TWINRELECT

Twinning for excellence in reliable electronics

D5.4

DELIVERABLE REPORT

D5.4: 1st Report on Virtual Knowledge Platform

WP5: Establishment of Sustainability Framework

Document information

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Contents

1. Introduction

The TWIN-RELECT project unites four leading organizations from Europe and the UK—University of Thessaly (UTH), Leibniz Institute for High Performance Microelectronics (IHP), French National Centre for Scientific Research (CNRS), and the University of Manchester (MAN)—in a mission to advance research in the design of reliable electronics. This collaborative effort seeks to enhance UTH's scientific and innovation capabilities while addressing critical challenges in developing resilient and efficient electronics.

A cornerstone of this initiative is the establishment of a **Virtual Knowledge Platform** (VKP), designed as both a collaborative workspace and a long-term knowledge repository. Hosted under the University of Thessaly's domain at https://twin-relect-vkp.uth.gr/, the platform will function independently from the project's main website, ensuring continuity and accessibility. The dedicated URL has been selected to maintain consistency with the TWIN-RELECT project's main website.

The Virtual Knowledge Platform (VKP) will function as a comprehensive repository for project-related knowledge, encompassing literature, documents, and materials produced throughout the project's duration. Furthermore, it will facilitate interactive virtual training activities, tailored to various expertise levels, thereby promoting skill development and fostering the exchange of knowledge.

Key features of the Virtual Knowledge Platform include:

- **Public Space:** Openly accessible resources, including project literature, public deliverables and general educational materials, aiming to engage a broad audience and raise awareness of the project's objectives.
- **Private Space:** A secure and restricted area accessible to registered users, offering exclusive project materials, available only to the participants of the project.

Led by the University of Thessaly, the Virtual Knowledge Platform serves as a key component of the TWIN-RELECT project, fostering collaboration and knowledge exchange, advancing research capabilities, and cultivating enduring connections among participants and external stakeholders. Through this forward-thinking initiative, TWIN-RELECT aims to create a lasting impact in the field of reliable electronics.

2. Structure of the Virtual Knowledge Platform

2.1 Contents and Organization of the Virtual Knowledge Platform

The Virtual Knowledge Platform (VKP) is thoughtfully designed to offer a user-friendly and well-organized environment, offering seamless access to a wealth of resources generated throughout the TWIN-RELECT project. The platform will be divided into distinct sections to ensure that the correct resources are accessible to the appropriate users. The structure will allow easy access to public resources while providing secure and controlled access to restricted content for registered users.

The key sections of the Virtual Knowledge Platform are as follows:

Home

The Home Page serves as the central hub for accessing all major sections of the Virtual Knowledge Platform. It provides an overview of the project, its objectives, and ongoing progress in the design of reliable electronic systems. It serves as the entry point for both public users and registered partners, offering intuitive navigation to all platform resources and training materials. Key features include the links to the project's main website, a detailed contact information page, and a login option for accessing restricted sections. This page ensures seamless access to all aspects of the Virtual Knowledge Platform, aligning with the project's goals of transparency and engagement.

Implementation

The Implementation section provides access to two important subsections: the Grant Agreement and the Consortium Agreement. These documents outline the project's structure, responsibilities, and legal framework, making them essential for internal reference. Access to these private documents is restricted to the project partners, ensuring secure and efficient availability of critical information throughout the project's lifecycle.

Templates

The Templates section will include all templates produced throughout the project, such as deliverable templates, presentation templates, and other essential formats. Each template will prominently feature the project logo, as well as the EU-funded logo and the UK Research and Innovation (UKRI) logo, to ensure consistent branding across all project materials. These templates are designed to maintain uniformity in the project's documentation, reporting, and presentations, helping partners adhere to established guidelines. They will be readily accessible to all project partners, enabling them to efficiently produce high-quality, standardized materials throughout the project.

Workpackages Materials

This section serves as a comprehensive repository for all materials produced during the project, organized by each work package (WP1 to WP7). It includes a wide range of resources such as posters, presentations, flyers, reports, infographics, and other supporting documents that highlight the activities, results, and progress of each work package. To ensure consistent

branding, the official project logo is also available in this section, allowing partners to incorporate it into their materials. By centralizing these resources, the Workpackages Materials section optimizes collaboration, communication, and dissemination efforts, making it easier for partners to share knowledge, prepare presentations, and effectively communicate results with stakeholders.

Workpackages Deliverables

This section provides access to all deliverables produced during the project, organized by each work package (WP1 to WP7). It includes final reports, technical documents, and other outputs that represent the key milestones and achievements of the project. Each deliverable is structured to align with the project's goals and requirements, ensuring that all documentation adheres to the highest standards of quality and consistency. Some deliverables may be designated as private in accordance with the terms of the Grant Agreement and will only be accessible to authorized users. Additionally, the inclusion of the project logo on all deliverables ensures a unified visual identity. The organized structure of this section allows partners to easily track progress, access completed work, and reference deliverables for future activities or dissemination purposes.

Pictures

This section serves as a central repository for all visual materials produced or collected during the project, including photographs, graphics, and other imagery. It contains pictures from events, meetings, workshops, and other activities that document the project's progress and milestones. These visuals are organized to provide an easily navigable archive for partners and stakeholders. Where applicable, the project logo may be included to ensure consistent branding across visual outputs. This section enables partners to utilize visuals for reports, presentations, and communication activities, while also serving as a record of the project's achievements and collaborations.

Educational Material

The Educational Material section will house all resources created for training and educational purposes throughout the project, including course materials, tutorials, webinars, and other learning tools. These materials are designed to support the development of skills and knowledge related to the project's focus on reliable electronic systems. The materials will be accessible to all users who are willing to enhance their understanding of reliable electronics, not only project partners but also external stakeholders interested in the field. This section aims to promote widespread learning, knowledge exchange, and capacity-building in reliable electronics through open access to these valuable resources.

Publications

This section will serve as a comprehensive archive of all papers, journals, and scholarly articles published during the project, showcasing the key findings and contributions to the field of reliable electronic systems. It will highlight the project's research outputs, fostering knowledge sharing and amplifying the dissemination of its impact within the scientific community and

beyond. Additionally, this section can be used to share previously published papers from various sources, creating a rich repository of related work that can inspire brainstorming, spark new ideas, and foster further collaboration among project partners and stakeholders.

Figure 1 illustrates the user interface of the Grant Agreement document view from a registered user, showcasing the full range of accessible details and functionality. In contrast, Figure 2 displays the view available to a guest user, emphasizing the restricted nature of sensitive content. These two figures underline the platform's robust security features, providing transparency while protecting proprietary project information.

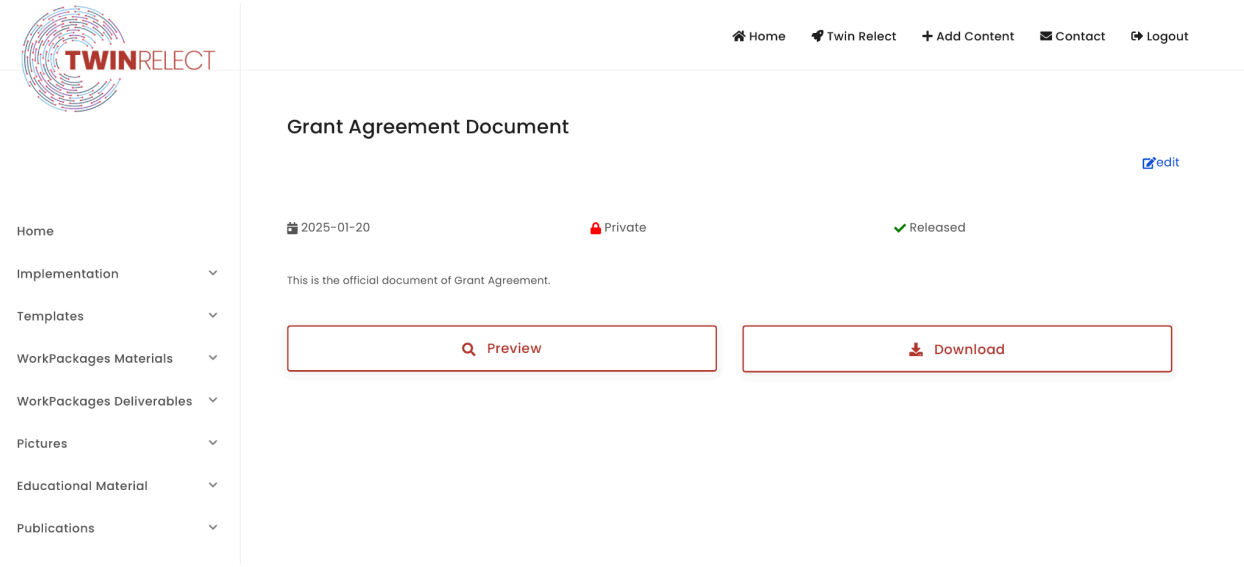

Figure 1: Example of the Grant Agreement Document view from a registered user

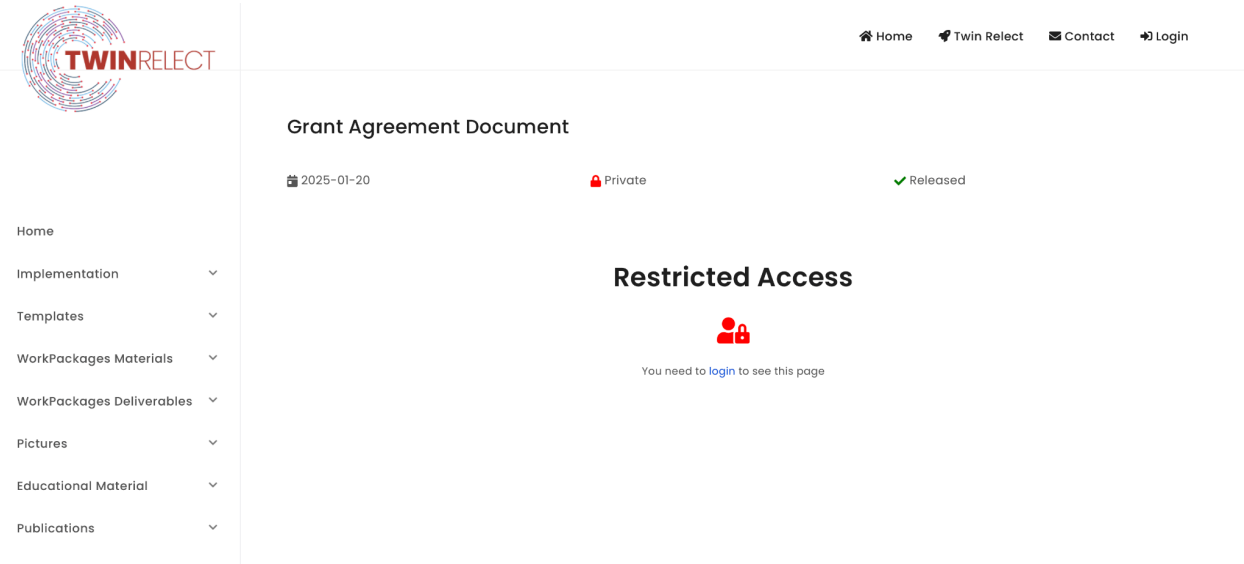

Figure 2: Example of the Grant Agreement Document view from a guest user

2.2 Technical Overview of VKP Development

The Virtual Knowledge Platform (VKP) is hosted on a robust and meticulously designed infrastructure to deliver outstanding performance, scalability, and security. At its core lies powerful hardware, including the Intel(R) Xeon(R) CPU E5-2620 v2 @ 2.10GHz, known for its exceptional efficiency and multitasking capabilities. With 16GB of RAM, the system effortlessly handles concurrent users and complex computational tasks, ensuring a smooth and responsive user experience even during peak loads.

The platform operates on Linux (Almalinux), an enterprise-grade operating system known for its reliability, advanced security features, and seamless compatibility with enterprise applications. This choice lays a stable and secure foundation for the VKP, fostering dependable performance and easy integration with other essential software components.

The software stack supporting VKP is thoughtfully designed to maximize both efficiency and reliability. The Apache Web Server forms the backbone of the platform, facilitating the rapid and reliable delivery of web pages and applications. PHP 8.2, the latest iteration of the PHP scripting language, powers dynamic web applications with cutting-edge performance enhancements and robust feature support. Security is further fortified by SELinux, which enforces stringent access control policies to safeguard the platform's data and applications against unauthorized access.

Data management is entrusted to MariaDB Server 10.5.22, a high-performance relational database management system that ensures efficient, scalable, and reliable data handling. Supporting the storage requirements is the QNAP NAS T-433, a network-attached storage solution that offers high availability, redundancy, and secure access, making it a cornerstone for data backup and file management.

The VKP's user interface is designed with a focus on interactivity, accessibility, and visual appeal. PHP powers the back-end processes, while MySQL efficiently handles relational database operations. On the client side, JavaScript enables dynamic features and rich interactivity. To ensure consistent and responsive design across all devices, the platform leverages the Bootstrap CSS Framework, delivering a seamless and visually engaging experience.

The system's architectural design is depicted in Figure 3, which illustrates the seamless connectivity between the Web Server, Database Server, and Storage NAS Server. This schematic highlights the efficient interplay of these components, ensuring smooth communication, data flow, and system reliability.

By integrating high-performance hardware, a secure operating system, a versatile software stack, and advanced development frameworks, the VKP exemplifies modern standards of efficiency, security, and user satisfaction. This robust infrastructure empowers the platform to serve as a reliable, scalable, and user-friendly solution, meeting the evolving needs of its users with precision and excellence.

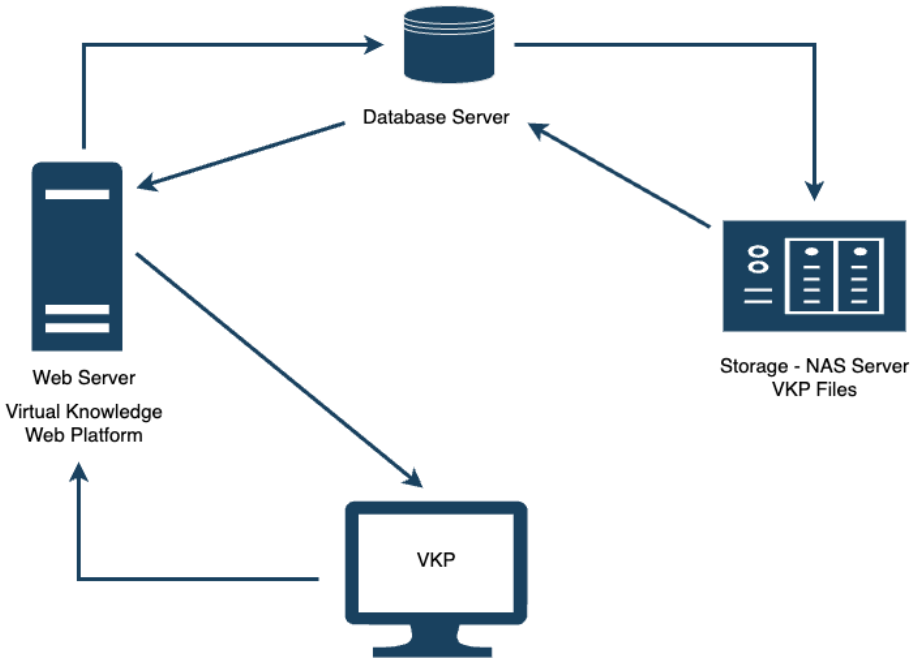

Figure 3: Schematic Representation of VKP Components and Connectivity

3. Platform Resources and Access Control

The **Virtual Knowledge Platform (VKP)** will provide a comprehensive range of resources designed to enhance research, education, and knowledge dissemination throughout the duration of the TWIN-RELECT project and beyond. As indicated earlier, the platform will consist of both a **Public Space** with free access for everyone and a **Private Space** with restricted access for registered users. The University of Thessaly will manage the registration process, ensuring that access to the Private Space is granted exclusively to the project's partners. Furthermore, only registered users will have the ability to upload content to the platform, ensuring that contributions are secure and controlled. This dual-access structure will allow for the seamless sharing of public information while maintaining the confidentiality and integrity of sensitive project materials.

3.1 Public Place

The Public Space offers open and unrestricted access to a wide range of high-value resources produced throughout the TWIN-RELECT project, ensuring that the project's findings and outcomes are readily available to the global community. The Public Space includes a diverse range of public deliverables, such as in-depth reports, research summaries, and analytical insights that outline the project's key milestones and contributions to the field. It also features a variety of educational resources—webinars, recorded sessions, and interactive materials—that aim to enhance the knowledge and enable learning for a wide and diverse audience.

In addition to these educational materials, the platform also hosts a collection of research publications, available under open access, further promoting global collaboration and the dissemination of new knowledge in reliable electronics. Ready-to-use templates for reports, presentations, and technical documents are also made available, simplifying the process of sharing and communicating research outcomes. These resources not only promote transparency, but also stimulate innovation by making the project's findings accessible to all, ensuring a lasting impact on the global academic community.

3.2 Private Space

The Private Space is a secure, dedicated environment created to facilitate confidential collaboration among registered users, consisting of representatives from each partner organization participating in the TWIN-RELECT project. This space will enable participants to share sensitive documents, such as preliminary drafts of reports or research findings, before they are finalized or made publicly available.

Additionally, certain deliverables classified as private will be stored exclusively in this space to ensure controlled access and data protection. Beyond documents, the Private Space will house other sensitive materials, including video recordings of meetings, detailed minutes, and internal discussions that are critical to project progress and coordination.

The Private Space will also assist streamlined communication among partners by providing a repository for shared resources, such as technical guidelines and templates. This ensures that all collaborators have

access to the latest project-specific information in a centralized and secure environment. Furthermore, this space will reinforce compliance with confidentiality agreements and data protection standards, safeguarding the intellectual property and sensitive data integral to the TWIN-RELECT project.

3.3 Security and Access Management

Access to the Virtual Knowledge Platform (VKP) will be restricted to registered users to ensure that only authorized individuals can access private materials and sensitive project-related content. The registration process will be carefully managed by the project coordinator, the University of Thessaly (UTH), which will grant access exclusively to project partners involved in the TWIN-RELECT project. By limiting access to registered users, the platform ensures that all private and confidential materials are shared only with those who have a legitimate need for access, promoting both security and trust within the project ecosystem.

Figure 4 illustrates the user interface that registered users will use to log into the platform. This login interface serves as the entry point to the Virtual Knowledge Platform, ensuring that only authorized users can access private resources and materials after successfully authenticating.

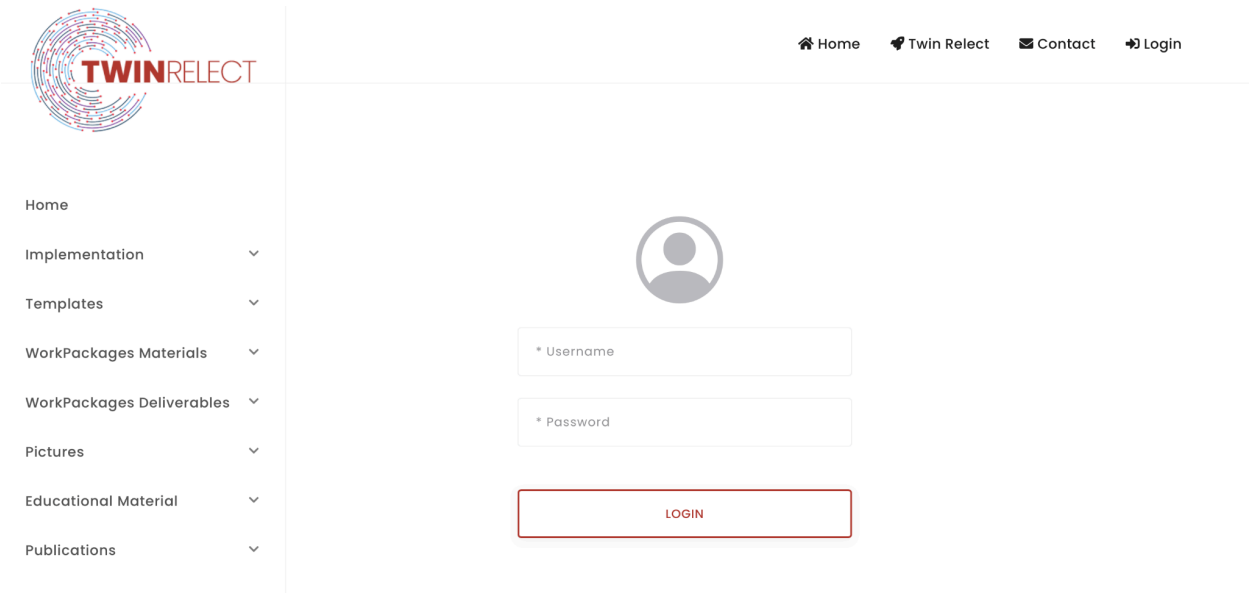

Figure 4: Login interface of the Virtual Knowledge Platform

Private content, including internal documents, sensitive project deliverables, confidential meeting materials, and other restricted resources, will be made available solely to registered users. These materials are essential to the smooth operation of the project, and ensuring their protection is a top priority. To maintain robust security and compliance, the platform will have regular reviews of user access and permissions to make sure only the right people can access the materials based on their role in

the project, reducing the risk of unauthorized access. These reviews will confirm that the appropriate individuals maintain access according to their role and involvement in the project, mitigating the risk of unauthorized access.

The project coordinator (UTH) will be responsible for overseeing any modifications to user access, including adding new members, removing outdated access rights, or updating permissions as roles evolve throughout the project. This proactive and responsive management of access ensures that the right people have the right level of access at all times, further fortifying the platform's security. Additionally, the use of secure authentication and encryption mechanisms will protect sensitive data both in transit and at rest, enhancing the overall integrity and confidentiality of the platform.
This structured and rigorous access framework guarantees that the VKP will serve as a trusted, secure, and collaborative environment where sensitive materials are shared exclusively among project partners, without compromising the integrity of the data or the project's objectives. By maintaining a high standard of security, the VKP fosters an environment conducive to seamless collaboration, while safeguarding valuable intellectual property and project deliverables throughout the duration of the TWIN-RELECT project.

4. User Interface

The User Interface (UI) of the Virtual Knowledge Platform (VKP) has been designed with the goal of delivering an intuitive, seamless, and accessible user experience for a diverse range of users, including public users, registered partners, and internal project members. Centered around user-friendly principles, the platform ensures efficient navigation, an organized visual structure, and a consistent layout across all its sections. This allows users to easily access essential resources and content, while enhancing their overall experience on the platform.

The Home Page, shown in Figure 5, functions as the central hub for navigation. This page offers a clear overview of the platform's key sections such as Templates, Workpackages Materials and Deliverables, providing users with an organized henry point to access essential resources. The Home Page is designed such that both public and registered users can access it. Public users can navigate through general resources that are available to all, while registered users, granted additional privileges, have access to a broader range of exclusive, more sensitive resources. This ensures that the platform maintains proper access control, making it certain that private materials remain securely restricted.

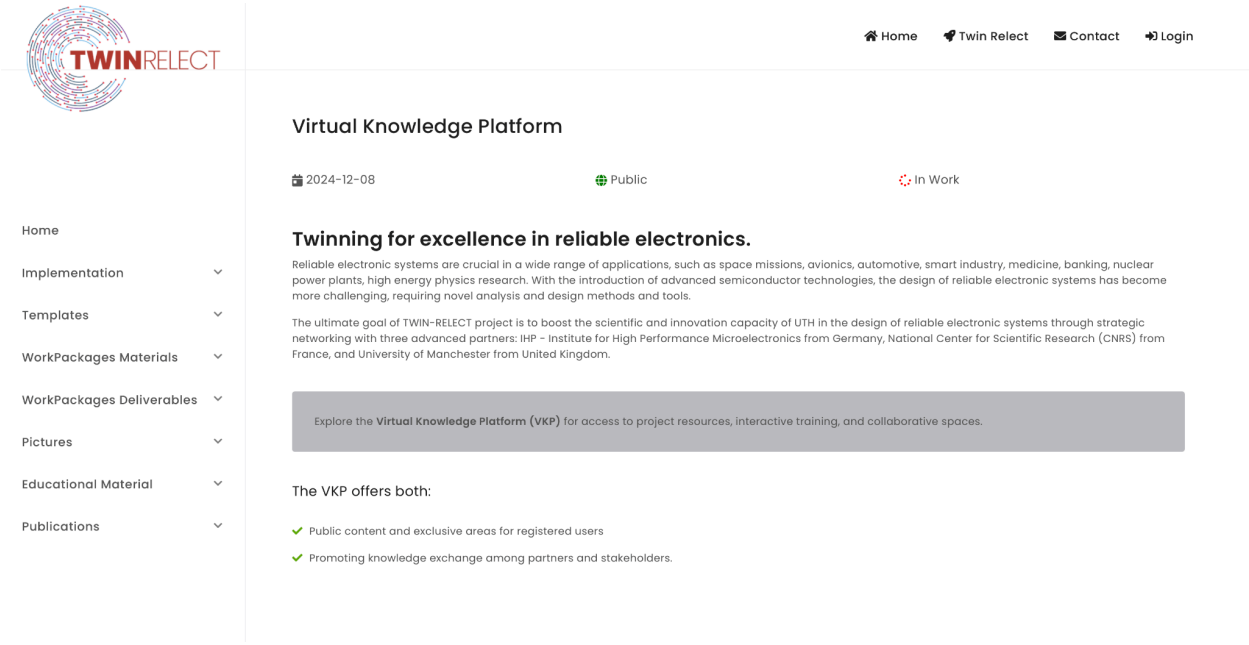

Figure 5: Home Page of Virtual Knowledge Platform

One of the key features of the platform is the ability to embed files directly within the UI. This enables users to view various types of contents—such as PDF documents, videos, and other media—without having to download them separately. This functionality enhances the user experience, allowing for a more interactive and efficient consumption of training videos, recorded webinars, research papers, and additional resources.

Designed with responsive principles, the VKP interface ensures optimal usability across a wide range of devices, from desktop computers to mobile phones and tablets. This responsive approach guarantees that users can access the platform and interact with content in an efficient manner, regardless of the device they are using. The platform also ensures accessibility for all users, incorporating features such as adjustable text sizes, high-contrast visuals, and screen reader compatibility, ensuring inclusivity for all users.

In terms of aesthetic design, the UI reflects the TWIN-RELECT project's branding guidelines, incorporating a visually appealing structure that promotes a professional yet user-friendly atmosphere. The platform prominently displays the TWIN-RELECT logo, reinforcing the project's visual identity while maintaining a cohesive and polished look throughout the platform. The content layout is structured hierarchically, with clear sections, headings, and easily distinguishable categories that further support a streamlined user experience.

5. Platform Updates, Maintenance, and Long-Term Sustainability

5.1 Platform Updates and Content Contribution

The Virtual Knowledge Platform (VKP) will undergo regular updates to ensure it remains a dynamic, relevant, and valuable resource for all TWIN-RELECT project participants. These updates will incorporate new research findings, project deliverables, meeting notes, and any other pertinent materials that reflect the ongoing progress and outputs of the project. This iterative update process ensures that the platform remains vibrant and adaptable to the evolving needs of the project. By continuously adding new content, the VKP will remain a comprehensive source of up-to-date information for all users.

Responsibility for maintaining and updating the platform will be shared among all TWIN-RELECT partners. Each partner will actively contribute to the platform by uploading materials from their respective areas of expertise, ensuring that the platform captures the diverse range of work being done within the project. This collaborative model not only helps maintain the platform's content but also promotes shared ownership and engagement. By contributing regularly to the VKP, the project partners will preserve the integrity and richness of the resources available, ensuring that the platform evolves alongside the progress of the project.

In addition, a feedback mechanism will be implemented, allowing users to provide insights into the platform's functionality. This feedback will be used to identify areas for improvement, ensuring that the platform remains agile and responsive to the needs of its users. Such an approach guarantees that the VKP continuously adapts to the changing requirements of the project, while also remaining user-centric and efficient.

5.2 Technical Maintenance, Security and Long-term Sustainability

The University of Thessaly (UTH) will oversee the technical maintenance and operation of the VKP. This responsibility encompasses ensuring the platform's uninterrupted functionality, implementing necessary software and security updates, managing user access, and promptly addressing any technical issues that arise. UTH will provide ongoing technical support, ensuring smooth operations and a user-friendly experience for all contributors and participants. By managing these technical aspects, UTH ensures the platform remains stable and accessible, enabling effective collaboration across all project teams.

Furthermore, the VKP is designed to be sustainable beyond the official conclusion of the TWIN-RELECT project. All contents of the platform will remain accessible to both the public and the partners, ensuring that the valuable research findings, methodologies, and resources developed during the project will continue to benefit the wider scientific community. This long-term accessibility fosters further research, knowledge exchange, and collaboration beyond the lifespan of the project. The platform will thus serve as a lasting repository of knowledge that can be referenced, built upon, and utilized by future research initiatives and stakeholders in relevant fields.

To ensure data integrity and security, the VKP will employ a robust backup and redundancy strategy, with regular backups made to secure off-site locations. This strategy guarantees that critical content remains protected against potential disruptions. Moreover, the platform will remain open to integrating emerging technologies, ensuring that it stays up-to-date with advancements in digital tools, collaboration features, and analytics capabilities. As the project progresses, there will be opportunities for collaboration with external institutions, further expanding the VKP's reach and impact. Periodic evaluations will also be conducted to assess the effectiveness and impact of the platform, with findings shared with stakeholders to guide future improvements and enhancements.

6. Conclusion and Future Enhancements

The Virtual Knowledge Platform (VKP) was successfully established in January 2025, providing a solid foundation for facilitating collaboration, knowledge sharing, and resource management within the TWIN-RELECT project. With its comprehensive and intuitive interface, the platform offers efficient access to essential project resources, while ensuring a secure environment for confidential and sensitive content. Its development marks a significant milestone in enhancing communication and coordination among project participants.

As the project progresses, the VKP will undergo further expansion to incorporate additional educational resources, thereby enhancing learning opportunities for both project partners and external stakeholders. These advancements will support the continuous professional development of all involved parties and foster a deeper engagement with the project's objectives. Moreover, the platform will be seamlessly integrated into the collaborative workflows of project partners and coordinators, optimizing communication and streamlining the management of shared resources. This integration will promote more efficient project execution and strengthen teamwork across the various work packages. Future updates will also provide expanded information on deliverables and work packages, offering stakeholders greater transparency into project progress and upcoming milestones. These planned improvements will further cement the VKP as an indispensable, dynamic tool, driving ongoing collaboration and innovation throughout the TWIN-RELECT project and beyond.