Deliverable 11.9:

Specification of the EURAD Knowledge Management (KM) platform (p-KMS)

Work Package 11 State-of-Knowledge

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Executive Summary

The EURAD KM is dealing with capturing knowledge in areas associated with RWM, which is structured along the EURAD GBS (Goal Breakdown Structure) [1] and to make it accessible to the end users. Deliverable 11.9 is an outcome of Task 1 of the EURAD WP 11 (SoK), and is based on a previous screening and review of existing KM approaches and tools that are currently used in RWM organisations (Deliverable 11.1 [2]).

Based on these recommendations [2], a EURAD portal knowledge management system (p-KMS) will provide a structured system for accessing the internal knowledge base (documents, reports, guidance, procedures etc.) and external information sources, and ensure knowledge dissemination and long-term preservation in the RWM area within and beyond the EURAD community. The p-KMS preference should be an integrated digital web-based platform, offering users tools for KM and collaboration workspace, which involves governance, processes, people and technology. Beyond searching and accessing various types of knowledge, the possibility to commenting, providing feedback and contributing to the development of knowledge should also be essential features of the p-KMS. This goes along with guaranteeing a long-term operability of this p-KMS. The outcome of this Deliverable 11.9 is an initial proposal that addresses both essential (basic) and advanced functionalities considered necessary for a p-KMS.

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Glossary

The following are common terms to be used in the context of the EURAD Roadmap. They are specifically adapted for and directly linked to EURAD Knowledge Management and might thus deviate from definitions used in other communities. Please do not consider this list to be final and comprehensive, it will be expanded as needed during the development of EURAD.

Community of Practice (CoP)

A voluntary group of peer practitioners who share lessons learnt, methods, and best practices in a given discipline or for specialised work. The term also refers to a network of people who work on similar processes or in similar disciplines, and who come together to develop and share their knowledge in that field for the benefit of both themselves and their and other organisation(s).

Concept Maps

Tools for organising and representing knowledge.

Content

The interactive and non-interactive object containing information represented by text, image, video, sound or other media.

Content Management

The processes and workflows involved in organising, categorising and structuring information resources so that they can be stored, published and reused in multiple ways.

Critical Knowledge

Critical knowledge refers to the specific information, skills, and expertise that are essential to the success of an organisation or individual in a particular field or industry. It is the knowledge that is crucial for achieving key objectives, solving complex problems, and making critical decisions. When this essential knowledge is at risk of being lost, it becomes critical.

Document Management

Systems and processes for managing documents including the creation, editing, production, storage, indexing and disposal of documents. This often refers to electronic documents and uses specific document management software.

Domain

An area of activity, interest, or knowledge, especially one that a particular person, organisation etc. deals with. It represents the lowest level of the EURAD Roadmap Goal Breakdown Structure.

Domain Insight (DI) Documents

Context documents that provide direct links for each knowledge domain to safety and implementation goals related to RWM requirements.

EURAD

The European Joint Programme on Radioactive Waste Management (EURAD). Also referred to as the ‘Joint Programme’.

Expert

Someone widely recognised as a reliable source of knowledge, technique or skill whose faculty for judging or deciding rightly, justly, or wisely is accorded authority and status by their peers or the public in a specific well-distinguished domain.

Glossary

A glossary is a list of specialised terms and their definitions used in a particular field or text.

Goal Breakdown Structure (GBS)

The EURAD goal breakdown structure is a thematic breakdown of knowledge and generic activities essential for radioactive waste management. It comprises Themes (Level 1), Sub- themes (Level 2) and Domains (Level 3), each formulated as goals. Although hierarchical and numbered, the knowledge and activities presented across the GBS should be considered collectively with no weighting to order of importance. Rather it is emphasised that there are many inter-dependencies and linked data across the GBS, where knowledge and activities can be centred in different ways, depending on the end user role and precise boundary conditions of the RWM programme to which the roadmap is applied.

Information Management

The management of an organisation's information resources with the aim of improving the performance of the organisation. Information management underpins knowledge management, as knowledge is derived from information.

Information Transfer Policy

The information transfer policy means that information and information assets will be transmitted between departments, service providers, private entities, and individuals. Information is transported through several media and methods in both electronic and paper formats.

Knowledge

Knowledge is the acquisition, understanding and interpretation of information. It is often used to refer to bodies of facts and principles accumulated by humankind over the course of time. Knowledge and information each consists of true statements, but knowledge serves a purpose: knowledge confers a capacity for effective action.

Knowledge Ambassador

A person which plays an active role in supporting knowledge sharing and effective integration of knowledge management strategies in WPs.

Knowledge Base

A collection of knowledge in the form of subject-problem-solution information that pertains to a specific topic or subject of interest. A knowledge base is a special kind of database for knowledge management.

Knowledge Management (KM)

An integrated, systematic approach of identifying, managing and sharing an organisation's knowledge and enabling groups of people to create new knowledge collectively to help in achieving the organisation's objectives.

Knowledge Management System (KMS)

A system for applying and using knowledge management principles to typically enable to create, share and find relevant information and knowledge quickly.

Knowledge Preservation

A process of maintaining an organisational system of knowledge and capabilities that preserves and stores perceptions, actions and experiences over time and secures the possibility of recall for the future.

Metadata

Descriptors which define and describe the data and the circumstances of their creation (date, persons, locations, institutions, treaties, liabilities, storages, access modes etc.)

Ontology

A formal specification of a shared conceptualisation of a domain of knowledge. An ontology defines a set of concepts and categories, as well as the relationships between them, and can be used to facilitate communication and knowledge sharing within a particular domain.

Portal

A tool to integrate many existing systems within an organisation as well as to provide a solid platform to develop other knowledge management initiatives, enhancing the efficiency of communication and of organisational processes. A portal greatly facilitates the production, accessibility, sharing and effective use of valuable information. It also guarantees generation and usage of information at different times or across different locations and teams.

Portal-Knowledge Management System (p-KMS)

A comprehensive access structure to resources that are suitable to support the fundamental activities of knowledge management to communicate, study and do research.

Radioactive Waste Management (RWM)

All activities, administrative and operational, that are involved in the handling, pre-treatment, treatment, conditioning, transport, storage and disposal of radioactive waste.

Roadmap

A generic RWM framework to organise different typical scientific and technical domains and sub-domains in a logical manner against different phases of a RWM programme.

Self-activity tracking

Self-activity tracking is a process of tracking, collecting, and analysing by users' they behaviour on websites, apps, or devices**.** It track self-activity on the website, including the use of applications, actions performed on the website like a scroll, click, form filling, etc.

Semantic search engine

Semantic search describes a search engine's attempt to generate the most accurate search engine results page (SERP) results possible by understanding based on searcher intent, query context, and the relationship between words.

State-of-Knowledge (SoK)

Experts' view of the most relevant knowledge and associated uncertainties in a specific domain/sub-domain applied in the context of a radioactive waste management programme.

State-of-the-Art (SotA)

"State-of-the-art" refers to the current level of advancement in a particular field, technique, or technology. It is used to describe the highest level of performance achieved by the most advanced research or development in a given area.

Strategic Research Agenda (SRA)

Describes the scientific and technical domains (and sub-domains) and knowledge management needs of common interest between EURAD participant organisations.

Taxonomy

A hierarchical structure in which a body of information or knowledge is categorised, allowing an understanding of how that body of knowledge can be broken down into parts, and how its various parts relate to each other. Taxonomies are used to organise information in systems, thereby helping users to retrieve relevant information.

Text Mining

Text mining, also known as text data mining, is the process of extracting valuable insights and knowledge from large amounts of unstructured textual data. It involves using computational techniques to analyse and understand patterns, trends, and relationships within textual data, with the goal of uncovering hidden information and improving decision-making. Text mining techniques typically involve several steps, including data pre-processing (such as removing stop words and stemming), feature extraction, text classification (such as using machine learning algorithms), and clustering (such as grouping similar documents together).

Themes

Large groupings of related Knowledge Domains typical in Radioactive Waste Management. They are the highest level of the EURAD Roadmap Goals Breakdown Structure.

Theme Overview (TO)

Broad description of programme goals and typical activities for each theme and how they evolve over the phases of implementation.

Vocabulary

A set of terms to support consistent indexing and end user navigation, browsing and searching. It gathers synonyms, acronyms, variant spellings, relation etc.

Work Package (WP)

A group of related tasks established within EURAD. Because they look like projects themselves, they are often thought of as sub-projects within the Joint Programme.

1. Introduction

EURAD is a unique Strategic Programme in which Waste Management Organisations (WMOs), Technical Support Organisations (TSOs), and Research Entities (REs) work together to ensure cutting-edge knowledge creation and preservation in view of delivering safe, sustainable and publicly acceptable solutions for the management of radioactive waste across Europe now and in the future [5].

EURAD Knowledge Management (KM) has comprehensive access to knowledge on many aspects of RWM (Radioactive Waste Management). It is the goal of the EURAD Work Package State-of-Knowledge (WP SoK) to use this access to RWM knowledge to establish the State-of-Knowledge (SoK), which considers preserving, capitalising of and providing open-access to knowledge generated in the field of RWM research that can be extracted by present and future generations of experts and by any interested end-users (from WMOs, TSOs, REs, Programme Owners, research community at large, international organisations, and Civil Society).

For that purpose, existing web-based platforms and/or tools that have been developed for similar purposes were surveyed and reviewed with respect to their suitability and functionalities. Based on this survey and review, actions to develop and implement a p-KMS were derived, together with five major categories of prerequisites being essential for planning, developing, implementing and maintaining a large-scale, sustainable portal KM system. All these findings have been published in Deliverable 11.1 [2], which in its conclusions also proposed a set of features and capabilities required for the upcoming EURAD p-KMS. They were prioritised based on currently running established systems. A list of links originating from [2] is presented in Appendix B.

This deliverable 11.9 is also directly related to “task 1 - Knowledge Platform: Specification.” The resources required to fulfil these tasks are one subject of document MS242, the next step towards the EURAD p-KMS.

The dynamic growth of information technologies provides an opportunity to develop an integrative portal-type application that assimilates knowledge in the form of KM assets and allows users getting access from other locations. The p-KMS will be scalable, flexible to store different types and formats of information (including metadata), extensible to adjust for future developments and also contains collaborative tools to facilitate the exchange between experts and knowledge searcher. It will also use and integrate modern technologies like data mining (semantic technologies and big data processing tools) and AI.

The p-KMS is intended to provide open access to the EURAD knowledge repository (see Fig. 1), to support a knowledge sharing culture and to contribute and facilitate continuous learning. The technological tools (which is an electronic, digital or physical tool that can expand the human ability for performing tasks or generating products) under consideration include database management systems, document management systems, communication systems (messaging, e-mails), and workflow systems. Thus, world-wide access with any operating system is possible via respective internet browsers. The aim of this portal is not only to provide unlimited access to the knowledge in RWM, but also to ensure extensive interactions between members of EURAD and the RWM community. This p-KMS aims to

provide a fit-for-purpose technical solution that covers all phases of the KM lifecycle, including knowledge capture, creation, storage, processing and access, and to bring it in line with statutory and regulatory guidelines. Chapter 2 shows the lifecycle of the portal, i.e., the path a portal takes from strategy through implementation to production. It describes the hierarchical organisation of the knowledge which is generated within EURAD. The lifecycle of the portal contains strategy, design, development, implementation, testing, populating with content, deployment, and maintenance (updating of the content and upgrading the portal's functionality) [3]. Once a portal is implemented, it will be connected to the EURAD documents repository (e.g., ProjectPlace). The EURAD GBS is divided into different levels which are 7 Themes, 21 Sub-Themes and 79 Domains [1]. The associated types of EURAD KM documents for each domain are DIs and SoKs. Further, State-of-the-Art documents (SotAs) from EURAD RD&D WPs, guidance documents, reports from previous EURATOM research activities, as well as external documents will be integrated. The access to these documents will be provided through the portal after user registration the assignment of respective access rights, e.g., for "visitors", "administrators" or "contributors". Chapter 3 then contains a list of prerequisites for the development of a p-KMS derived from [2]. Especially, the application of a semantic approach (search functions) will enable users to carry out advanced and multi optional inquiries on the portal and in external databases from international organisations being active in RWM. The requirements for such a p-KMS are divided into two tiers: essential features are mandatory for the fundamental working processes of the p-KMS, whereas optional features will improve the effectiveness of the p-KMS and could be implemented step by step at later phases of the portal development. Such improvements are expected from more intensive user feedback (and their mutual interactions through p-KMS tools like forum or newsletters). Beside the information and data, users should also benefit from useful links to international databases, ongoing activities and training courses - all in the field of RWM. Moreover, the portal should also support the EURAD KM Communities of Practice (CoPs) by hosting their dedicated workspaces, and making the ideas, discussions and lesson learnt accessible to all members of the CoPs and beyond. The security of information has to be also taken into account and has to be set up in accordance with international standards. The procedure is also described in chapter 3. The final chapter 4 Conclusions summarises all of the above presented major findings. In addition, procedures to develop a suitable p-KMS are sketched in the appendices and more details are elaborated in the associated MS242 document "Specification of the EURAD p-KMS (prototype)" [4].

2. Outline of the EURAD p-KMS management

The portal lifecycle management consists of implementation (design, development, testing and configuration) and maintenance (content management and validation) [6].

The outline of the EURAD p-KMS management is supported by the following documents:

1. Requirements extracted from the survey and the questionnaire, see Deliverable 11.1: "Screening and review of existing/available knowledge management approaches and/or tools" [2]
2. Design of the portal based on necessary requirements, see Deliverable 11.9: "Specification of the EURAD KM platform (p-KMS)" as an initial proposal addressing basic SoK platform functionalities (this document)
3. Implementation of the portal, see Milestone 242: "Specification of the EURAD KM platform (p-KMS)" as a complete implementation plan is prepared and will be handed over to the Programme Management Office (PMO) [4]

Knowledge architecture outline

One of the purposes of the p-KMS is to provide open access to RWM knowledge by sharing it among the EURAD and EU RWM Community and by ensuring knowledge transfer between generations. Consequently, the EURAD p-KMS is planned to be an integrated repository of architecturally structured knowledge (including knowledge capture, creation, storage, processing and access to information and data). The EURAD KM programme uses a hierarchical structure, as illustrated in Figure 1. There are several document categories directly linked to the EURAD KM documents, making up the uppermost three layers of the graph: i) Theme Overview (TO) documents, ii) Domain Insight (DI) documents, and iii) SoK documents. Although the documents vary in their level of detail (with the level of detail increasing from TO over DI to SoK documents), scope and style, all of them have in common that signposting to other existing resources and literature is fundamental. It should be noted that other types of documents are produced in the framework of EURAD KM, such as Guidance documents, under the coordination of WP12 Guidance, Mobility Reports, under the coordination of WP13 Training & Mobility, and State-of-the-Art (SotA) Reports by the R&D WPs, which all are an integral part of the EURAD KM programme [7].

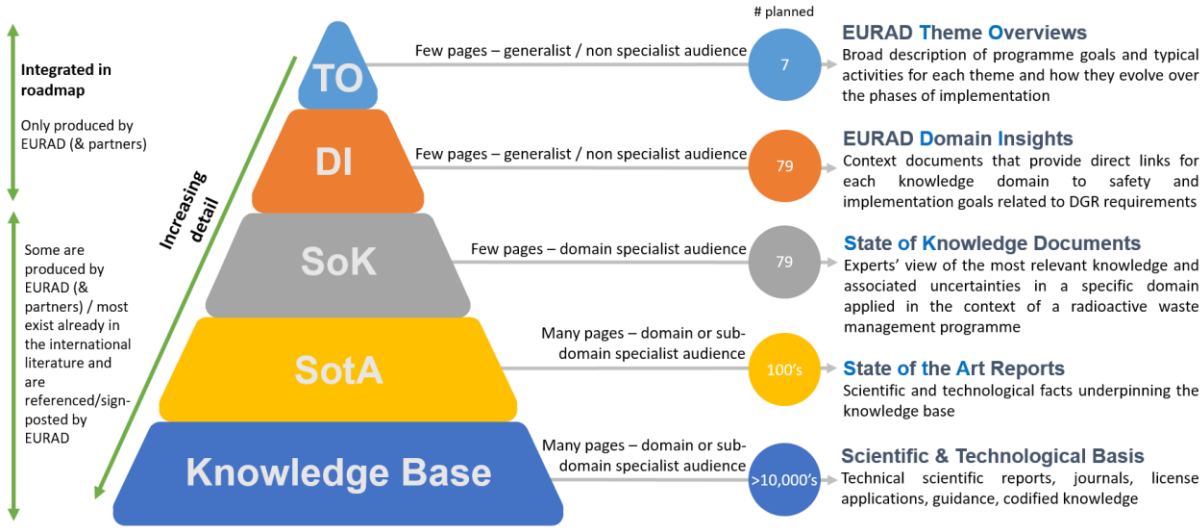


Figure 1: Hierarchy of documents that are relevant for the work of WP11 SoK in the EURAD KM programme [7].

Information management outline

The EURAD knowledge repository on p-KMS will consist of well-structured (following the GBS nomenclature) information (TO, DI, SoK, SotA) managed by a document management system and many unstructured data (links, records, videos, news) that is managed by a content management system. The knowledge database may be stored on a local IT infrastructure maintained by the associated organisation of a EURAD Community member, or it may be connected to an external source, e.g. as cloud storage. The access to the p-KMS will be web-based, and the knowledge seeker can use a "text mining" tool (see Glossary) to automatically find, extract, filter, categorise and analyse the desired information and resources.

To further foster not only the implementation of a p-KMS but even more prominently the generation, structuring and supply of RWM knowledge from within EURAD WPs, the role of KM Ambassador was introduced within each EURAD WP. Currently, this is mostly occupied by the respective WP leader but should be assigned to a dedicated person in the future as the workload of a WP leader is already high. This will be accompanied by a more detailed definition of the tasks and responsibilities of such KM Ambassadors based on the experiences gained in the EURAD years 3-5.

Knowledge indexing outline

The portal shall incorporate relevant metadata to ensure correct cataloguing and indexing. The keywords and key phrases (classified vocabulary) in the documents are also an important form of metadata, and their extraction will be an essential task for a semantic approach [8]. The effectiveness and relevance will depend on finding a sufficient number of quality keywords from the text. The portal must be able to process the data through semantic engines coming from different data sources. As a result, the function applies the proper context to quickly locate the searched information.

A semantic approach should support and provide:

- Abstracting and summarising. This task aims at delivering shorter, informative representations of larger (sets of) documents
- Comparison and search. This task finds semantically similar information
- Indexing and classification. This considers texts, usually according to certain categories
- Translation. Context-driven translation of texts from one language into another
- Question formulation and query answering. This task is based on intellectual systems analysis
- Extraction of information. This refers to the extraction of information stored in different formats

A semantic approach enhances knowledge transfer and sharing through standardisation. To apply a semantic approach, knowledge needs first to be categorised and ontology or taxonomy must be created. Both will assist to store information and will provide a classification scheme for existing data and data to be uploaded in the future. It also will serve for data search, extraction and findability of the data. Another advantage of the automated or semi-automated semantic approach is that it significantly reduces the time experts have to be involved in the otherwise time-consuming process.

Storage, access and collaboration outline

The existing knowledge base (e.g., reports, scientific publications) is and remains crucial for a thorough understanding of RWM-relevant subjects. All EURAD documents shall be stored on one server and can be accessed from anywhere. Important communication components of the portal include one-to-one and one-to-many communication channels, and a forum which allows people to have discussions and collaborative interchanges.

Beside a powerful search engine, the portal will provide the collaborative tools[1] for sharing information between EURAD WPs and the CoP. These tools will have restricted access, however they will allow collaboration between both internal and external users. Group calendars and forums for discussion on the EURAD portal-KMS will support user collaboration.

A formal user registration should be implemented to enable the assignment of access rights, e.g., in terms of "visitors", "contributors" or "administrators". The categorisation of the users has to be defined, and access rights should be restricted to a small group. The process of allocating access rights has to be strictly controlled. Modification and updates of the portal content shall be done only by authorised users and has to be kept under control by respective authorisation and versioning processes. This will allow tracing changes and the history of the content. User access rights can be reviewed and re-allocated from one role to another.

There will be several user roles defined in a hierarchical manner, where the respective access rights can be reviewed and re-allocated from one role to another:

1) It starts with the “visitor”, an external person which, e.g., wants to learn about the scope and functionality of the p-KMS. For this role, there is no access to the real content of the p-KMS

[1] Examples for collaborative tools suitable for a p-KMS are forums, emails, instant messaging, notifications, calendar sharing tools, documents sharing, whiteboards etc.

foreseen, but on the contrary there is also no registration necessary to keep the entrance obstacles as low as possible.

2) If such “visitors” become interested in the p-KMS, they can register (the details of which information is asked for, and how identity is counter-checked is still to be defined) and change their role to “users”. Then they have access to all the RWM-related content of the p-KMS, and they are also allowed to take part in the internal communication channels (with other users and also the “custodians” and “contributors”).
3) A third role is labelled “contributors”. Again they need a registration, combined with more rigorous checks of their identity. Such “contributors” have all permissions a “user” has, but they can actively contribute new knowledge to the system or update the existing one (corrections or extensions). Such new or changed content has to be verified before moving from a “preliminary status – on hold” to full access by the “users”.
4) The fourth role is the “custodian”, these persons (probably only 2-3) are required to maintain the quality of the p-KMS content, e.g. by double-checking new or changed content, by regularly processing user feedback with respect to content, and other duties (e.g. legal issues) still to be negotiated. Their permissions are more extensive than the “contributors”.
5) The role with the largest range of permissions is the “administrator”, who has full access to the p-KMS. He is not responsible for any content, but has to keep the p-KMS running by taking care for system performance (hardware and software issues), backup and mirroring, versioning, and processing user feedback / recommendations with respect to the functionality of the p-KMS.

3. List of recommended p-KMS features

The list of features explained and categorised in this chapter has been derived from the outcome of Deliverable 11.1 [2] (which in turn is to a large degree based on responses to a KMS questionnaire, for details see D11.1). After issuing D11.1, internal and external discussions with IT and KMS experts continued, i.e. existing web-based platforms and/or tools that have been developed for similar purposes were surveyed and reviewed with respect to their suitability and functionalities. A list of links originating from [2] or identified in the follow-up discussions is presented in Appendix B.

Based on these survey, review and discussions, actions to develop and implement a p-KMS were derived, together with five major categories of prerequisites being essential for planning, implementing and maintaining a large-scale, sustainable portal KM system. This eventually led to the outline of the portal, entailing everything the portal must and can be able to do. These are: the portal layout, portal utility, content and document management, portal functionality and security issues. The features are divided into two groups: essential and additional features. This prioritisation is based on currently running established systems. The essential features are mandatory for the fundamental working processes of the p-KMS. The additional features will improve the effectiveness of the p-KMS and can be implemented step by step at later phases of the portal development.

Based on the recommendations provided by RWM organisations [2], the list of features is the outline of the portal, entailing everything the portal must and can be able to do. These are: the portal layout, portal utility, content and document management, portal functionality and security issues. The features have been divided into two groups: essential features and additional features. The essential features are mandatory for the fundamental working processes of the p-KMS. The additional features will improve the effectiveness of the p-KMS and can be implemented step by step at later phases of the portal development.

3.1. Portal layout

A portal layout is a template that defines a set of selected portlets[2] that should appear on a page. The portal layout has to comply with the standards and best practices for the design of user-friendly interfaces. A very broad overview of internationally accepted standards for graphical user interfaces can be found in [9]. For a quick start into the topic, there are plenty of web pages available, a fine example is [10]. The presentation format of the portal should be independent of the information content of the website, which allows displaying the information on different devices [3].

- Essential features:
    - Self-activity tracking tools (as self-activity tracking technology develops, users are given more power in collecting their individual data, to monitor their own activities on the portal, track their achievements and help users set goals)

[2] A pluggable user interface component making up part of a portal.

  - Easily integrated with other software (e.g. Microsoft Office 365) and Learning Management Systems (LMS, e.g. Moodle)
  - Notification system (as content changes notifications should be send to the users)
- Optional features:
  - Well-designed dashboard (intuitive structure and access)
  - Social features (for announcements on: Facebook, LinkedIn, Twitter etc.)
  - The p-KMS must be useable on very different screen sizes. Thus, a mobile version of the portal should be made available for smartphones and tablets

3.2. Portal utility

There are functionalities that the portal should support in order to provide users with diverse means of interaction with the p-KMS. Such interactions should be straightforward, user-friendly and self-explanatory to lower any obstacles for utilising them.

- Essential features:
  - Access to essential information (usage, terms, etc.) through a Q&A section / FAQ
  - Multimedia support
  - Providing a contact point for users to reach RWM experts and Knowledge Managers. Knowledge Ambassadors of the individual RD&D WP should be involved.
  - Offer a variety of feedback option:
    - Users to content managers (users should have an option to leave feedback on improvements, etc.)
    - Content manager to users (users should receive a response that their feedback is received and how it will be used)
    - To provide the system with a tracking of the correctness of the responses provided, which enables the learning function of the semantic engine to continuously improve the semantic associations
- Optional features:
  - Portal help tools (from pop-up texts over manuals to video tutorials)

3.3. Content and document management

Content includes every type of data and information source that is used on the portal. Thus, a set of policies (information security policy, information transfer policy) must be defined together with the EURAD IT experts' group[3] and approved by the PMO.

- Essential features

[3] The IT Expert's Group is a group of experts and programmers specialised in information technology, drawn from the pool of EURAD partners but also extending into external institutions such as IAEA and OECD-NEA. The tasks for this group are defined as follow: provide feedback to the p-KMS feature list, monitoring, evaluation and assessment of the p-KMS development and implementation, recommendations to expand the capabilities of the portal in future, support the content management strategy.

- User identification and access rights (more details are provided in chapter 2 Outline of the EURAD p-KMS management)
- Ensure that knowledge inventory is up-to-date, and all revisions are saved, secured and protected
- Alerting mechanisms to display new published content automatically to users that indicate specific interests and notify users (based on their expertise, categorisation of users) when a document is created, updated, needs to be reviewed or expires
- Possibility to tag content and create widgets to display newly published content automatically to specific sections of the portal
- Support a systematic sharing of KM experience in RWM (case studies, lesson learnt, successful stories) with EURAD experts and other members
- Provide a clear hierarchy of knowledge following the GBS
- Validate the knowledge organised by appointed Knowledge Managers including the audit of the documents
- Continuous addition of valuable information and timely updating of stored externally available knowledge

- Optional features:
  - Option to save previous versions of uploaded documents

3.4. Portal integration

The functionality is defined as the series of tasks to support integration with existing systems, retrievability of their information, data and knowledge, the collaborations by guaranteeing the secure usage of the portal resources.

- Essential features:
  - Option to connect to knowledge bases (via import or link) from:
    - Explicit knowledge from external resources at the portal (links to other nuclear portals and resources)
    - EURAD Knowledge Base and other WPs documents (e.g. from ProjectPlace)
    - EURAD KM WiKi
  - Link to EURAD training & mobility program website
- Optional features:
  - Links to activities (training courses, conferences, and workshops) in other RWM organisations (IAEA, NEA/OECD, World Nuclear Association (WNA) & waste management facilities). The users will be kept updated with ongoing and upcoming activities on regular basis.

3.5. Retrievability of the data, information and knowledge

There is a need to choose and implement a semantic approach enabling complex queries in the form of full sentences to be used for information retrieval based on similarity of concepts for the effective 'search' capability, going beyond local search (within the EURAD database). In this context, artificial intelligence (AI) could play an important role in a p-KMS, as it enables more efficient and effective management of knowledge. An AI-powered p-KMS can help analyse large amounts of data and help provide valuable insights to the knowledge searcher quickly. Thus, AI connects people to things and people to people, it would be recommended to use AI in portal–KMS for efficient and effective management of knowledge.

- Essential features:
  - Capability to index various document types/file formats
  - Well-structured multi-search options (multiple search option in a single request)
  - Option to refine search by categories (e.g. tags & keywords, organisations, date, authors)
  - The search should include all file formats: Video & Images, PDF, Word etc.
- Optional features:
  - General/global search (outside of the EURAD sources)
  - Integration of external content in the search index or integration of external search engines
  - Option to refine search by multiple categories and tags at once

3.6. Categorisation of knowledge for the effective search and navigation

Enabling a targeted, comprehensive and efficient search for specific information within the p-KMS requires several features.

- Essential features:
  - Pride an adapted vocabulary covering GBS
  - Congruence with the EURAD roadmap Glossary
  - Making use of ontologies (see Glossary of this document)
- Optional features:
  - Multilingualism (option to recall information on different languages)
  - Making use of taxonomy (see Glossary of this document)
  - Provision of keywords and key phrases

3.7. Collaborative tools

These tools support synergism of collaborative actions and respond to changes as quickly as they are expected (continuous delivery).

- Essential features:
  - Define accessibility option (close or open for external users, or limited access)

  - Provision of collaboration spaces for internal (collaboration between WPs) and external (collaboration of CoPs & public)
  - Establish a collaboration mechanism with external experts (outside of the EURAD Community)
  - WPs and CoPs calendar
  - Competence map of EURAD Experts and DI authors (so called “Who is Who”)
- Optional features:
  - Forums
  - E-workspace, which allows EURAD community members to have online discussions in order to exchange information, experience and insights on project issues
  - Newsletter for the distribution and dissemination of the knowledge
  - Easily track user activity (in accordance with national data protection laws) including publishers

3.8. Security and maintenance issues

The digitalisation and automation of information and knowledge transfer facilitate the process to achieve solutions on a continuous basis. Thus, the digital transformation is planned to support the EURAD community members with knowledge and recommendations on the sustainable KM implementation within their organisations. The performance considers application of sustainable practices and tools such as a portal. To maximise the effectiveness of the sustainability approaches and integration to KM in RWM the portal-KMS shall have a security policy to safeguard its own operation, content and all personal data. The portal developers shall take precautions to preserve data integrity and security [4, 11].

- Essential features:
  - Review of the portal functionality by the EURAD IT expert group with the support of the EURAD KM CoP
  - Continuous addition of valuable information and timely updating of stored knowledge
  - Statistical data collection: views, downloads, changing, most often used topics, often updated documents, countries; use of cookies
  - Tracking of changes made to the content (as an option only authorised users can make changes in documents)
  - Backup and mirroring option: definition of preventive actions for loss of data and electronic documents in case of hardware or software faults
  - User identification and access rights (Established personal data protection)
  - Well defined and easy to control user access permissions and levels

4. Conclusions

The primary objective of this Deliverable 11.9 document is to provide suggestions/recommendations for implementing a portal-KMS with a long-term perspective. As a result, this document has collected and categorised essential and optional features for planning, developing, implementing and maintaining a large-scale, sustainable web-based p-KMS for RWM. Such a listing of the features will also help to adjust for the available budget and timeline, for the latter see also Appendix C. The respective list of features contains the portal layout, portal utility, portal functionality, the content and document management, portal integration, retrievability of the data, categorisation of knowledge for the effective search and navigation, collaborative tools, as well as security and audit issues. These features are proposed based on the requirements of currently available analogous market products. Namely, the essential features will be the basis for further p-KMS planning, calls-for-tender (unless relying on internal resources of EURAD partners), and thus should facilitate the final decision-making process.

The detailed implementation plan is provided in the document Milestones MS242 “Specification of the EURAD p-KMS (prototype)” [4], which is based on the general design principles given in Appendices A and B of the MS242 document [4]. Another important recommendation given by the surveyed organisations [2] for portal layout was to build an attractive portal. The portal should be equally accessible from different display formats [3]. It should also provide a self-tracking tool and should be easily compatible with other software and systems (e.g. Microsoft Office 365 or LibreOffice, learning management systems). Also, it should include a collaboration mechanism with external experts (outside of the EURAD Community), well-structured multi-search options, ideally in all formats of information (e.g. video & images, PDF, MS Word files etc.), standardised vocabulary and have feedback, backup and mirroring mechanisms. An optional feature of the portal development is a mobile version that should also be available for smartphones and tablets.

5. References

[1] EURAD Roadmap - A generic framework to organise typical scientific and technical domains in a logical manner against different phrases of a RWM programme. Deliverable 1.7: EURAD Roadmap, extended with Competence Matrix. The work is done within the HORIZON 2020 project EURAD, under the EC Grant agreement no: 847593. https://www.ejp-eurad.eu/roadmap

[2] Abbasova D., Arnold, T., Brendler, V., Franzen, C. (2021): Screening and review of existing/available knowledge management approaches and/or tools. Final version as of 08.03.2021 of deliverable D11.1 of the HORIZON 2020 project EURAD. EC Grant agreement no: 847593.

[3] ISO/IEC/IEEE 23026:2015(en) Systems and software's engineering-Engineering and management of websites for systems, software, and service information.

[4] Abbasova D., Arnold, T., Brendler, V., Franzen, C. (2022): Specification of the EURAD p-KMS. Final version as of 27.01.2023 of milestone MS242 of the HORIZON 2020 project EURAD. EC Grant agreement no: 847593.

[5] https://www.ejp-eurad.eu/about-eurad

[6] ISO/IEC/IEEE 26531:2015(en) Systems and software engineering — Content management for product life-cycle, user and service management documentation.

[7] Knuuti T., Tatomir, A., Göbel, A., Franzen, C., Abbasova, D., Arnold, T., Brendler, V., Fuzik, K. (EURADWASTE22) (2022): Capturing the State-of-Knowledge in EURAD Knowledge Management. EPJ Nuclear Sciences & Technologies 8:37, 2022, https://epjn.epj.org/articles/epjn/abs/2022/01/epjn220029/epjn220029.html

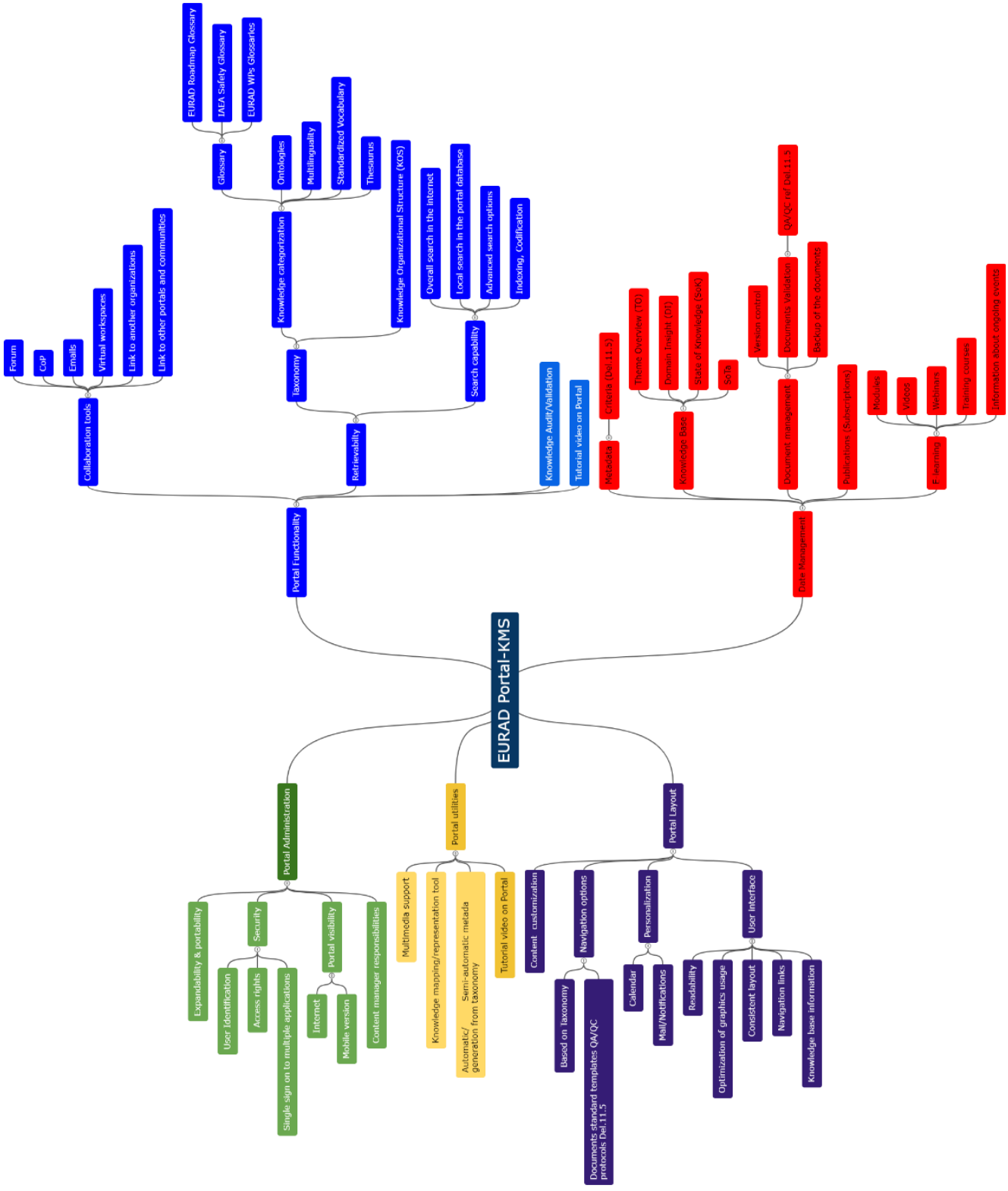
[8] Exploring semantic technologies and their application to nuclear knowledge management, IAEA, 2021, ISSN1995-7807, NG-T-6.15.

[9] Galitz, W.O. (2007) The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, 3rd Edition, ISBN: 978-0-470-05342-3, John Wiley & Sons, 888 pp.

[10] https://www.interaction-design.org/literature/article/user-interface-design-guidelines-10-rules-of-thumb

[11] ISO/IEC 270027:2013 Information technology – Security techniques-Code of practice for information security control.

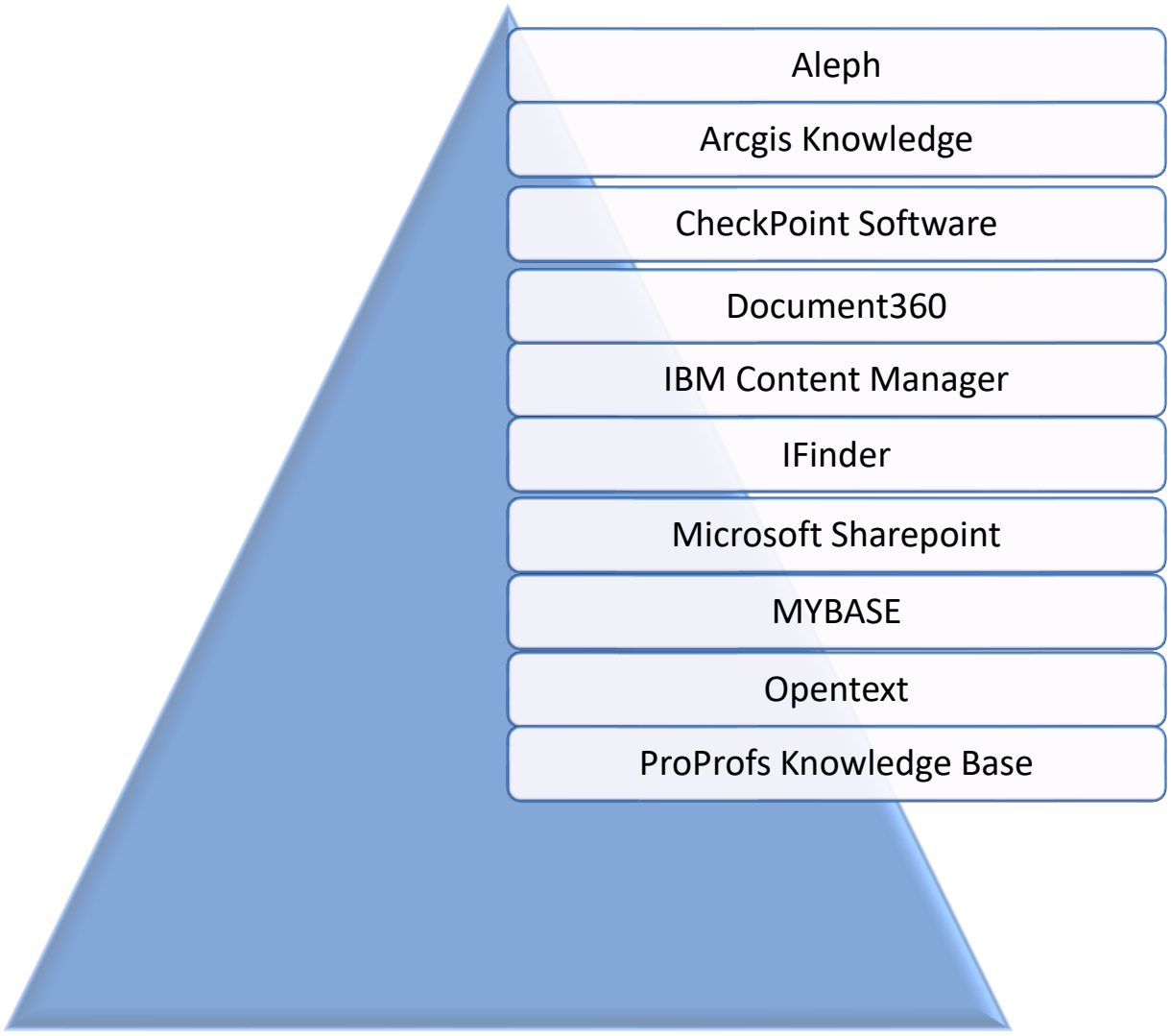
Appendix A. The suggested draft portal-KMS design[4]



[4] This draft is based on the findings described both in Deliverable D11.1 [2] and in this document. Taking into account the upcoming MS 242 document and the recommendations form the IT Expert Group, it certainly will be refined.

Appendix B. List of market p-KMS software products and services

This figure addresses representative software products and services already available on the market that might be adjustable to the specific p-KMS needs.



Appendix C. Proposed timetable of p-KMS implementation

	Q3 2023	Q1 2024	Q1 2025	Q4 2025	Q1 2026	Q2 2026	Q4 2026
Milestones							
Required	Portal design development, Del. 11.9	Validation, Approval and Publication of the Del. 11.9 Definition of the Critical System Requirements					
Infrastructure		Define and accept a mechanism for the Tender implementation for the portal KMS development service. Target group : IT companies	Call for Tender	Verification and validation of the Tender result	Cost confirmation and purchase		
Testing					Configure and Test	DI and other data's transfer from WIKI to the p-KMS	
Improvements					Performance optimisation and metrics	Content management	
Security					Implement Security Information Management (SIM)		
Integrations					Conduct security audits and reviews	Assessment of the Quality Metrics	Launch the p-KMS for the EURAD Community

For more details, see the MS.242 document “Specification of the EURAD p-KMS (prototype)”. The “Call for Tender” is to be established both in case of external purchases and in case of adaptations of already available “in-house” solutions as in both cases the before defined list of features must be obeyed.