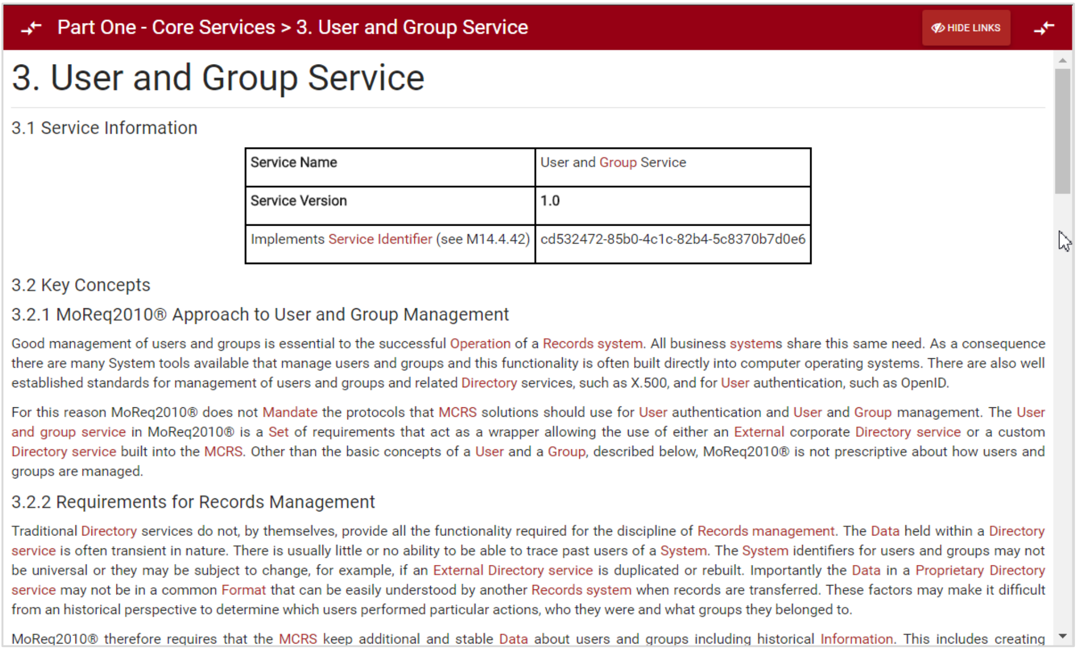


Figure 37. REQs Content panel with multiple sections.

The selected reference document can also be navigated through the existing links the content panel. The content of a document section can have linking information attached to any part of its text, which allows the user to swiftly navigate between linked sections. As an example, if the user clicked in the link highlighted in **Figure 38** the content panel would reload to show the contents of the link's target (section "3. User and Group Service" in this case). Also, note that the current document and section selected are reflected at all times in the URL of service. As mentioned before, links can be hidden\shown via the respective option in the content panel header.

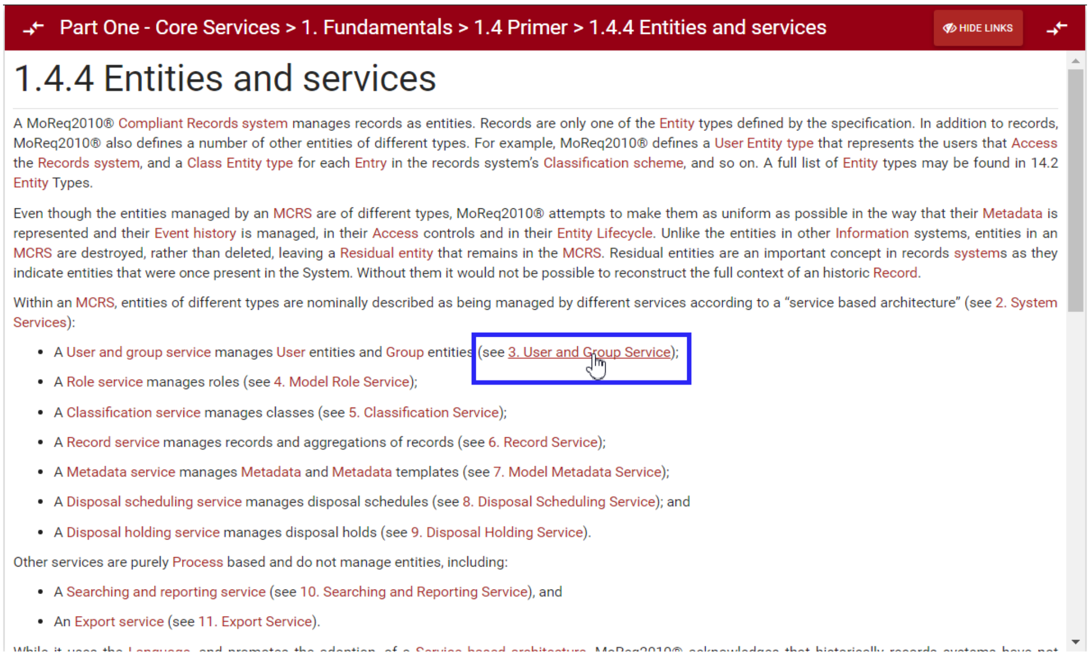


Figure 38. REQs content panel links.

Sections in REQs may have special types assigned to them, indicating that the section have an extra meaning besides the one innate to the document's hierarchy. When this happens, an extra field can be seen when the content panel is in read mode (1 in **Figure 39**) besides the usual content (2 in **Figure 39**).

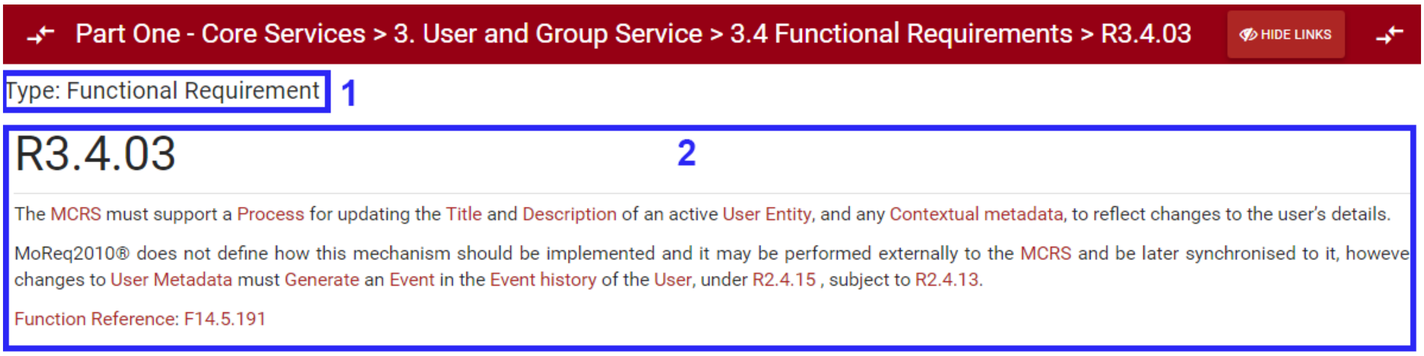


Figure 39. REQs Sections with special types.

3.2.5. Edit Mode

After a section is selected from the navigation panel (see section 3.2.3 Document Navigation) and the user has enough permissions (see section 3.2.1 User Roles), the edit\read mode toggle button will be available in the header of the content panel (**Figure 40**).

Figure 40. REQs Edit\read mode option.

When the edit mode is activated, a new button will appear at the header of the navigation panel (**Figure 41**). This allows the user to edit the currently selected documents properties (**Figure 42**):

- Name (required), the full name of the document;
- Alias (required), a simpler id of the document to be used in URLs;
- Resource URL (optional), a base URL were the images of document can be found;
- A Public checkbox, to mark whether the document is available to everyone or restricted to DLM users.

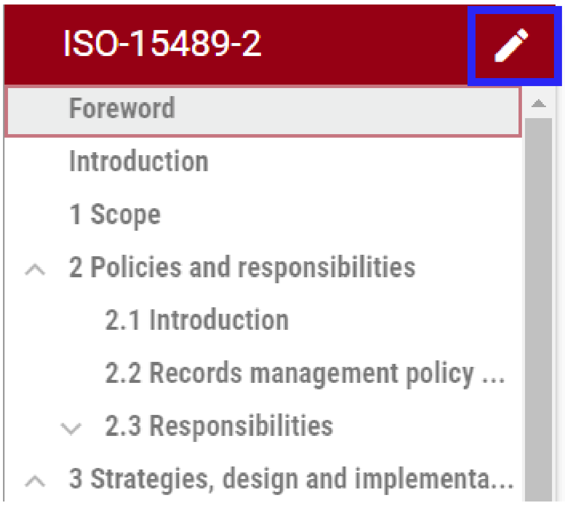


Figure 41. REQs Edit document button.

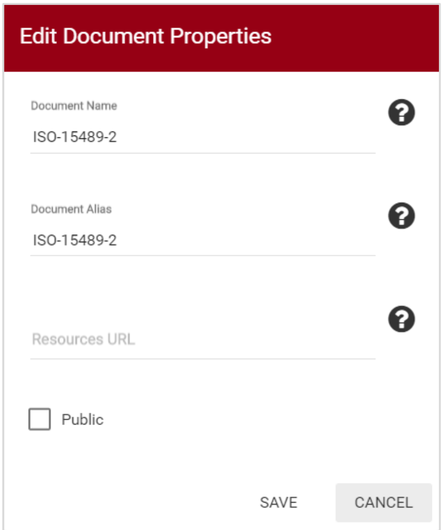


Figure 42. REQs Edit document properties.

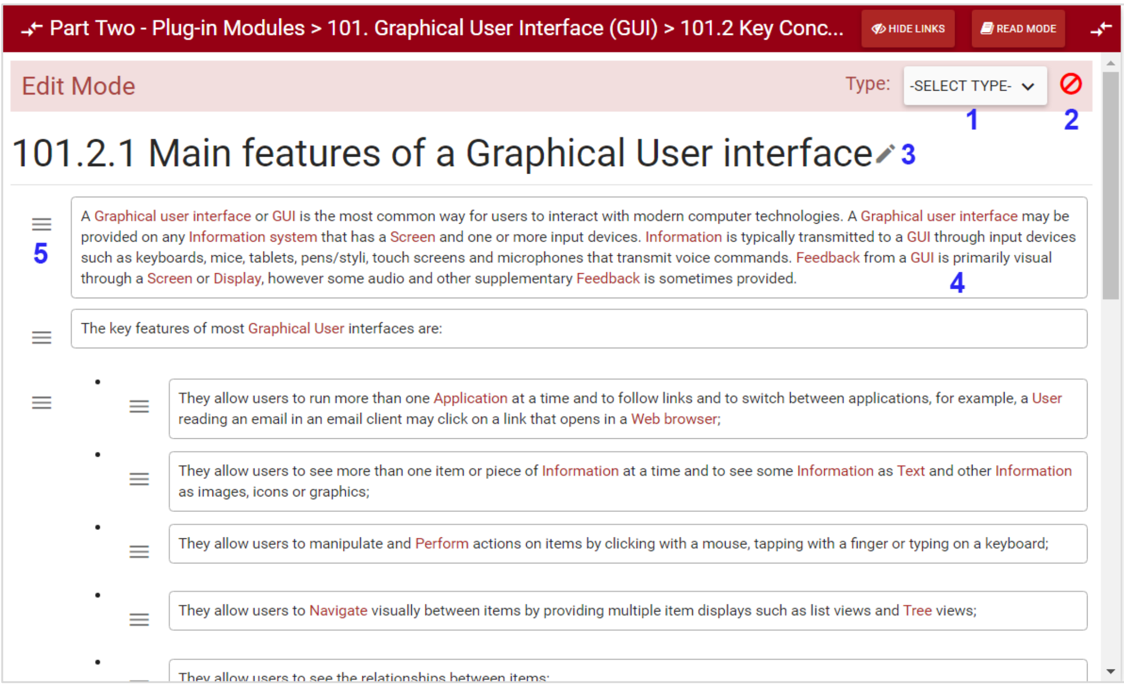


Figure 43. REQs Edit mode content panel view.

When in edit mode, the view of the content panel changes to the one in **Figure 43**. This view has many important features to allow the user to edit the currently selected section of the document (**Figure 43**):

1. The type combo box, for changing the special type of the current section.
2. The clear type button, to clear the special type of the current section.
3. The edit section properties button, which allows the editing of the section's properties: name and, again, type (**Figure 44**).
4. The section's content elements, which represent all the textual data. Adding, removing and editing these elements is what allows the modification of the textual content in a section of the document.
5. The content element's option menus, with options to delete the element or add new ones before or after the element (**Figure 45**).

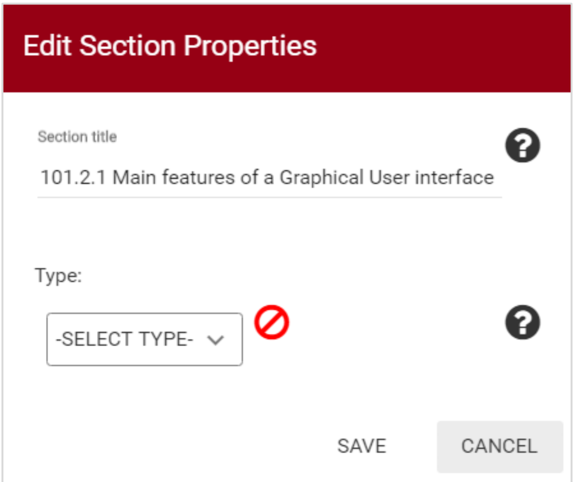


Figure 44. REQs Edit section properties.

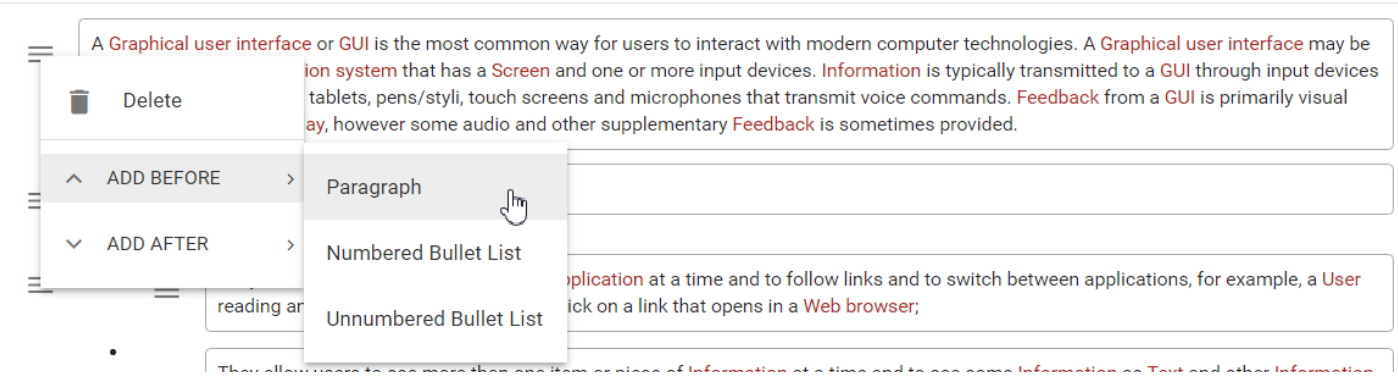


Figure 45. REQs Element menu.

To edit the actual text of a content element, the user simply needs to click the desired element (**Figure 46**) and the text editor for that element will appear (**Figure 47**). Note that multiple elements' text editors may be opened at the same time.

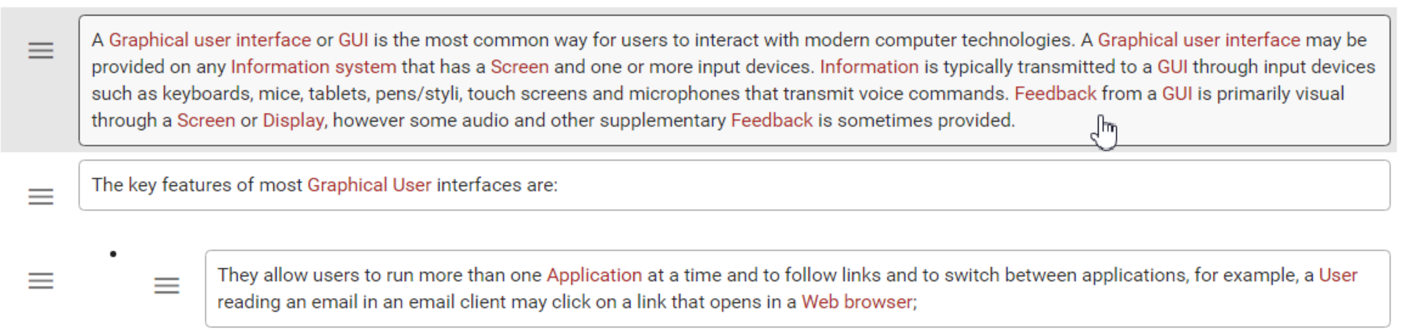


Figure 46. REQs Selecting an element for editing.

The text editor of each element provides important features to edit the element's contents (**Figure 47**):

1. Bold function, to style the selected text bold.
2. Italic function, to style the selected text italic.
3. An improved add link function, to insert links in the selected text. This links can either be: external – links to anywhere on the web; or internal – links to specific entities (sections with special types assigned to them) of the current document (**Figure 48**). In this case, it is also possible to mark if the target entity's title text should replace the selected text when in read mode.
4. Clear formatting function, to clear all style format of the currently selected text.
5. Undo and redo functions.
6. A toggle HTML function, allowing an advanced user to edit the HTML of the content directly.
7. Word and characters counters.
8. The editor's text box, where the element's text can be edited or selected to use with the other functions.
9. Save and publish button, to save and automatically publish the changes made.
10. Cancel button, to discard any changes made and revert to the original state.

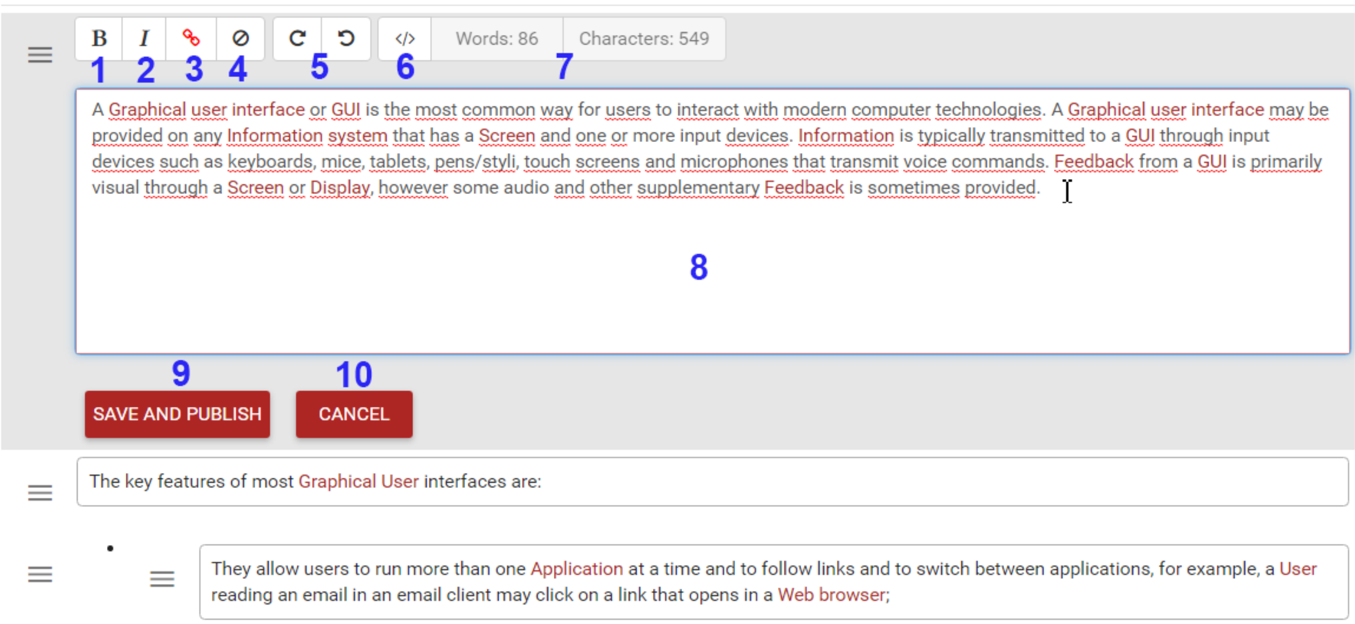


Figure 47. REQs Editing a content element.

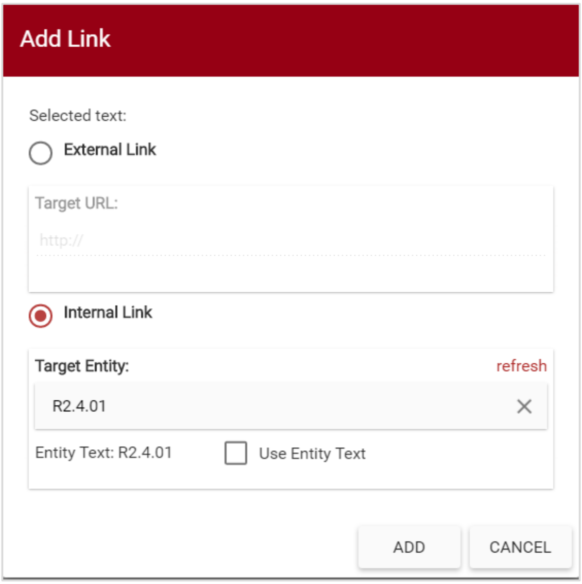


Figure 48. REQs Add link dialog.

3.2.6. Comments and Log

After a section is selected from the navigation panel (see section 3.2.3 Document Navigation) and the user has appropriate permissions (see section 3.2.1 User Roles), the show\hide comments and log toggle button will be available in the header of the content panel (**Figure 49**). Each section of a document has comments and log associated to it. Comments are a practical tool for users to discuss a section of a document and possible changes to it. On the other hand, log entries provide an automatic registry of changes made to a section and its contents.

Figure 49. REQs Show\hide comments and log option.

When the comments and log button is activated, a panel will appear at the top of current section's content (**Figure 50**). This panel allows the user to view, edit or add comments to a section. Log entries, like reports of adding a new paragraph to the section, are added automatically when such actions are performed. The comments and log panel has a few main features (**Figure 50**):

1. The list of comments and log entries.
2. The filter of the list, which allows selecting the type of comment\log entry the list will show.
3. The comment entry's context menu, with options to edit the comment, mark it private, public or hidden (**Figure 51**). Only the comment's owner or the DLM Reviewers have access to this menu.
4. The new comment text editor, with basic styling options for the comment as well as the option to submit a comment as private. Private comments are only seen by their owners and DLM Reviewers.

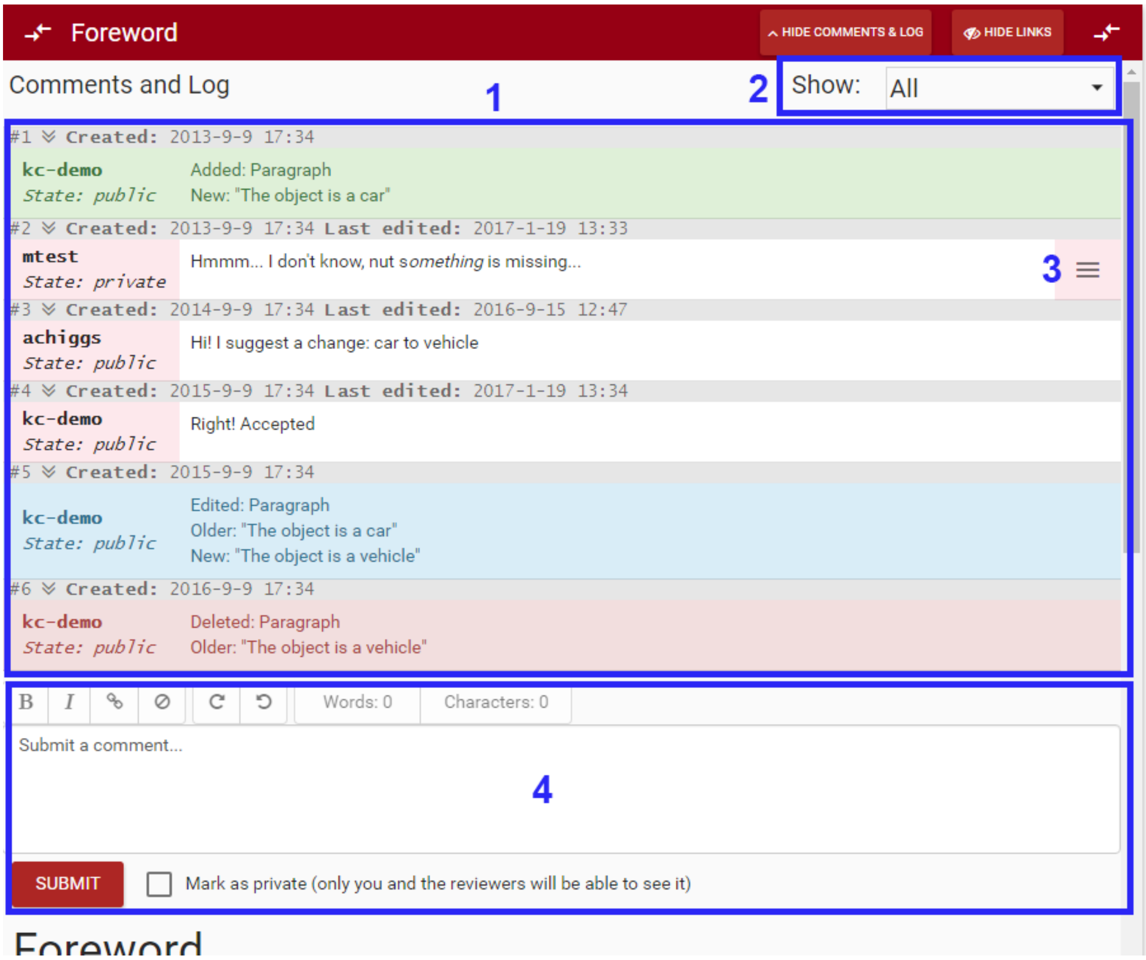


Figure 50. REQs Comments and log overview.

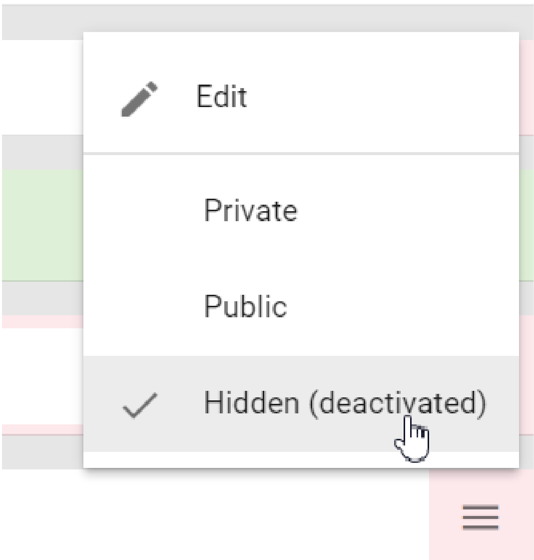


Figure 51. REQs Log entry menu.

Comments and log entries have important areas with information (**Figure 52**):

1. A top bar with the entry ID number, its created and its last edited dates.
2. A header with the username of the entry's creator.
3. A main body area, with the contents of the log.

Entries also have distinct appearances for an easier recognition in the list. The comment entry has a pink and white background (**Figure 52**), while the element creation log entry has a green styling (**Figure 53**), the element removal red (**Figure 54**) and the element editing blue (**Figure 55**).

Figure 52. REQs Comment entry.

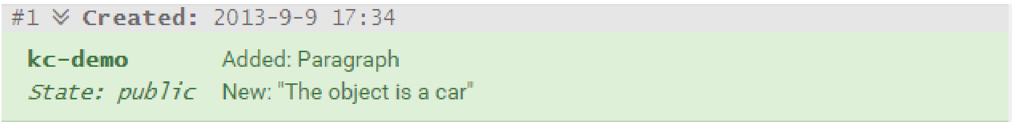


Figure 53. REQs Element creation log entry.

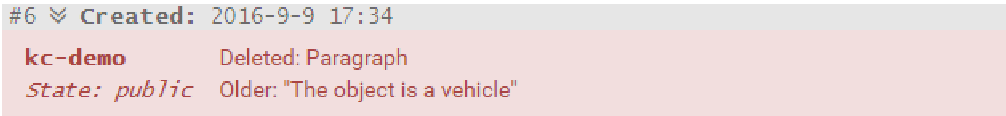


Figure 54. REQs Element removal log entry.

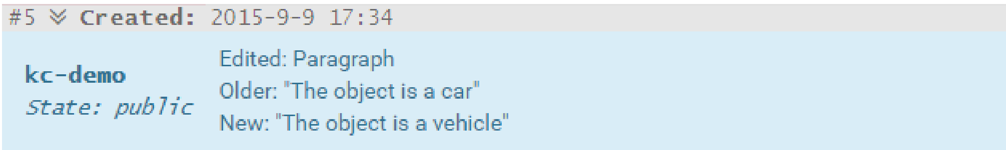


Figure 55. REQs Element edit log entry.

3.2.7. PDF Viewer

Documents in the REQs database can have PDF files associated to them. In this case, it is possible to view the PDF of the document directly in the REQs interface, side-by-side with the REQs version, using the PDF viewer in the far right of the interface (**Figure 56**). The PDF viewer shows the open PDF file and a toolbar with a few tools and information (**Figure 57**):

1. Previous page button.
2. Current displayed page number / total number of pages in the PDF.
3. Next page button.

4. Zoom in tool.
5. Zoom out tool.
6. Information about the sync mode on the viewer.

The PDF viewer has a sync mode flag that indicates if the current document has syncing capabilities with the PDF viewer. Some documents in the REQs database will synchronize automatically with the PDF viewer, meaning that when the user changes sections in the navigation panel, the PDF viewer will automatically switch pages to show the current section's page. The configuration of this sync mode is not yet available, thus the number of synced documents is still limited.

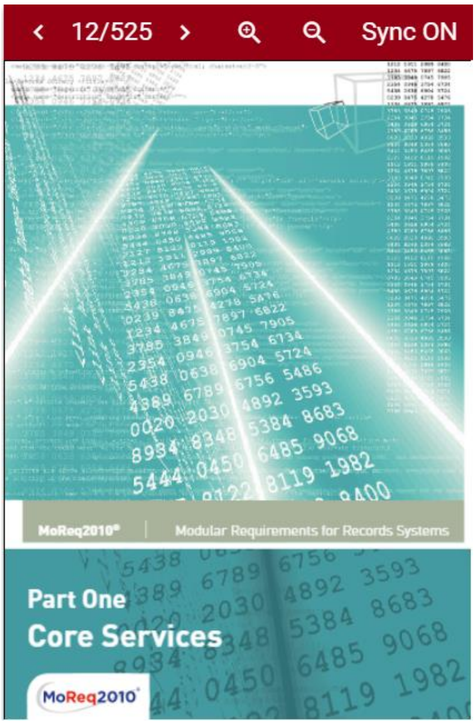


Figure 56. REQs PDF viewer.

Figure 57. REQs PDF viewer toolbar.

3.3. Data Store

This section describes how data is stored in both Resources Centre services: EVOC and REQs. Both services data are stored in MongoDB databases (more technology details in the **Appendix A – Technological Specifications**).

3.3.1. EVOC

The data domain model of EVOC is presented in **Figure 58**. The Vocabulary Class is central to the service data' structure as it connects the remaining Classes. A Vocabulary needs to be classified under a Space. Additionally, it can also be classified under a Group. Space have a one or more Users associated representing those who can access and edit that space and the vocabularies within.

Vocabularies have associated Nodes that define the contents of each vocabulary. A node can belong to more than one vocabulary. Vocabularies have a Vocabulary Type associated which determines the name of the nodes associated with the vocabulary and what Attributes those nodes can have. This, and the other characteristics of a node attribute can have, is given by the associated Attribute Type. Nodes also have a language associated with them.

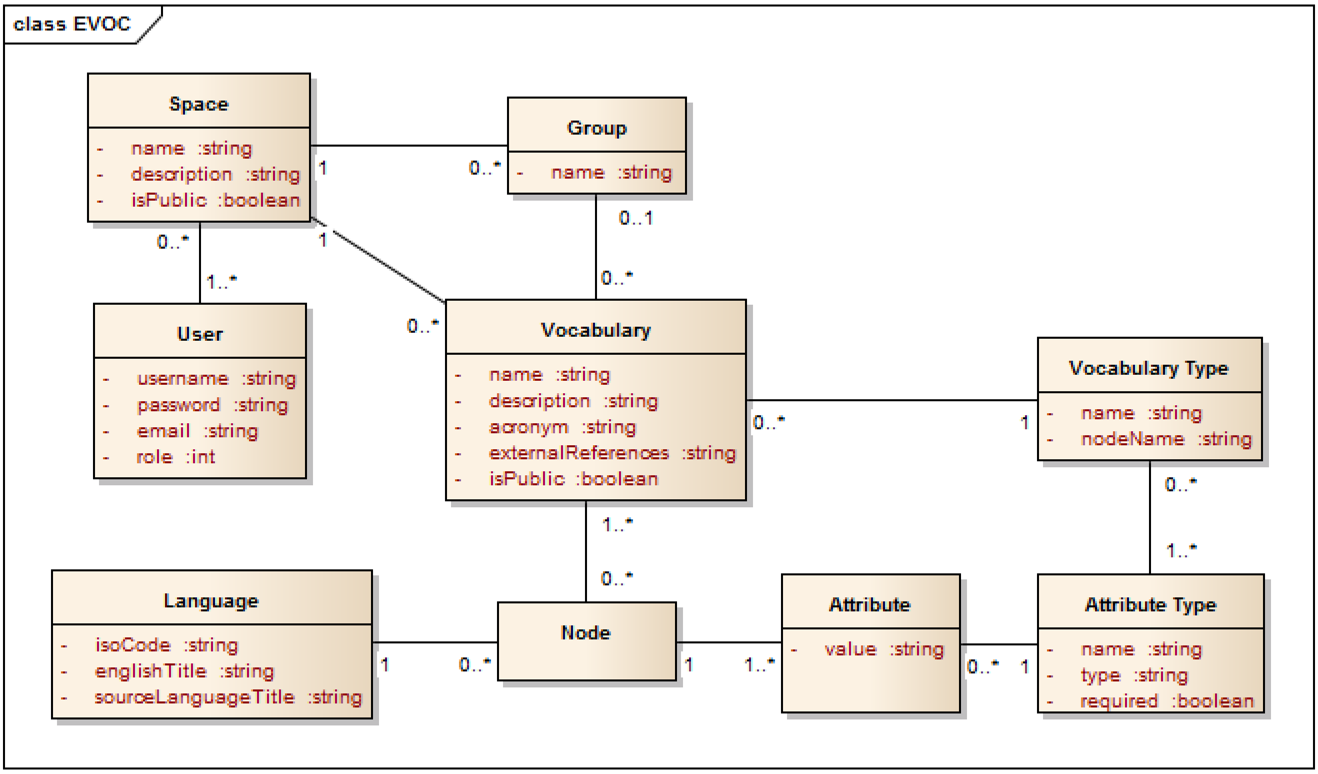


Figure 58. EVOC Data Domain Model.

3.3.2. REQs

The data domain model of REQs is presented in **Figure 59**. All Documents have an associated Structure. To better capture all the details inherent to a document, this structure is broken down, up to small text parts. First, there are the Sections, which can have other sections inside and contain Blocks. These blocks can be Images, Paragraphs, Bullet Lists (which are made of paragraphs) or Tables (which are made of Table Elements, or cells, that can contain other blocks). Paragraphs are also divided into Sentences and those into Text parts, which can have different formatting attributes associated with them, like being in bold or having a Link associated with them.

Also, note that a section may have a *specialType*, which indicates that section has additional meaning to the application (for instance, a functional requirement of the document). The application can then take this information and act accordingly, displaying or offering special interactions with the section. Each section also has its own Log, containing any Log Entries that have been associated with the section.

Finally, from the sections to the texts, all parts of a document's structure are called Components. The generic property of a component is the fact that it 'knows' who its children components are and the order in which they are supposed to appear. This is essential to show the components in the correct order and it allows forming a unique URI path to any component of the application (starting with a document's *uri_base* attribute).

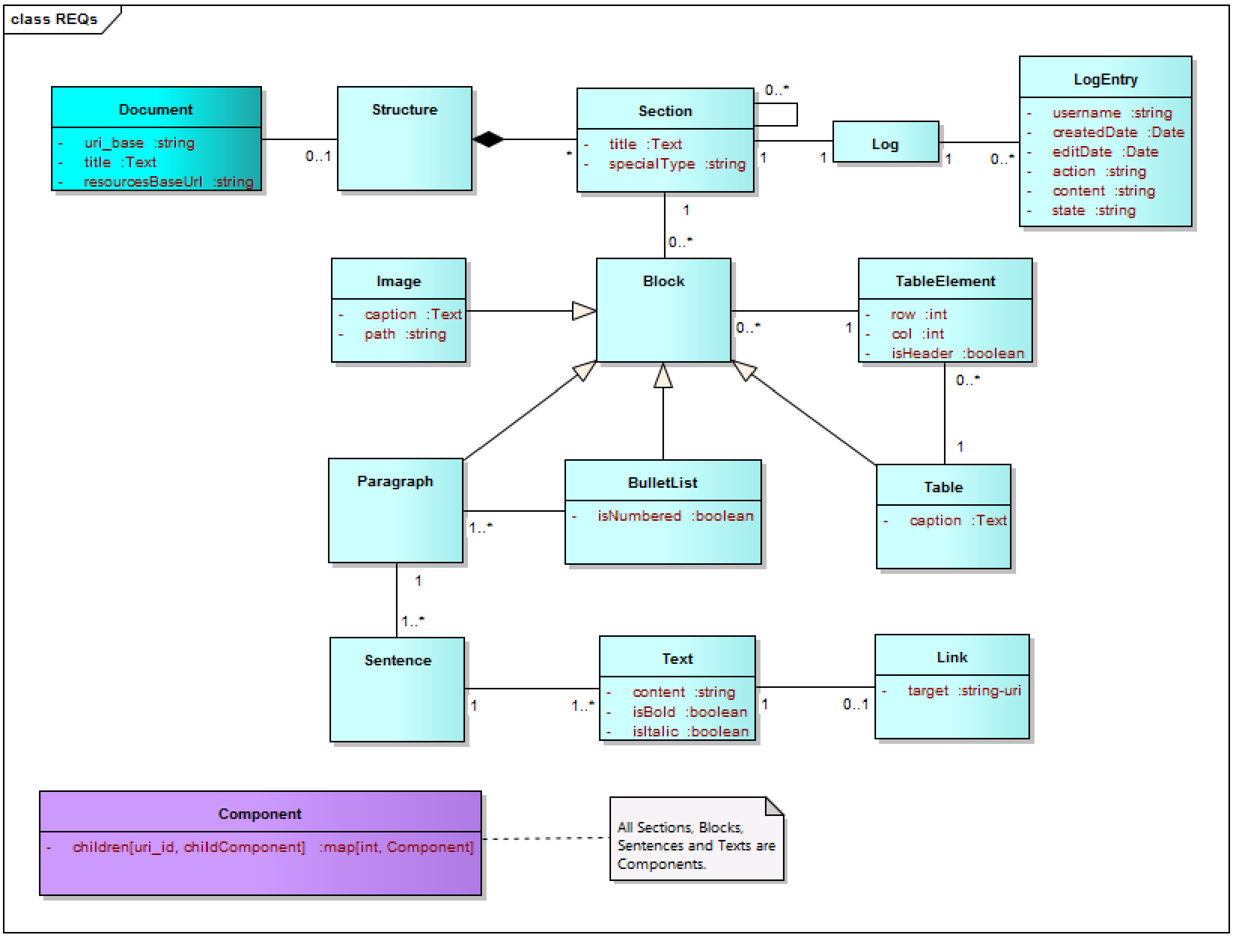


Figure 59. REQs Data Domain Model.

4. Assessment Services

The Assessment Services (**Figure 60**) is the component of the Knowledge Centre containing the services for assessment and validation of existing systems and businesses. Currently, three services have been developed to achieve these objectives: The MoReq[9] Schemas Validator, which implements a specific case of schema validation; the MoReq Assessment service; and the Maturity Assessment questionnaire.

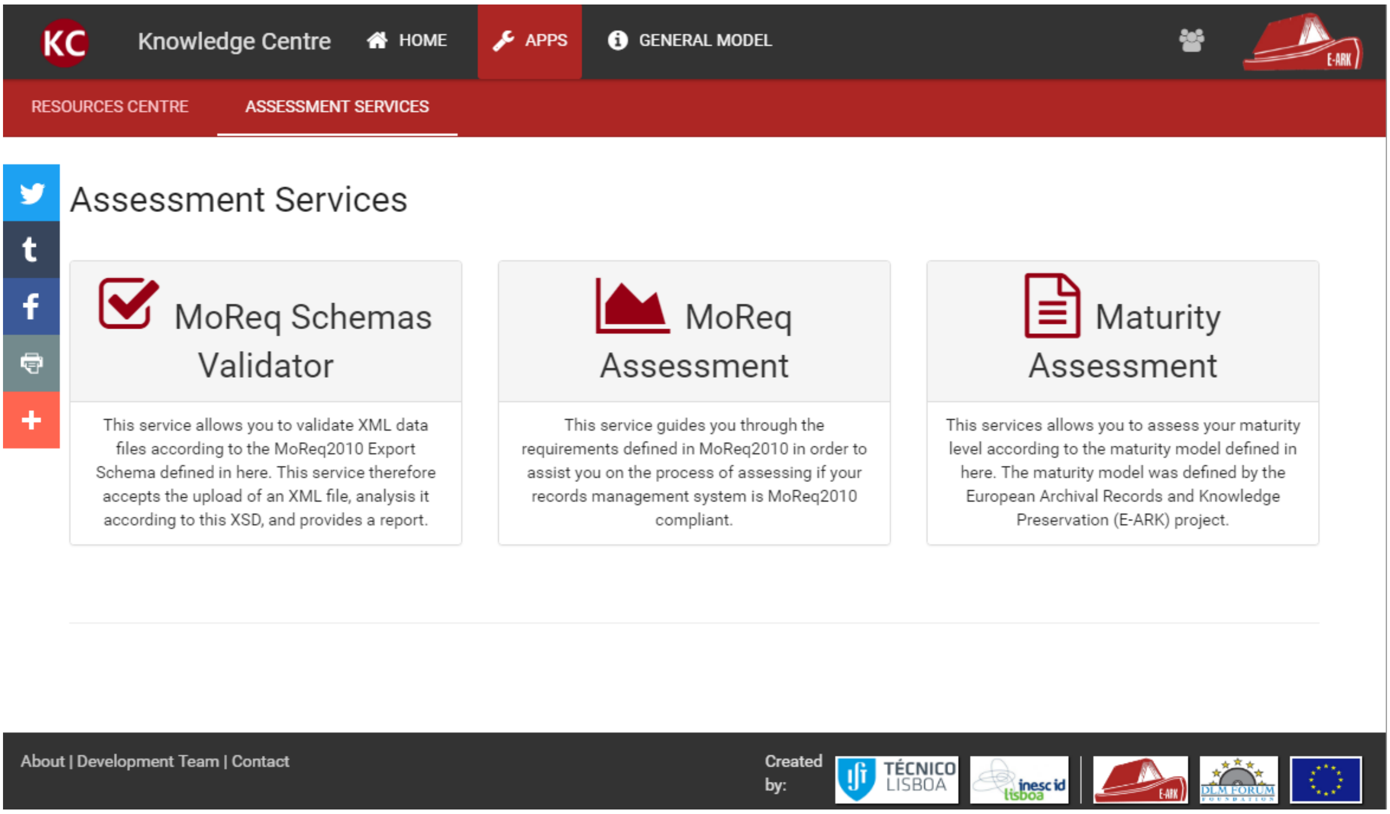


Figure 60. Assessment Services Page

4.1. MoReq Export Validator Service

The MoReq Export Validator Service was developed for the purpose of assisting records management developers to validate their MoReq2010 Compliant Export Services. According to MoReq2010, an authorised user can export entities from a MoReq Compliant Records Systems (MCRS) to an XML[10] data file that can be validated using the MoReq2010 XML Schema[11]. Therefore, the MoReq Export Validator Services implements an automatic process that validates data files

[9] MoReq2010, Modular Requirements for Records Systems, Volume 1, Core Services & Plug-in Modules, Version 1.0. More information at http://moreq.info/.

[10] The Extensive Markup Language (XML) is a markup language which establishes a set of rules for encoding documents in a format that is both human and machine readable.

[11] Requirement R11.4.1 from Section 11 – Export Service in MoReq2010.

according to the MoReq2010 XML Shema[12]. The mentioned schema is defined as an XSD[13] that defines the structure of how entities in a MCRS must be exported.

The main layout of the MoReq Export Validator Service can be seen in **Figure 61**, and is described in the following list:

1. A set of MCRS exports examples that can either be run or downloaded for further analysis;
2. The validation form that allows the user to perform the validation through the controls describe below;
3. The 'Browse" button, which triggers a dialog box that allow users to select an XML file to be submitted for validation;
4. A text box where the selected XML File' name will be displayed;
5. The "Submit" button starts the validation of the selected XML File;
6. A checkbox which allows the user to select if the results of the validation are to be displayed in the same page or in a new window.

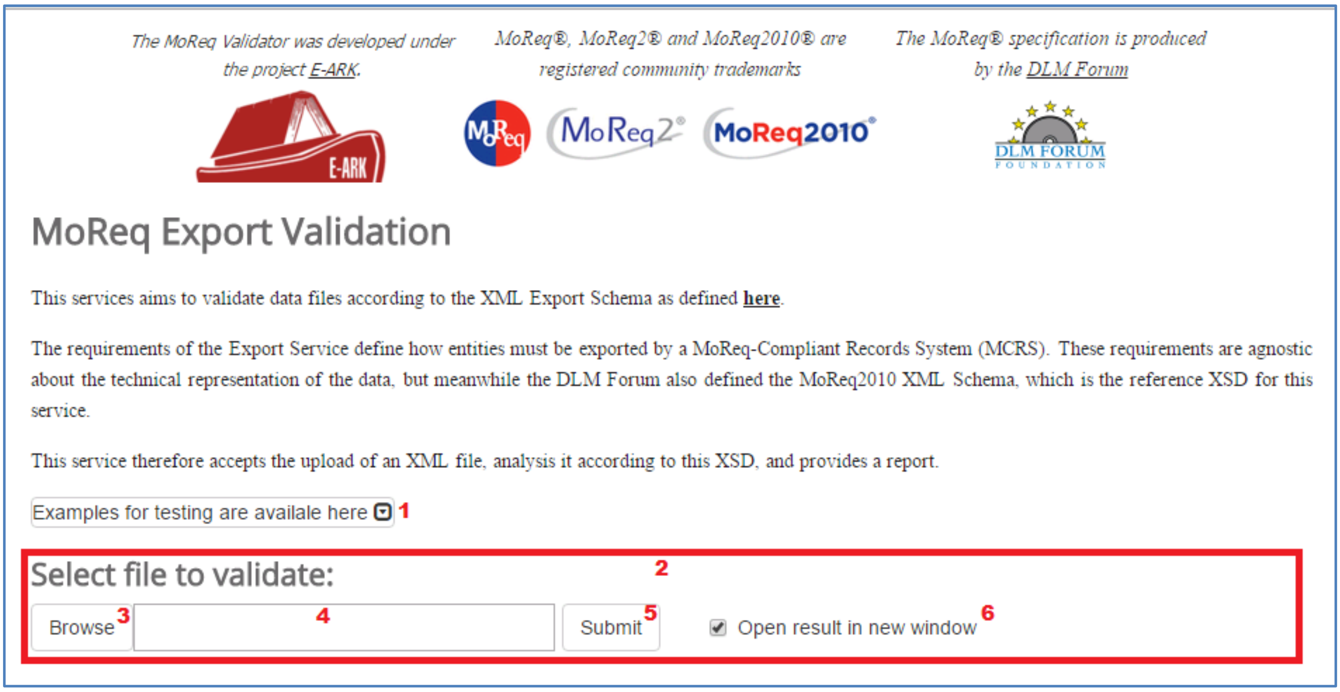


Figure 61. MoReq Export Validator Service main layout

To facilitate understanding of what constitutes a MoReq2010 Compliant Export XML File the service provides a set of valid and invalid examples. Those examples can be accessed by selecting 1 in **Figure 61** resulting in the panel presented in **Figure 62**, where the user is presented with:

1. A short description of the example case;
2. The possibility of downloading the selected example to analyse it; and
3. The possibility of performing a validation of the selected example.

[12] The MoReq2010 XML Schema is available at http://moreq.info/files/export/export.xsd.
[13] The XML Schema Definition (XSD) is used to express rules to which XML document must comply so as to be considered valid according to the schema which is being used to perform the validation.

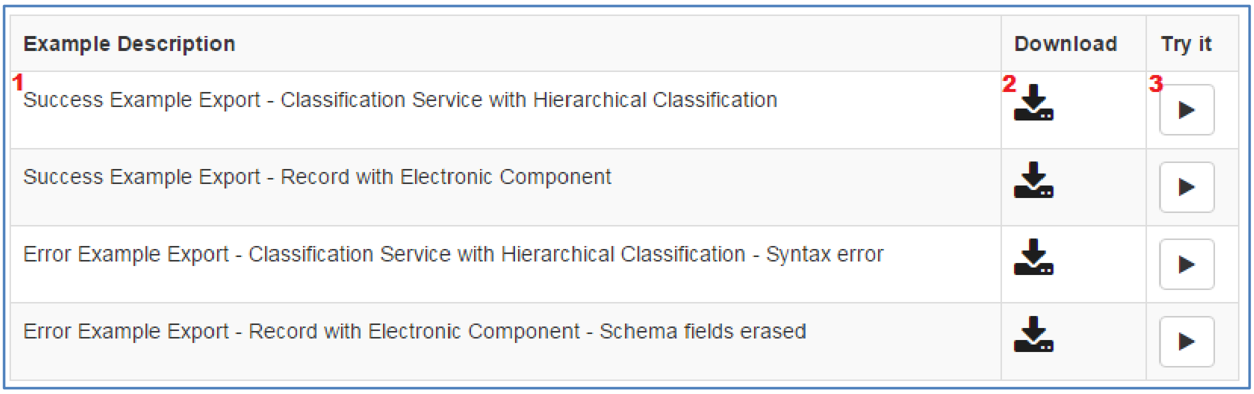


Figure 62. Examples panel layout

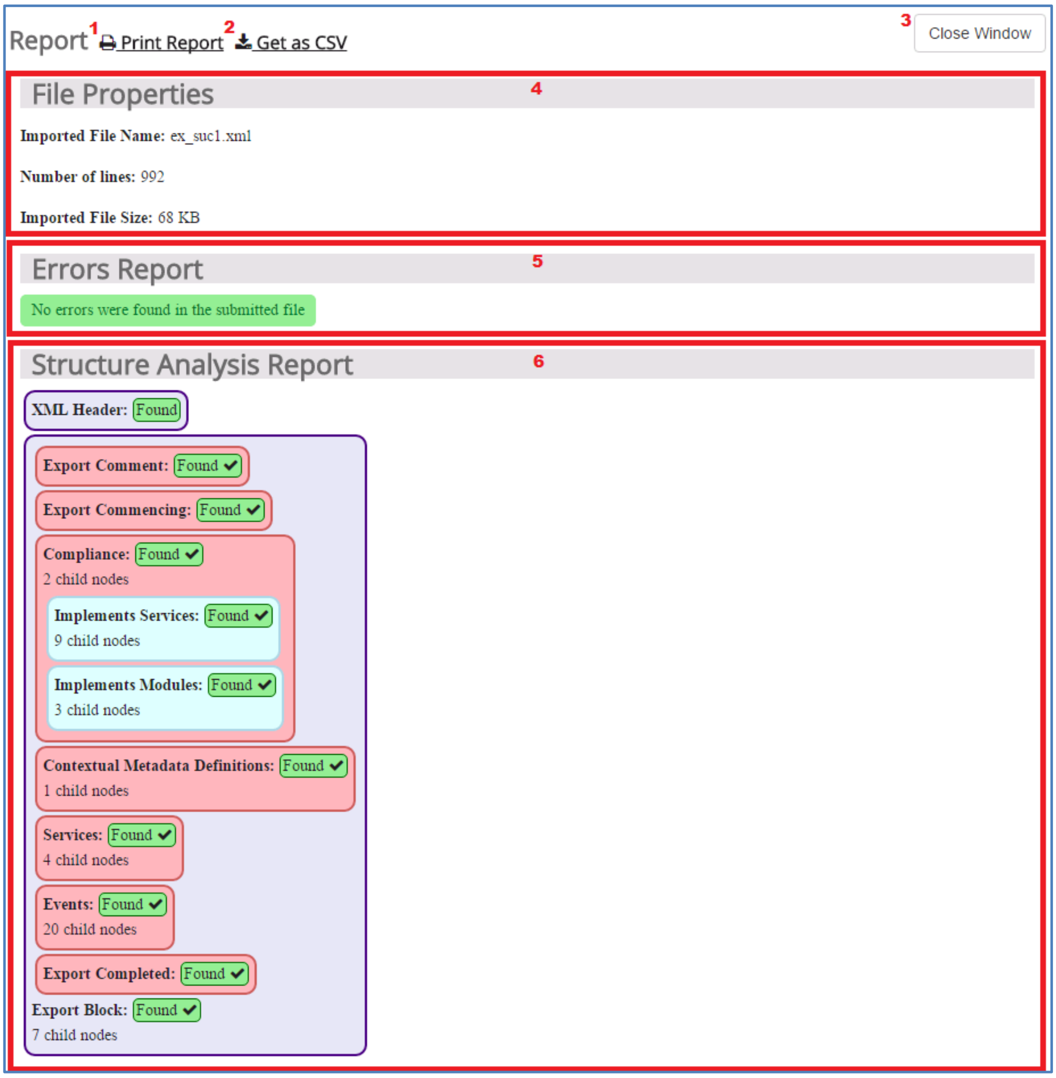


Figure 63. Validation Report layout

Once the system has performed a validation on an XML file, a report is automatically generated (**Figure 63**) with the following structure:

1. The Print Report button allows users to get a printable version of the validation report;
2. The Get as CSV button allows users to download a version of the validation report in .csv format;
3. The Close Window button closes the window in which the validation report is being displayed;
4. The File Properties section focuses on the imported file properties, specifically in its file name, number of lines and size;
5. The Errors Report section lists any XSD validation errors that may have occurred during validation, providing details regarding the line and column number and message of each error (see **Figure 64**). An error can be:
    - Fatal Error: if the XML contains entities that do not belong and consequently disrupt the mandatory structure required;
    - Error: if a mandatory element is missing in the XML;
    - Warning: if optional elements are missing (for example, no “<!DOCTYPE …>” defined or references to an undefined parameter entity);
6. The Structure Analysis Report section displays a simple structure analysis based on the MoReq2010 Export Schema. It simply signals if a given element is present on the file that was subjected to validation.

Line Number	Column Number	Error Message
20	14	Error: cvc-complex-type.2.4.a: Invalid content was found starting with element 'Compliance'. One of '{"http://moreq.info/files/export":ExportCommencing}' is expected.
643	4	FATAL ERROR: The element type "Export" must be terminated by the matching end-tag "".

Figure 64. Example of a list of errors that occurred during XSD validation

4.2. MoReq Assessment

The MoReq Assessment tool allows system developers to test their products’ compliance with the MoReq 2010 specification. The testing of the product uses the MoReq2010 test cases that consist of a set of steps that can be performed in the system to assure that the behaviour is as expected. Each test case has a pre-condition state, a set of steps and post-condition state that indicates the expected result. MoReq2010 test cases were developed along with MoReq2010 and were published by the DLM-Forum at http://www.moreq.info/testing-and-certification. The MoReq 2010 testing script has diverse Test Cases, organized in Test Modules, to which users with testing permissions (testers) can associate evidences and explanations of their product's conformity. This evidences and explanations may then be reviewed, approved or contested by expert users with reviewing permissions (Reviewers).

4.2.1. User Roles

There are two main roles a user can have in the MoReq Assessment tool, which determine what the user can do within the application:

- **Tester** – registered users, with an associated ERMS product in the app, for which they can edit the details. They can submit evidences and explanations of the product compliance with the test cases for reviewer’s approval. Has access to the Dashboard and Product Profile views.

- **Reviewer** – A reviewer can see all the testers' products and can see the evidences and explanations they submitted for each test case. They may approve test case compliance or request more explanations. Has access to the Dashboard and Product Profile views.

Anonymous users or users without one of these roles will only be able to see the home view of the app. One very important reviewers' feature is the product search bar (appears in top toolbar, as seen in **Figure 65**), giving them the ability to search from all the existing products in the database using a custom query.

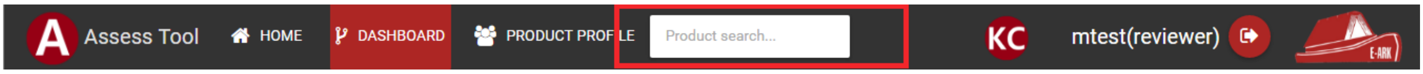


Figure 65. MoReq Assess reviewers' top toolbar.

4.2.2. Home and Main Layout

The tool presents a simple home screen when the users first open the tool (**Figure 66**). Here we can see the main layout of the entire application:

1. The top toolbar present in all the views.
2. The view display, where the current view is displayed.

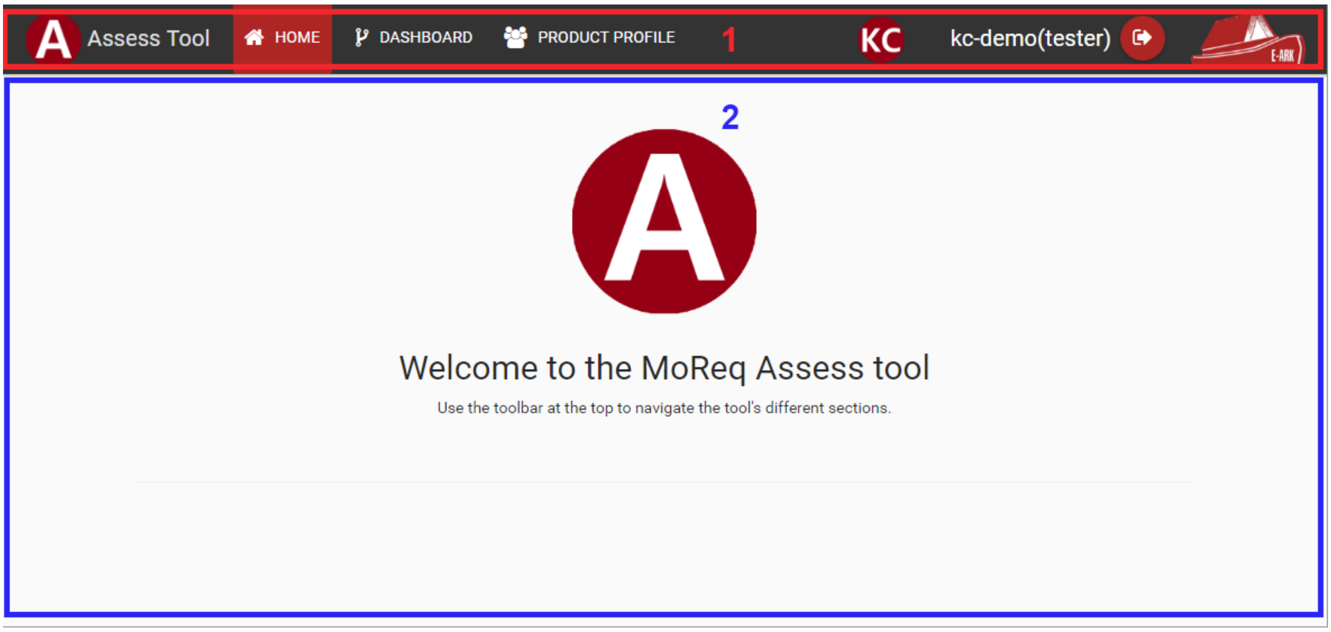


Figure 66. MoReq Assess Home.

The top toolbar provides means of navigation between the tool's views, as well as other functions (**Figure 67**):

1. The Assess Tool logo and title.
2. Navigation buttons to switch between the different views (for an authorized user, see 4.2.1 User Roles).
3. The Knowledge Centre logo, allowing the user to quickly access the Knowledge Centre main page (**Figure 2** in Chapter 2 Knowledge Centre Service);
4. The logout button, next to the current user's username and role (between parentheses).
5. The E-ARK logo, which links to the E-ARK Project main website.

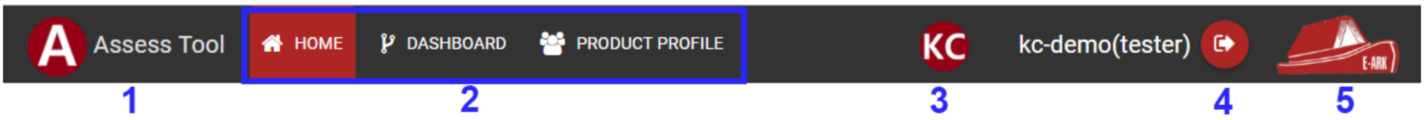


Figure 67. MoReq Assess top toolbar logged in.

When a user is logged out, he will not have access to the Dashboard or the Product Profile from the top toolbar, but will have a user options button near the KC logo, so he can login or register (**Figure 68**).

Figure 68. MoReq Assess top toolbar logged out.

4.2.3. Dashboard as a Tester

The Dashboard view, for the user with Tester permissions, is where he can provide evidences and explanations to prove his product complies with the test cases. The test case status determines the stage of the evaluation of the test case for a user product. A test case status may be:

- **None** – The initial status of a test case.
- **Approved** – The evidences and explanations for that test case have been approved by a reviewer.
- **Pending review** - The tester has submitted evidences and explanations for the test case and is awaiting a review.
- **Pending explanation** – The reviewer has given feedback for a test case, and is waiting for further explanations from the tester.

In the Dashboard view, these concepts are always present in the main layout (**Figure 69**):

1. The test case navigation panel, where test cases are organized by modules (in red) and have different colours for different states: white for none, green for approved, blue for pending review and yellow for pending explanations.
2. An info message, about the selected test case's status, in its correspondent colour.
3. The test case details panel (collapsed here, can be seen expanded in **Figure 71**), where all the necessary information about the selected test case is displayed.
4. The test case log (collapsed here, can be seen expanded in **Figure 72**), displaying explanations and feedback from the users and reports of changes in the evidences.
5. Test case evidences (collapsed here, can be seen expanded in **Figure 73**), a table displaying all evidences associated with the selected test case.
6. All available evidences (collapsed here, can be seen expanded in **Figure 74**), a table displaying all the evidences the tester has uploaded.

When a test module is selected in the navigation panel, a warning message appears to alert the user (**Figure 70**).

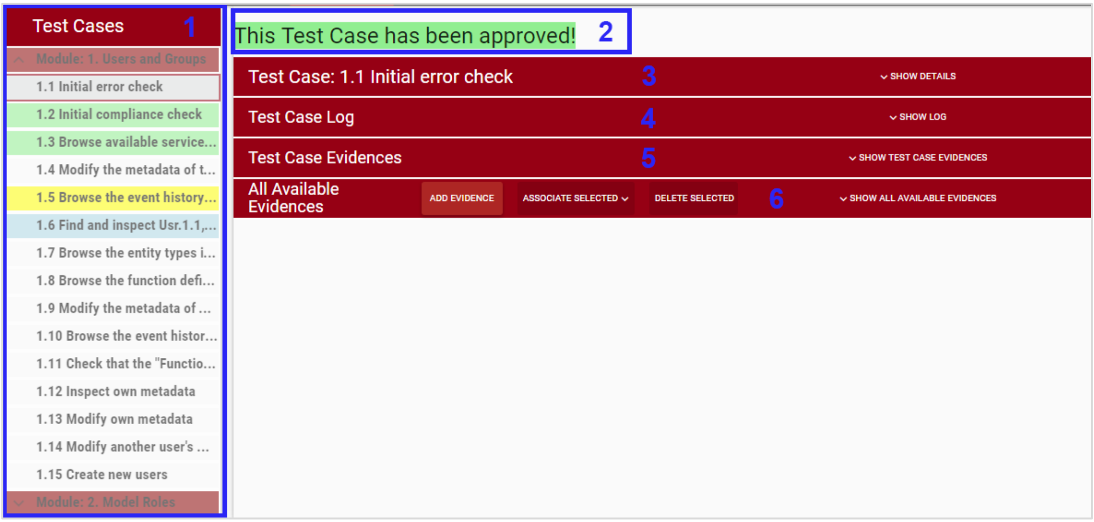


Figure 69. MoReq Assess Dashboard overview – *tester*.

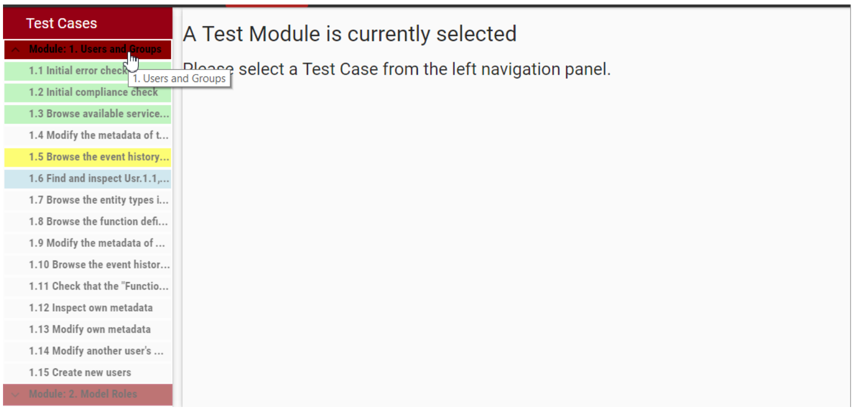


Figure 70. MoReq Assess Dashboard with test module selected.

The detail panel (**Figure 71**) displays all the pre-condition, steps and expected results a tester should follow and achieve for a test case to be approved for his product.

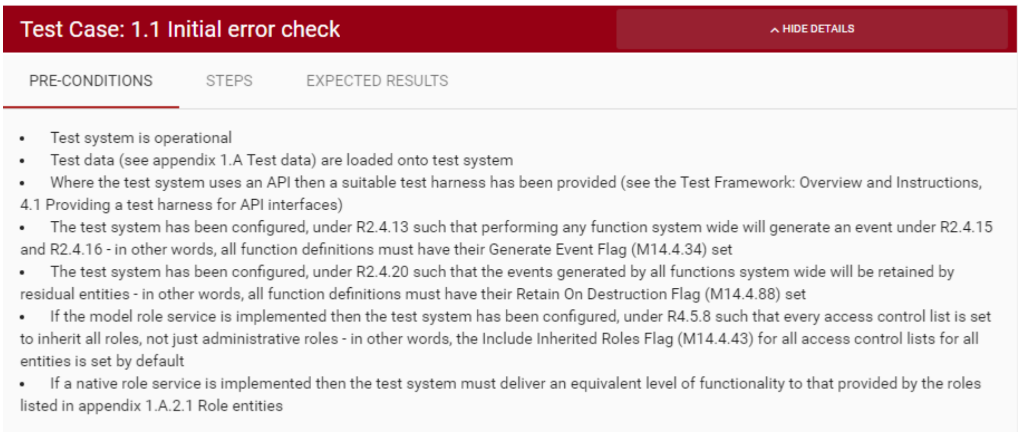


Figure 71. MoReq Assess Test case details.

In the test case log (**Figure 72**), the tester may submit a new explanation for the current test case and mark it 'Ready for review' when he wishes to receive feedback from a reviewer. The log entries have various colours according to its type of message:

- White, for tester's explanations.
- Blue, for reviewer's feedback.
- Green, for association of evidences.
- Red, for disassociation of evidences.

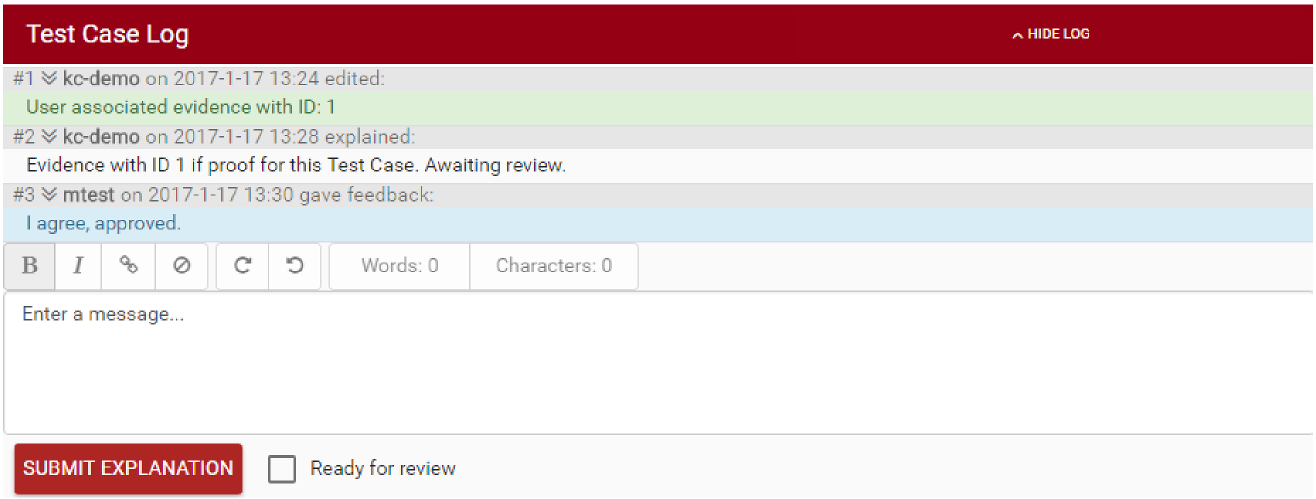
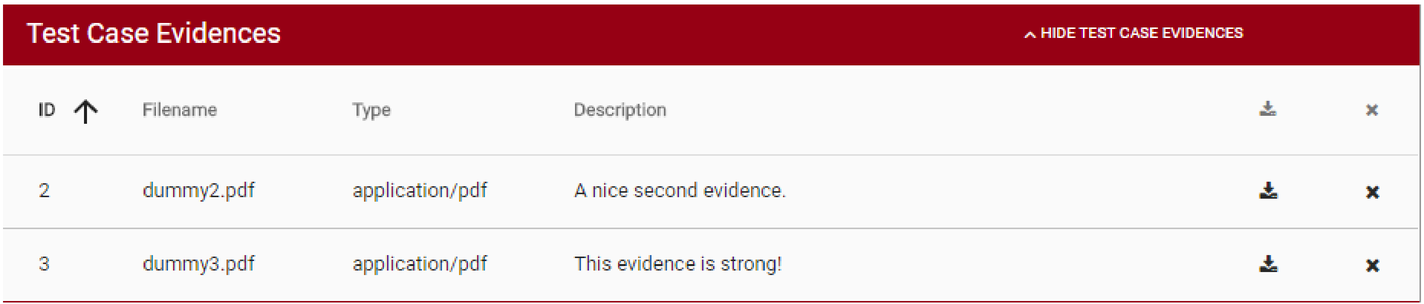


Figure 72. MoReq Assess Test case log – *tester*.

The evidences list (**Figure 73**) show all the evidences currently associated to the selected test case. This list presents the IDs, filenames, file types and description of the evidences, as well has buttons to download and disassociate each evidence.


Test Case Evidences

HIDE TEST CASE EVIDENCES

ID	Filename	Type	Description
2	dummy2.pdf	application/pdf	A nice second evidence.
3	dummy3.pdf	application/pdf	This evidence is strong!

Figure 73. MoReq Assess Test case associated evidences.

The All Available Evidences table (**Figure 74**), displays all the evidences the user uploaded to the tool, either if they have been associated with a test case or not. Evidences associated with the test case currently selected in the navigation panel will be displayed with a green background. This panel also provides functions for evidence management:

1. Add evidence button, opens a dialog (**Figure 75**) for the user to create a new evidence.
2. The associate evidence options, allow the user to associate currently selected evidences with test cases.

3. The delete selected button, for removal of selected evidences.
4. Checkboxes to select evidences to be used with the previous functions.
5. Details about the evidences: ID, filename, file type, test cases associated with it and description.
6. Download buttons for the evidences' files.

When evidences are selected in the table, the 'Associate Selected' and 'Delete Selected' functions become available (**Figure 76**).

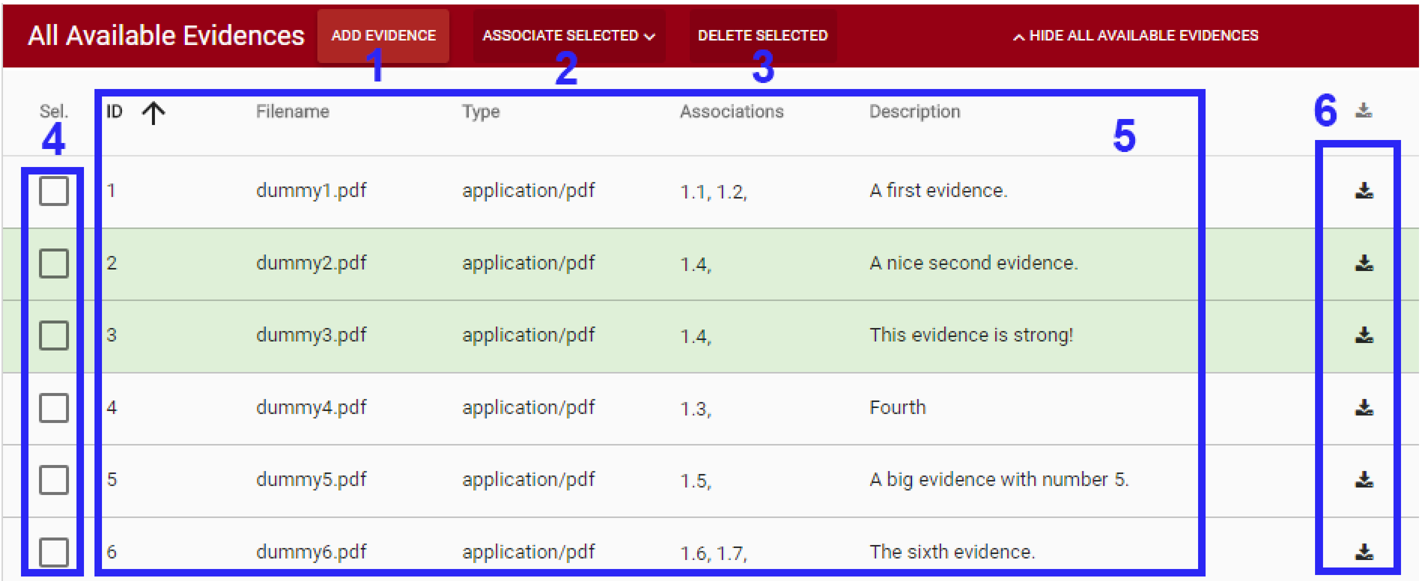


Figure 74. MoReq Assess All available evidences.

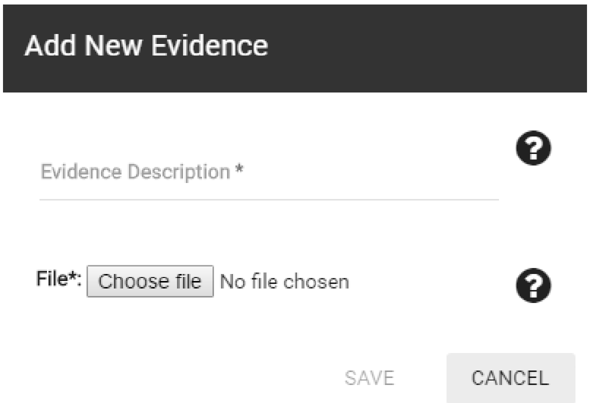


Figure 75. MoReq Assess Add evidence dialog.

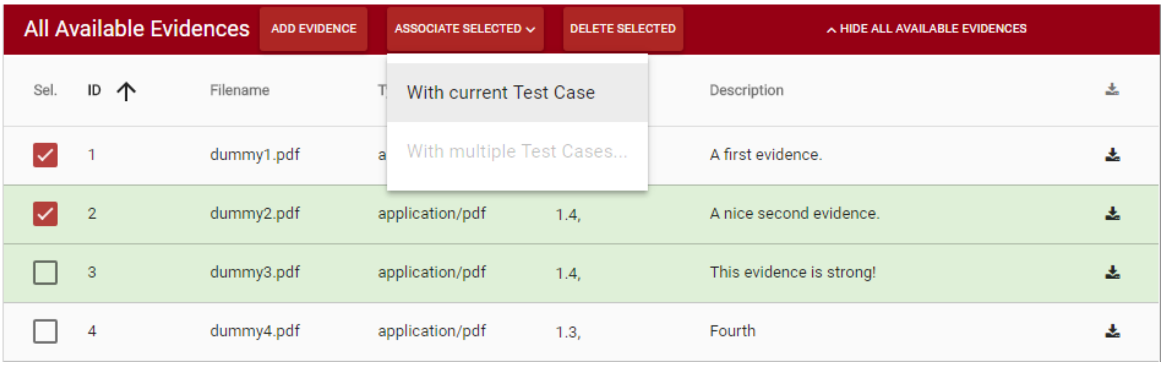


Figure 76. MoReq Assess All Available evidences – checked evidences.

4.2.4. Dashboard as a Reviewer

The Dashboard from a reviewer's perspective is very similar to that of the tester (see section 4.2.3 Dashboard as a Tester). After a product has been selected, in the top toolbar (see section 4.2.1 User Roles) we can see that most features are similar with minor differences (**Figure 77**):

1. Current product and owner information.
2. Status of the selected test case.
3. Test case details, equal to tester's view (see **Figure 71**).
4. Test case log, with entries' display similar to tester's view, but allowing the reviewer to send feedback instead of explanations, as well as approving or requiring more explanations for the test case (**Figure 78**).
5. The evidences associated with the selected test case, similar to tester's view (see **Figure 73**), but without the function to disassociate evidences.
6. The test case navigation panel, equal to tester's view.

Note that when no product is selected, the reviewer's dashboard shows a warning message (**Figure 79**).

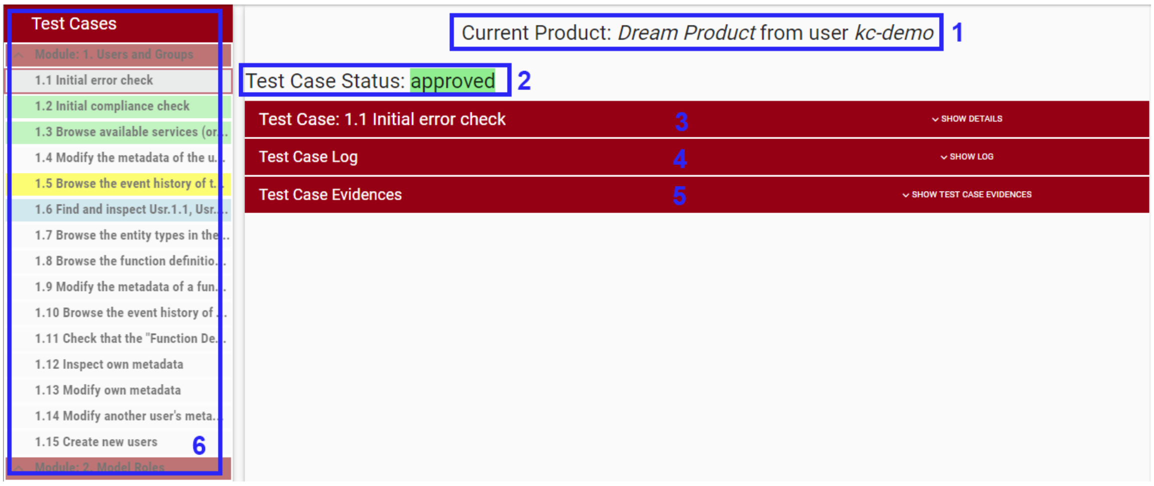


Figure 77. MoReq Assess Dashboard overview – *reviewer*.

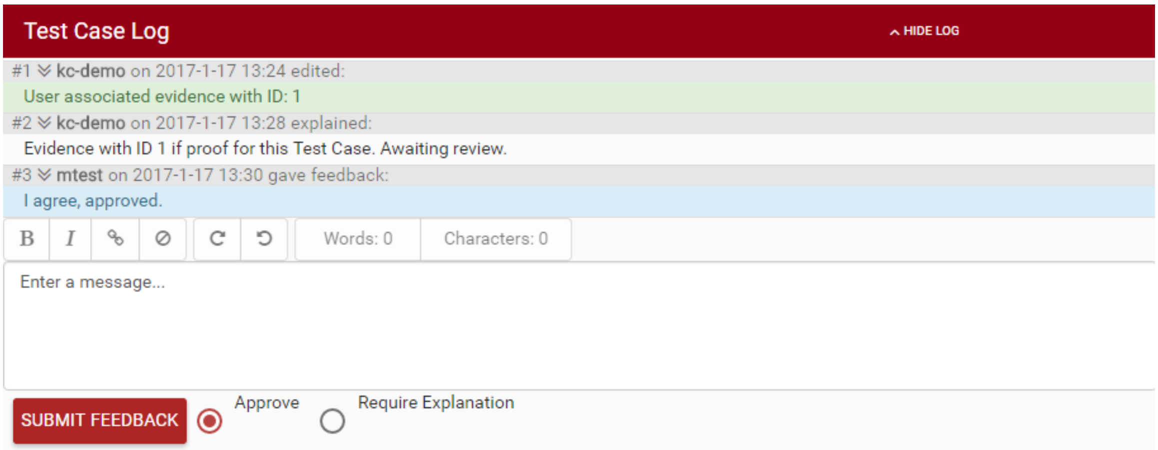


Figure 78. MoReq Assess Test case log – *reviewer*.

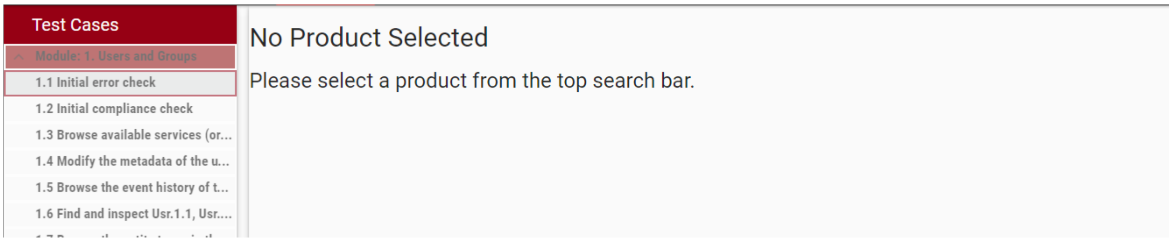


Figure 79. MoReq Assess No product selected.

4.2.5. Product Profile

The third view of the MoReq Assessment tool is the Product Profile (**Figure 80**). All users with tester permissions have one product associated with them and this is where they can see the information about their product. Reviewers see the information about the product they have currently selected.

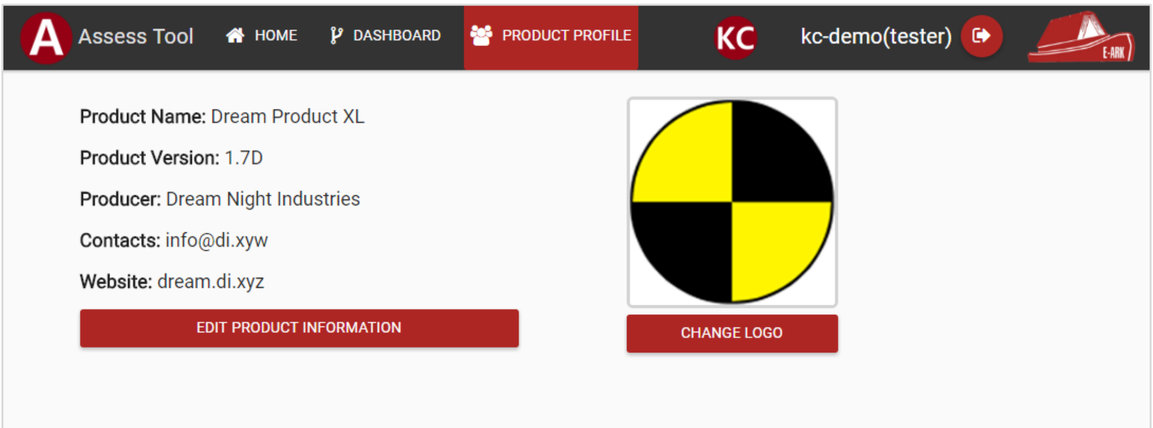


Figure 80. MoReq Assess product profile.

Testers can also edit their product's information (**Figure 81**, only name is required) and change their logo (**Figure 82**).

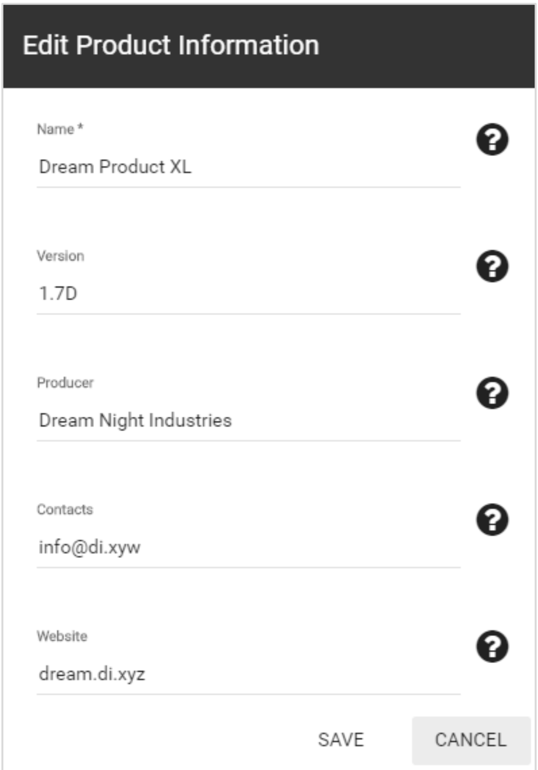


Figure 81. MoReq Assess Edit product information.

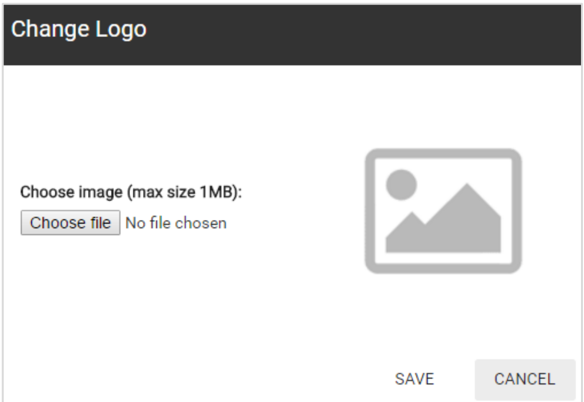


Figure 82. M0oReq Assess Change product logo.

4.3. Maturity Assessment

The maturity assessment was developed within the Knowledge Centre as a self-assessment questionnaire which consists of a set of questions that are used to determine the maturity level of information governance practice in organizations. This questionnaire assesses the maturity levels for each of the three dimensions of the maturity model detailed in D7.5 and D7.6. Each question is detailed with the following fields:

1. **ID:** Which identifies the number of the question in the overall questionnaire;
2. **Title:** Which depicts the main topic the question refers to;
3. **Question:** Which details the question itself;
4. **Objective:** Which details the objective of that question, what knowledge the question intends to capture;

5. **Notes:** Which either clarifies some aspects and/or terms of the question or details examples of evidence to substantiate the answer for the question;
6. **Terms:** Terms associated with the question that might require clarification. Terms are defined as a hyperlink to the corresponding definition in EVOC. EVOC is the vocabulary manager which makes part of the Knowledge Centre;
7. **Answers:** Which depicts five possible answers to the question.
8. **Comment:** A field for respondents to put comments that can be used to substantiate their answer.

The questionnaire starts by providing an introduction. This introduction provides details on the purpose of the questionnaire, how it will be analysed, and clarifies concepts being constantly used throughout the questionnaire. For each question there is a field that respondents can use to provide additional comments, clarifications or a justification to the answer. These comments can be used by the maturity model development team when reviewing the maturity model.

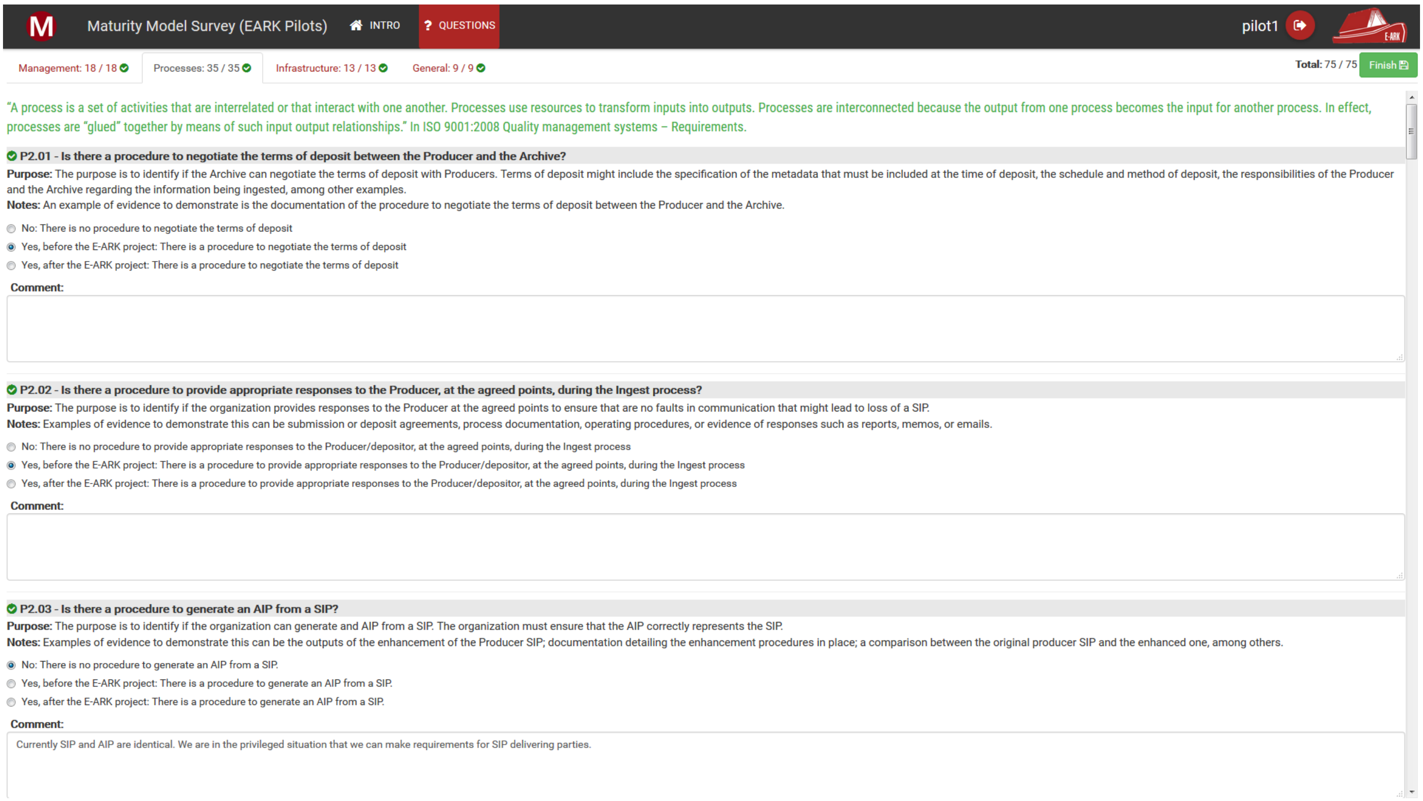
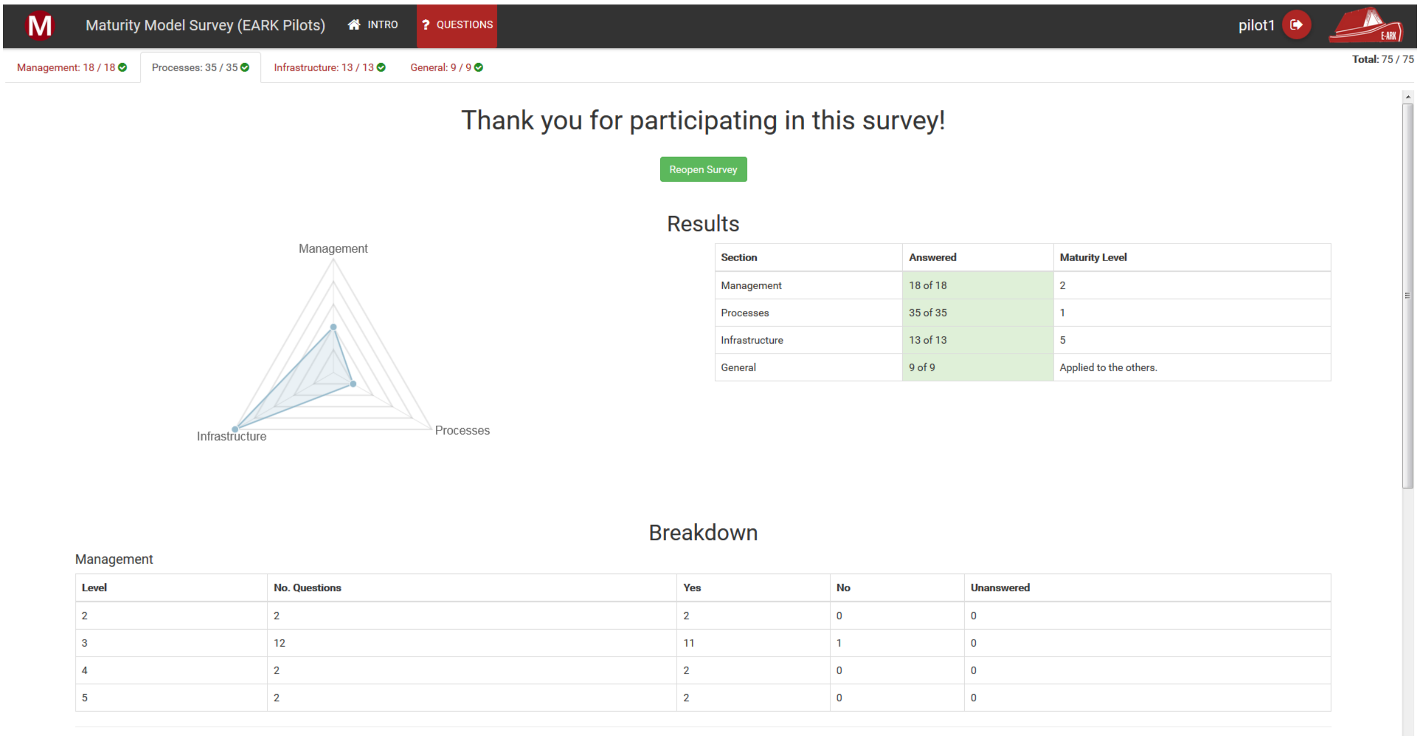


Figure 83. On-line Self-Assessment Questionnaire

The questionnaire is available on-line at http://earkmaturitysurvey.dlmforum.eu/. The questionnaire is presented in a set of four tabs, one for each of the dimensions of the maturity model and one for general questions that are used to assess maturity levels 4 and 5 of the other dimensions. Then in each tab a short description of the dimension is presented followed by the questions, objective, notes, terms, answers and a field for comments (shown in Figure 83).

After an organization fills the questionnaire a report is issued for that organization, depicted in Figure 84. This report presents the results of the assessment through a spider chart and specifies the results for each dimension by detailing the number of questions answered and the maturity level for that dimension. It also provides a detailed breakdown of the results for each dimension which includes the number of questions answered for each maturity level, the number of questions answered with "Yes" and "No" and the unanswered questions. Organizations can then build on these results and develop an improvement plan to cover the weak point found by this assessment with the ultimate goal of improving their information governance practice.



Section	Answered	Maturity Level
Management	18 of 18	2
Processes	35 of 35	1
Infrastructure	13 of 13	5
General	9 of 9	Applied to the others.

Level	No. Questions	Yes	No	Unanswered
2	2	2	0	0
3	12	11	1	0
4	2	2	0	0
5	2	2	0	0

Figure 84. Example of Maturity Assessment Results.

5. Conclusions and Future Work

The current version of the Knowledge Centre contains the services planned to gather, contribute and assess Information Governance good practices. At the moment, the service focus on Archival Management (the focus of the project) but it is capable of being extended to other related fields. The feedback received through the last year of the project in conferences and presentations about the Knowledge Centre is quite positive. Nonetheless, there are still opportunities for improvements to be carried by the DLM Forum as the future owner of the Knowledge Centre after the end of the project. Therefore, this section describes the main changes since the first prototype of the knowledge and the potential future work.

5.1. Changes from the prototype of the Knowledge Centre service

The first prototype of the Knowledge Centre was published in January 2016 and described in deliverable 7.3. From that date until the time of writing of this deliverable the prototype was promoted through conferences, presentations at national and international events, newsletters, workshops, among others. Consequently, users of the service were able to provide feedback to the developers to ensure that the services align with their expectations. That allowed us to define new requirements and prioritize developments. The main goal in the end was to have fully functional services that can without significant effort improve through use and demand. The following improvements were made:

- In the prototype version, the REQs service was capable of structuring reference documents into specific sections and chapters, link specific terms to their definitions to EVOC, and define shortcuts between text or chapters. The main goal was to promote a simpler way to use and navigate through the reference documents present in the system. In the current version, users are also able to contribute to the evolution of the reference documents by providing feedback in the document. Users can now comment specific sections of the text and, if the reference document owner is registered in the Knowledge Centre, he has the capability to react to the feedback provided by editing the document or replying to the provided comment.
- A new service, MoReq Assessment, was developed. The service guides users through the requirements defined in MoReq2010 in order to assist records management systems providers on the process of assessing if their systems are MoReq2010 compliant. The service uses the test cases defined for MoReq2010 and allows the submission of evidences of compliance. Evidences can be of any type: simple text, video, sound, images, etc. The service is described in Chapter 4.2 MoReq Assessment.
- The maturity assessment service was updated to incorporate the changes on the E-ARK maturity model since the prototype version. Additional, the service is now capable of providing immediate feedback in the form of charts and tables to the respondents of the survey in the service.
- To allow a simple use of the Knowledge Centre and to accommodate the necessary migration of the service to the DLM-Forum, the authentication system was centralized and integrated with the one on in the DLM-Forum website (http://www.dlmforum.eu/). Therefore, all previous registered users in DLM-Forum can use their accounts within the KC and a simple login in one of the services provides access to all other services in the Knowledge Centre. The notable exception being the Vocabulary Manager (EVOC), which was developed in the earlier stages of the project with its own authentication database but migration to the central authentication is planned in future work.
- To allow integration and use of the content on the Knowledge Centre by other tools, services or systems, an API was developed. Proper documentation of the API is still missing but the development team of the service is available to assist any effort of integration and use.

- A new section of the Knowledge Centre was developed focused specifically on E-ARK outputs. At the moment, it only includes the E-ARK General Model. In the future, it will include other outputs and developments of the project such as the E-ARK specifications.
- Through the use of the services, several minor bugs or unexpected behaviours were discovered that were corrected through the course of development.

5.2. Existing Services Improvements

Despite the extensive effort since the prototype version until now, there are still room for improvements in the Knowledge Centre. It is expected that with the migration of the service to the DLM-Forum and the establishment of the DLM Archival Standards (Maintenance) Board (entitled DAS Board), further developments will occur after the end of the E-ARK project. Therefore, the following represents a non-exhaustive list of possible improvements:

- The capability to relate terms within EVOC to define, for example, that a specific term is a specialization, generalization, similar, or equivalent to another;
- The expansion of the MoReq Export Validator Service to incorporate other schemas such as EAD/EAC, E-ARK specifications, etc.
- The functionality of associating multiple evidences to test cases within the MoReq Assessment service; and
- The capability of comparing maturity assessment results between users of the Maturity Assessment.

Appendix A – Technological Specifications

The Knowledge Centre was developed using the JavaScript programming language[14]. The main technology stack, and the current versions, used across the services is (**Figure 85**):

- Node.js[15] (v0.10.33) – the execution environment for the server-side application.
- MongoDB[16] (v2.6.10) – open-source document database. Interfaced with using the Mongoose ODM[17] (v4.3.4).
- Express.js[18] (v4.5.1) – the web application framework that runs on Node.js.
- Angular.js[19] (v1.4.8) – the JavaScript framework for the client-side application.

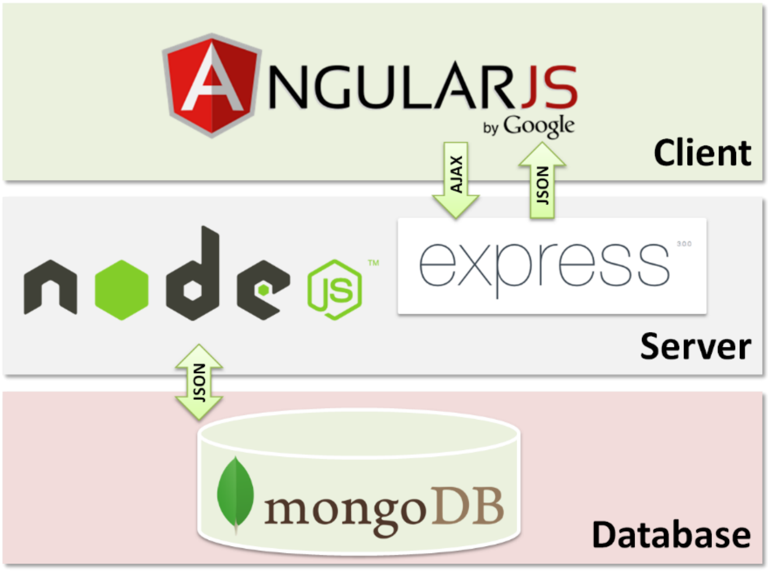


Figure 85. Base technology stack.

This technology stack follows the MVC[20] (Model-View-Controller) pattern. Mongoose is used to build the data model to be stored in the MongoDB (server-side), while Angular.js takes care of the views and controlling them (client-side). The bridge between the server (model) and client (view) sides is controlled by Express.js, while Node.js gives the foundations to build the application upon. The project libraries are managed using NPM[21] (Node Package Manager), server side, and Bower[22], client side, package managers.

Using Angular.js as the base framework, some important libraries were used to develop the user interface for the front-end of the Knowledge Centre services:

[14] https://www.javascript.com/
[15] https://nodejs.org/en/
[16] https://www.mongodb.org/
[17] http://mongoosejs.com/
[18] http://expressjs.com/
[19] https://angularjs.org/
[20] https://en.wikipedia.org/wiki/Model%E2%80%93view%E2%80%93controller
[21] https://www.npmjs.com/
[22] http://bower.io/

- Bootstrap[23] (v3.3.6) – styling framework for responsive applications.
- Font Awesome[24] (v4.5.0) - application icons toolkit.

Additionally, the following notable libraries were used in specific services of the Knowledge Centre.

EVOC and Maturity Assessment:

- js-xlsx[25] (v0.8.0)– Excel spreadsheet parser and writer.
- socket.io[26] (v1.4.4) – real time engine.

EVOC:

- node-jsonwebtoken[27] (v5.5.4) – JsonWebToken[28] implementation for node.js.

REQs:

- mongoose-schema-extend[29] (v0.2.0) – mongoose inheritance extension.

REQs, Maturity Assessment and MoReq Assessment:

- mongoose-deep-populate[30] (v2.0.3) – mongoose plugin to enable deep population of nested models.
- angular-material[31] (v0.11.2) – (front-end) material design implementation for angular.

[23] http://getbootstrap.com/
[24] https://fortawesome.github.io/Font-Awesome/
[25] https://github.com/SheetJS/js-xlsx
[26] http://socket.io/
[27] https://github.com/auth0/node-jsonwebtoken
[28] https://jwt.io/
[29] https://github.com/briankircho/mongoose-schema-extend
[30] mongoose-deep-populate
[31] https://material.angularjs.org/latest/