



ReInHerit

Redefining the Future of Cultural Heritage, through a disruptive model of sustainability



www.reinherit.eu



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Executive Summary

This deliverable, D4.6, aims to report on the management of the ReInHerit Digital Hub since its launch in July 2022, including any changes to its structure and content, and it introduces a first report on its analytics. It discusses the policies and workflow that have been adopted in this period and that enabled the enrichment of the Hub with a variety of content stemming from the ReInHerit project, from research and training material to applications and exhibitions. It follows therefore D4.1, which traced the requirements for the development of the Digital Hub, and D4.2, which described the technological and information architecture of the Hub as well as its development process.

Besides reporting on the use of the Hub in its first year (July 2022-July 2023), this deliverable aims also to cover its future sustainability, including its digital sustainability and its future management. Technological and digital preservation of the Hub and its content will be easily ensured, while the management of future users in the forum will need to be carefully evaluated at a later stage.

1. Introduction

This deliverable aims to document the evolution of the Digital Hub since its launch in July 2022 and the plans for its digital preservation and management post-project ending. The deliverable is therefore following up on D4.2 (Digital Hub report), which described the main functionalities, as well as the technological and information architecture of the platform. In turn, D4.2 was building on D4.1, the analysis of requirements for the Digital Hub, according to a review of existing platforms, the work conducted in WP2, and the requirements emerging from the conversations with the consortium members.

Since its launch, consortium members have begun to use the Digital Hub to publish their outputs, in different formats targeted at professionals or at broader audiences. In this context, changes have been requested by different consortium members to sections of the Hub, while new requirements and functionalities have been implemented also following an internal evaluation on the usability and potential of the platform. In parallel, the use of the Hub by colleagues in the consortium and the broader community has allowed us to monitor and evaluate the risks and solutions for a long-term availability of the platform and its resources.

This report is therefore organised in two sections: first, it will document changes and further developments in the Hub since July 2022 (i.e., since D4.2); secondly, it will describe the provisions and solutions which will guarantee the long-term sustainability of the ReInHerit Digital Hub and the decisions taken in relation to its future management.

2. The launch of the Digital Hub and its management policy

The Digital Hub was officially launched at its current URL (<https://reinherit-hub.eu/>) on the 13th July 2022 (Milestone 10). The preparation and development of the platform up until this moment is described in D4.1 (Requirements for the Digital Hub) and D4.2 (Digital Hub Report).

In short, the identification of the requirements for the platform and its development proceeded almost in parallel, with a first phase focusing on identifying the scope and needs for the Digital Hub as emerging from the DoA (M1-M5), followed by a review of existing platforms for cultural heritage (M5-8; for details, see D4.1, pp.12-18), and a review of the primary and secondary research emerging from WP2 (for details, see D4.1, pp.8-12), leading to the beginning of the development of the Hub (for details, see D4.1, p.7 and D4.2, p.8). This initial phase, preceding the official starting date of WP4 (M8) drew therefore on desk research, which was subsequently complemented by a series of meetings and workshops with the ReInHerit consortium partners (for details on the participation of the partners see D4.1, pp.18-22), in order to verify and further develop the requirements for each partner and deliverable to be showcased on the Hub.

Between M8 and M12 a first software and information architecture for the Digital Hub was established and developed and it was presented to the partners in February 2022. Between M13 and M17, the structure, functionalities, and design of the Hub were further refined, following feedback from the consortium partners, and the Digital Hub was further polished and developed.

Finally, as mentioned above, the Digital Hub was launched in July 2022: at the time, it still included only limited content and, while the partners had been invited to test it, they still had to start publishing their content and outputs. Once the partners began to upload content on the Hub and users began to navigate it, it was possible to start evaluating the solutions adopted, improving them, and adapt the platform to newly emerging requirements by consortium members. The changes implemented in the platform between July 2022 and June 2023 will therefore be summarized below.

In parallel, the initial policy for publication of new content in the Hub has also been adapted alongside its use by consortium members. Initially, the team at UNIGRAZ had expected to redeploy the Hub weekly (i.e. all updates would be published on Fridays, so to allow the team to revise content and update menus and subpages consistently), but – as the use of the Hub increased – it became evident that publishing weekly any new content was not a satisfactory solution for consortium partners, who often required faster and direct publication of their content. Therefore, the policy became also more flexible, as it will be described below.

2.1. Privacy and Data Protection provisions

The [Data Protection page](#) of the Digital Hub and the cookies notice have not changed since the launch of the Digital Hub. The Hub includes Google Analytics 4 (GA4) to monitor traffic and numbers of views and visitors, hence the data collected by GA4 are declared in the mandatory pop-up with the cookies and privacy notice, requiring first-time visitors to accept this message before being able to navigate through the Hub.

Cookies & privacy

Our website uses Google Analytics cookies to monitor number of visitors and pages viewed. The information collected by us will include IP Address, pages visited, browser type and operating system. The data will be used to support the further improvement of the content. It will not and cannot be used to identify any user. Users have the opportunity to set their computers to accept all cookies, to notify them when a cookie is issued, or to not accept any cookies.

You can find more information in the [data protection](#) page.

As the pop-up message states, data collected include the IP address (which is not logged or stored, but instead anonymised and used in GA4 to count the number of unique and repeated visitors), the pages visited, the browser type (computer; mobile; tablet) and the operating system (e.g. Windows; OS). As detailed in D4.1 (pp. 25-27) and D4.2 (p.15), provisions have been taken to comply with data protection regulations and ethical treatment of user data in the project. In GA4, the results of queries on the data (e.g. number of downloads of objects from the e-Shop) are available only for a limited period (3-6 months). The data are not stored and are instead shared with the project coordinator (BoCCF) as aggregated values for the sole purposes of monitoring the reach of the project KPIs (page views, downloads from eShop).

Contributors to the Digital Hub, i.e. consortium members publishing content on the platform, are added through their GitHub usernames – and the workflow is entirely based on GitHub, where a ReInHerit team has been created. GitHub is the most used code hosting platform, enabling version control and collaboration and it is a platform that was already being used by all technological partners within ReInHerit. GitHub teams, such as the ReInHerit team, allow managing user access and collaboration across an organisation and its repositories: in this way, individual contributions are identifiable and visible, but the code is all findable under the ReInHerit team (<https://github.com/ReInHerit>). In the ReInHerit team, users are managed by UNIGRAZ (admin) and all other users have rights as contributors, i.e. they are able to read and write code, but are not able to delete repositories. UNIGRAZ is therefore the data processor for GDPR purposes, and relies on established platforms such as GitHub for managing user data. No other personal data are collected besides usernames (and associated emails) for Hub contributors; it should also be noted that these are ReInHerit consortium members who have been added to the contributors group following their request for publishing on the Hub and are therefore fully aware of this fact.

In addition, the Digital Hub was launched with Gitter as a forum platform: this platform was conform to GDPR, as it was its successor Matrix. However, the results of our evaluation showed that users were struggling with Matrix (see below), so it was decided to move the forum to Zulip. This latter platform stands out also for a very precise and detailed approach to privacy and data protection (see <https://zulip.com/policies/privacy>), and GDPR compliance (see <https://zulip.com/help/gdpr-compliance>).

3. The 1st year of the Digital Hub (Jul 22- Jun 23)

As mentioned above, the Digital Hub was launched on the 13th July 2022 (Milestone 10). At the time, it included only essential content under the “About” pages (i.e. consortium members; project description; data protection page). D4.2 presents the technical and information architecture of the Hub and describes the planned content and its online presentation in the Hub. This plan has been followed during Autumn 2022 and Winter 2023 to enrich the Hub, with only minor deviations: as expected, once consortium partners finalized their content and begun to upload it on the Digital Hub, minor updates and customization were needed. In particular, a new section for podcasts was added; and the layout of selected sections was customized (e.g. allowing the upload of PDF files in the ‘Factsheet’ section; adding a side-navigation bar in the documentation of the first performance; adapting the filters in the e-Shop; filters in the news; etc.). In addition, the digital exhibitions were also developed within WP4, following the design instructions received from WP6 during Autumn 2022 – with a corresponding “in Gallery” application (i.e. the “Intro” and “Outro” questions present in the digital exhibitions were duplicated, in the museums’ languages – Greek and German – for their touch screen interactive in the travelling exhibitions), while the online collection subpage was developed independently by WP6.

This section will first report on the content uploaded on the Hub, describing any changes since D4.2 for the expected sections and introducing the new sections created during the first year of the Digital Hub. Subsequently, the current workflow for collaborating with consortium partners in uploading content to the Hub will be described, as well as an overview of the analytics for the platform and evaluation of its engagement.

3.1. Publication of content in the Digital Hub and changes to the infrastructure

At the top level, the Digital Hub is divided into 5 main types of content: these five sections are listed on the top navigation bar and are:

1. **About:** a section including the usual expected content for any web portal, including a description of the project and consortium, as well as the imprint page for the Hub and the data protection declaration.
2. **News:** in this section, news about the content uploaded on the hub and the project are regularly published. This section tends to focus more on the aspects of the project published on the Digital Hub (e.g. new webinar or podcast; new event whose documentation will be available on the Hub), while the primary ReInHerit website (managed by MATERAHUB) focuses on news concerning project dissemination (e.g. conferences).
3. **Resources:** in this section, technical documentation of the ReInHerit outputs (e.g. apps in the toolkit; e-Shop; performances; digital and travelling exhibitions; videogame) is presented for cultural heritage professionals, alongside webinars and research factsheets. It is therefore primarily a session targeted at professionals offering training material and documentation to empower them to learn about the methods and technologies used in ReInHerit.
4. **Discover:** this section is, conversely, targeted at a broader public. Here it is possible to find the exhibitions (digital, travelling, and the online collection), the applications (with a short description and promotional video), the e-Shop, the podcast, and the game.

5. **Participate:** this section hosts the ReInHerit Forum, and the archive of the previous forum used in the project, alongside with calls for participation (participating in the online collection; hosting a travelling exhibition).

Figure 1 shows the content of the Hub as of July 2023.

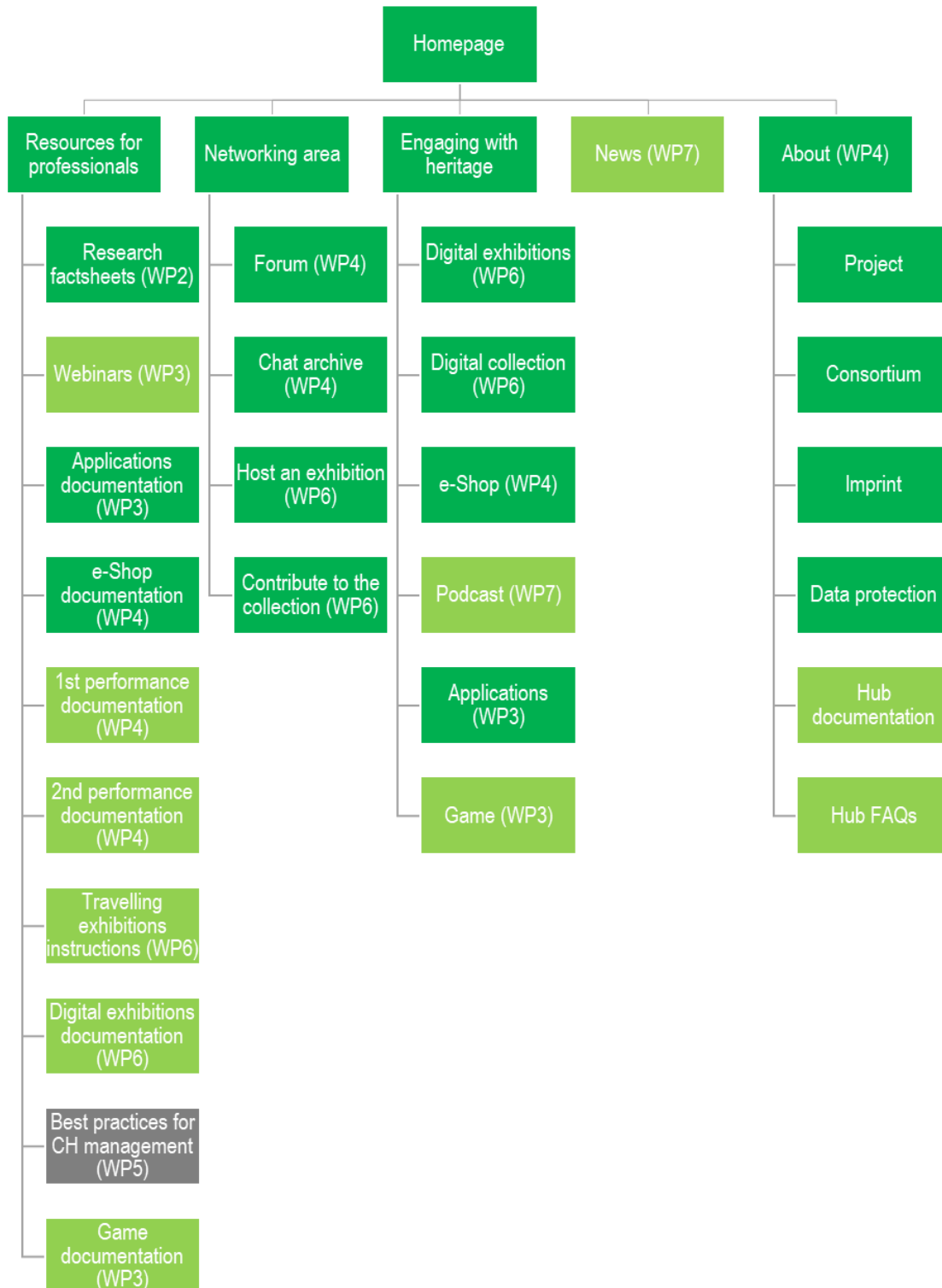


Figure 1. Content of the Digital Hub (July 2023). A dark green colour indicates that the section is completed; a light green indicates that the section is still being updated; a grey section indicates a section not yet available online.

Part of the content was uploaded altogether and directly published; part of the content, such as the webinars, is regularly being updated with every new event, and it is therefore considered as on-going. As mentioned, most of the content is organised around three areas, directly accessible from the navigation bar or from the homepage: the “[resources](#)” area (targeted at museum professionals); a “[networking](#)” area (targeted at museum professionals); and an “[Engaging with heritage](#)” area (targeted at a broader public).

At the moment of the launch, in **July 2022 (M17)**, the Digital Hub included only the *About* section, with a presentation of the project, consortium, and details on the imprint and data protection. In the *About* section, the documentation of the Digital Hub and FAQs are instead being regularly updated as the use and functionalities of the Hub expand and in response to questions the team at UNIGRAZ is often being asked by partners and users of the Hub.

Between **August** and **October 2022 (M18-20)**, the *eShop* was launched and all the products were uploaded, in parallel with the completion of D4.3 (eShop report) and in close collaboration with BOCCF. The *e-Shop*'s final design includes filters by object type and by museum; as well as a carousel within each object page to entice users to download it. During October, also CYENS began to use the [News](#) and [Forum](#) features, in support of the first immersive performance (in turn, described in D4.4).

In **November 2022 (M21)**, MICC launched the ReInHerit [Webinars](#), which led to minor changes to these pages: in particular, badges tagging the content in relation to three key themes (“Tourism”, “Technology”, and “Management”) were added to the footers of all webinars. In relation to the webinars, a workflow for the announcement of new webinars was agreed with MICC and CYCLADIC: MICC would publish each news announcing the webinar; UNIGRAZ would check and deploy it; and CYCLADIC would promote the post through the ReInHerit social media. Afterwards, MICC would share the registration of each webinar with CYCLADIC, responsible for uploading the videos on YouTube, and would create the page for each webinar (with YouTube link and slides) in the Digital Hub. Again, MICC would then notify UNIGRAZ, responsible for making the item public to every Hub visitor.

In parallel, also the ReInHerit *Museum Up* [Podcast](#) began to be published by Arte Sostenibile. This podcast was created in late Summer 2022 to foster further engagement with the project and is targeted at a general public. As a new addition to the project, it was something that had not been considered in D4.1 and D4.2, i.e. while planning the Digital Hub, and it has therefore been added after these first two deliverables were submitted. Once a few episodes became available, UNIGRAZ worked with Arte Sostenibile on a workflow for its publication in the Hub: after each episode is made available on the most popular podcast platforms (Apple Podcasts; Spotify; Google Podcasts; Amazon Music), a news item linking to the episode is published in the Hub. Through a query, the news about the podcast are subsequently aggregated and shown on the dedicated page.

In **December 2022 (M22)**, the same three key themes (“Tourism”, “Technology”, and “Management”) used to categorise webinars, were also added to the *News* section, in this latter case combined with a possibility of filter the list of news by theme. In parallel, during this month discussions with WP2 refined and polished the concept for publishing the results of the primary and secondary research. Furthermore, discussions with the museums in WP6 led to the decision of developing the digital exhibitions directly on the Digital Hub (task led by UNIGRAZ and GrazMuseum); having the Intro/Outro sections of the digital exhibitions developed also for in-Gallery use (and also hosted on the Hub and developed by UNIGRAZ, following the brief of the museums); and having instead the Online Collection developed as a subsite by GrazMuseum, with an external developer. Finally, a first redesign of the [Homepage](#) was launched at the end of the year.

In **January 2023 (M23)**, the publication of the research factsheets, the digital exhibitions, the in-Gallery applications for the travelling exhibitions, and the ReInHerit toolkit began – and it was completed during **February 2023 (M24)**.

The presentation of the research conducted in WP2 through a series of [research factsheets](#) was completed by adding both webpages on themes reflected in WP2 deliverables (in particular, in the literature and state-of-the-art review) and downloadable PDFs for each of these themes. In this case, the material was prepared by UNIC and Arcada and added to the Hub by UNIGRAZ. Similarly, D4.3 (by BOCCF) was converted in a web-based documentation of the ReInHerit [e-Shop](#), focusing in particular on the process and choices that guided the development of the e-Shop.

In February, the three ReThinking [digital exhibitions](#) (ReThinking Craftmanship; ReThinking Conflicts; ReThinking Identities), mirroring the travelling exhibitions were also launched. UNIGRAZ developed the architecture and design of the webpages, following the brief by Graz Museum, while Graz Museum led CYCLADIC and BOCCF in the development of storytelling and interactive presentations for selected objects, using H5P tools. In addition, UNIGRAZ was responsible for the so-called “Intro/Outro” application (a set of four questions preceding and following the exhibition itself, with an interactive map showing the responses collected both online and onsite, in the travelling exhibitions). Many of this design decisions were not yet clear at the moment of writing D4.2, and the final solution emerged throughout the autumn, from the work of WP6 and the liaising between museums and technical partners. The exhibitions consist of three “intro” questions; an overview of the three key objects in each exhibition, and a detailed page for each object with at least two different H5P visualisations; and an “outro” question, leading to a map visualisation of all answers to the questions. While the H5P animation are used only in the online application; the intro/outro section are replicated in German (for the Graz Museum) and Greek (for CYCLADIC and BOCCF) in the gallery space, so to allow visitors to add their responses and thus contribute to a global map summarising how online and onsite audiences reacted to provoking questions about ideas on conflicts, identities, and craftmanship. These in-Gallery applications were corrected and further updated during Spring 2023, as each museum hosted a different travelling exhibition and required therefore further translations in German/Greek or additional features (e.g. minor design changes to the size of the screen; switch between languages).

In parallel, the Graz Museum worked with a separate provider to develop another in-Gallery application (a series of annotated 3D visualisations shown through projections and tablets) and to develop the online collection (an added output from WP6, which has been realised through a Wordpress site - [Digital collection](#)), with both of these added as subdomains to the Digital Hub (although hosted independently on servers by the museum). As of July 2023, 22 objects have been uploaded to the Digital Collection (see also D4.2, p.31). Call for participations to [host an exhibition](#) and inviting [contributions to the collection](#) were also launched on the Digital Hub by the end of year 2 and more widely promoted in the first months of year 3.

During this period the applications developed by MICC as part of the ReInHerit toolkit were also presented in the Digital Hub, through three separate sections: on the one hand, an [Applications](#) section targeted at a broader public was created anew, with a simple page for each application containing an introductory text and a short video. On the other hand, two complementary sections focused on professionals, presenting the technical architecture of the toolkit apps ([Applications documentation](#)) developed by MICC and, in this case, also the application created for the first immersive performance by CYENS. In addition, during **March (M25)** and **April 2023 (M26)**, the section [components](#) was also launched, including an overview of key frameworks and tools used in

the development of the app (and aiming to be a short glossary introducing common machine learning terms to cultural heritage professionals).

A crucial change to the Digital Hub infrastructure was also implemented between February and May 2023: following an evaluation of the initial forum platform, in particular after a series of online chat aiming at raising engagement (led by UNIGRAZ in January and February 2023) and also following a major change in the service initially used on the Digital Hub, with Gitter adopting Matrix as infrastructure, it was decided that the solution was not anymore adequate. After a few short pilots testing other platforms (integration of Element client for Matrix in the Hub; Slack), it was decided to adopt Zulip as main platform to host the forum. Therefore, the current platform is now accessible through the [Forum](#) section; while the most active rooms from the previous forum remain visible through the [Forum archive](#) section (see also D4.2, pp.31-33).

Finally, in the months leading up to this deliverable, **May (M27)** and **June (M28)**, more documentation sections were added, in particular proceeding with the documentation of the [1st performance](#) following the submission of the respective deliverable (D4.4) and starting to prepare for the documentation of the 2nd performance (which took place in May 2023 and is described in D4.5). The documentation of both travelling exhibitions (including the conceptual overview; the physical architecture; and application for the tablet) and digital formats (including the digital exhibitions; the online collections; and the intro/outro applications) is also close to be concluded, with a set of [dedicated pages](#) and technical drawing to be launched in late Summer 2023, allowing other professionals to observe the processes and tools used in WP6.

During **Summer 2023**, two other outputs are being finalised for publication on the digital hub: the [videogame](#), already published online, and its [technical documentation](#), currently being completed following the submission of the corresponding deliverable. Similarly, the ReInHerit [Best practices for CH management](#) are being collected and prepared by WP5 and will be published online in early autumn 2023.

In short, while the main architecture and technical solutions adopted in the development of the Digital Hub have proven successful, minor design and functionalities changes were required during the upload of the different content. Furthermore, there have been changes in the distribution and organisation of the outputs from WP6 (digital exhibitions; online collection; in-gallery Intro/Outro sections); the podcast has been added as a completely new type of content; and the service supporting the Forum has been changed. The following sections will briefly report on the workflows and policies adopted during this period and offer a snapshot of the analytics for the Digital Hub.

3.2. Changes to the policy

The main policies concerning the Digital Hub and the publication of content on it have remained the same since D4.2, with UNIGRAZ maintaining full administrative rights on the Hub, and another 12 contributors able to post new content on the Hub. However, given the nature of the Digital Hub as a static website supported by a static website generator (Gatsby), the publication of content by each contributor does not lead to an automatic online publication of the new pages. UNIGRAZ, as admin, has to pull the new content and redeploy the website in order for the contributions to be shown online. Thus, the overall workflow includes continuous liaisons between developers at UNIGRAZ and the relevant partners and proceeds according to the following steps:

- Partners finalising their content and testing it with the support of UNIGRAZ in the existing solution (developed by UNIGRAZ following the requirements expressed in the 1st year of the project and documented in D4.1);
- Identification of any needed change and refining of the relevant subsections (UNIGRAZ);

- Partners directly uploading their content and/or sending their material to UNIGRAZ for upload;
- UNIGRAZ checking that the content was conform to technical specifications (e.g. formats; lengths; metadata) before deploying it and making therefore it available on the Digital Hub;
- Regular updates to the navigation bar and the Homepage to reflect the growth in material available on the Hub.

Therefore, through this process, consisting of a first addition of content by consortium members and a redeployment by UNIGRAZ, also a control of the content, its location in the Digital Hub, its code and design aspects can be tested and verified by the lead developers before being published online.

The frequency with which UNIGRAZ planned to redeploy content has proved to be less regular than initially suggested (i.e. weekly), but this flexibility has proven necessary so to accommodate the needs and deadlines of different partners. In this sense, control on redeployment by a single person at UNIGRAZ is crucial, since it allows monitoring and aligning all the different changes to the Hub and quickly addressing glitches and errors in newly prepared content.

Similarly, the formal policy for the Forum has remained the same, with the possibility for ReInHerit consortium members to open and moderate new discussions, while UNIGRAZ has reserved the full administrative rights (i.e. the possibility of deleting the forum and removing users).

3.3. Analytics and evaluation

The Digital Hub includes Google Analytics 4, which is used for its anonymised aggregated data on the numbers of users, page views, and has selected queries setup to monitor the achievement of the project's KPI (e.g. views and downloads of the objects in the eShop). The ethical and data protection aspects concerning the use of analytics are discussed above (pp.7-8) and in D4.1 (pp. 25-27).

Looking at the analytics from July 2022 to July 2023, it is obvious that – as expected – the addition of new content provokes spikes in attention by the visitors. In particular, from Figure 2 a first growth of attention in November and December 2022 is clear: this followed the promotion of the eShop and the launch of the webinars.

Between February and March 2023 another spike in attention can be attributed to the increase of content during February and its successive promotion, through events (e.g. Digital Hub promoted by UNIGRAZ at a Digital Art History Austria Association Meeting and with new leaflets). Additionally, the role of the digital exhibitions and the in Gallery applications was also a driver of traffic during late winter and early spring.

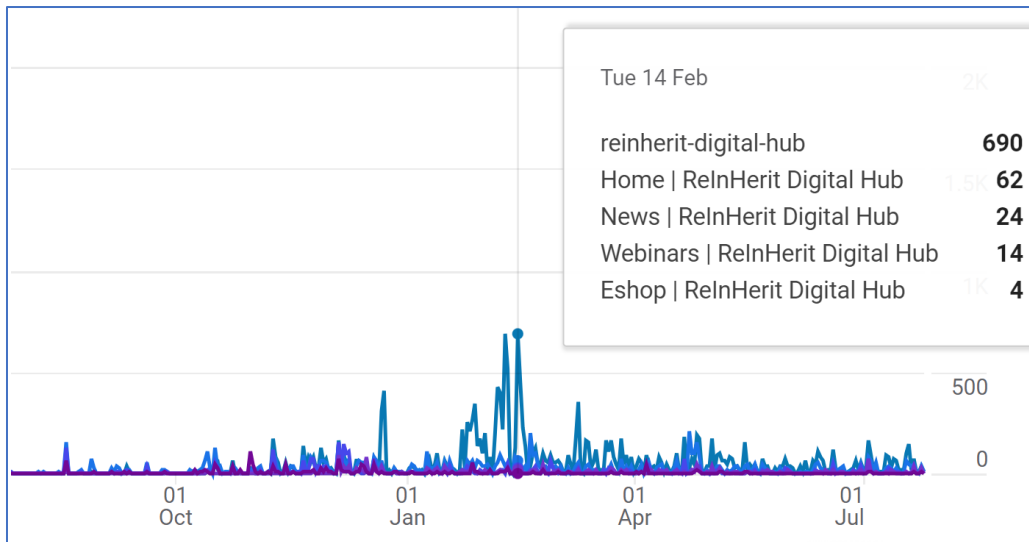


Figure 2. Page views of the Digital Hub (July 22 - July 23).

Figure 3 presents the total number of views (> 50,000, thus reaching a KPI) and users as of July 2023. From this data it is easy to see that there is a high number of repeated visitors, a fact that could be attributed to three main causes:

1. Consortium members checking the upload of their content;
2. the in Gallery Intro/Outro applications: these are pages in the Digital Hub, navigated through touch screens in the museums, with each visitor participating contributing to a view – all from the same touch screen, i.e. the same ‘user’;
3. repeated users particularly looking at the webinars and their materials.

Page title and screen name	Views	Users
	54,357	1,229
	100% of total	100% of total

Figure 3. Total number of views and users as of July 2023.

Figure 4 shows the growth of users in the digital hub, which is again beginning to raise significantly in November 2022 (with the launch of the eShop, the webinars, and the podcast) and is growing quite regularly, with some increases in March/April 2023, probably due to events in which the Hub was promoted and the circulation of the call for participation in the online collection through museums’ mailing lists.

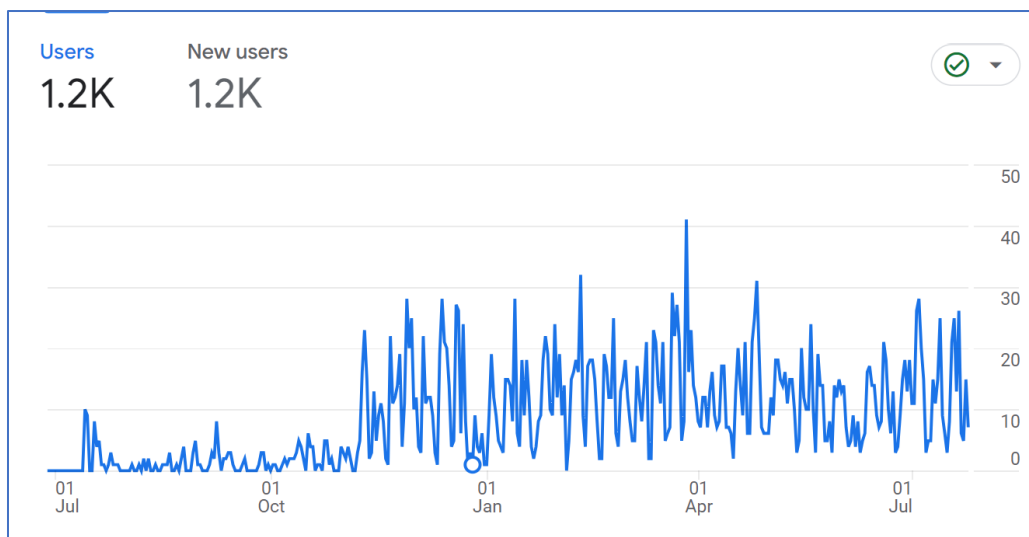


Figure 4. Growth of users in the Digital Hub (July 2022 – July 2023).

Through all the above figures, it is clear that the addition of new material and gradual completion of the Digital Hub scope and proposed content is substantially contributing to attract new users, in parallel with promotion through events, professional networks, and regular online events (such as the webinars). It is also clear that, if new users started to observe the Digital Hub with the first round of promotion of its content in November, it is only since February 2023, with increased content and increased participation by all consortium members in promoting their outputs on the Hub, that the Digital Hub has begun to receive regular attention by online visitors. It is expected that, as the Digital Hub's content is completed and the project intensifies its outreach effort, these numbers will increase further during late summer and autumn 2023.

Finally, the Forum in the Digital Hub uses a different form of analytics: the first version of the Forum was monitored manually by UNIGRAZ, weekly annotating the number of members. In this case, the growth was slow, due to a limited uptake of the forum by consortium members, and a consequent limited effort in promoting it through the project networks. In order to address this lack of engagement, UNIGRAZ organised a series of online chat in January and February 2023 (drawing on the example of successful Twitter chats, such as #museumhour), which contributed to add to the forum 10 consortium members and 2 external users. However, in February – as mentioned above – the service initially used, Gitter, began to use Matrix as a client for their forum, thus requiring a slightly more complicate login (in which users had not only to enter username and password, but also to select a server through the Element client for Matrix). Given the limited number of users and this additional difficulty, it was chosen to change service before relaunching the forum with more chats.

After some testing, Zulip was chosen. This service does not only stand out for its clear policies (esp. in regards of privacy and GDPR), but also for its easy of use: similar to Slack (a commonly used platform), but with a stronger and cheaper policy for hosting communities (e.g. a free cloud tier for research projects). It also includes statistics, which demonstrate the growth of users, and the number of messages exchanged and read on the platform (all as aggregated anonymised data). Figure 5 shows an overview of such analytics.

Zulip analytics for ReInHerit

Organisation summary

- Number of users: 45
- Users active during the last 15 days: 28
- Number of guests: 0
- Total number of messages: 163
- Number of messages in the last 30 days: 140
- File storage in use: 7.6 MB

Figure 5. Overview of Zulip analytics.

As it is clear from Figure 5, this new Forum launched in early May 2023 has already achieved a higher number of users than the previous forum. Figure 6, showing the growth of users, and Figure 7, showing the days in which the forum was most active, demonstrates once again the importance of the ReInHerit chats to draw new users, as well as events (the spike during the period around 20th July is due to the use of the forum in the Summer School in XR and AI in Matera).

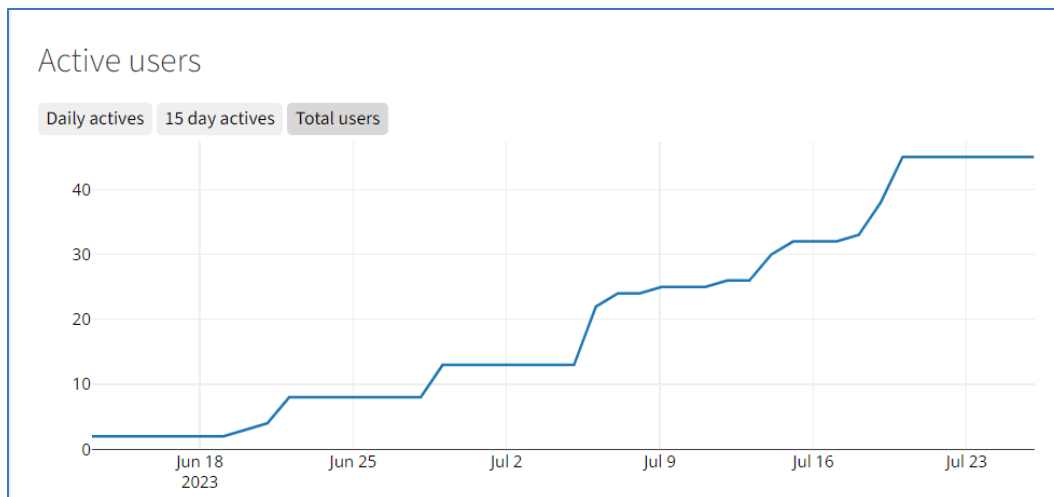


Figure 6. Zulip analytics on Forum users, following the relaunch of the ReInHerit chats at the end of June.

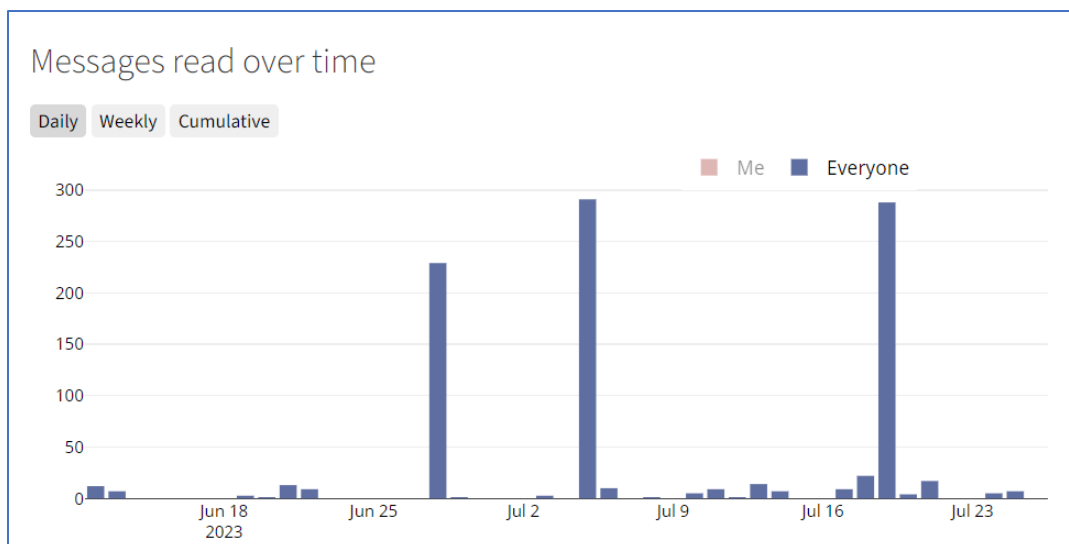


Figure 7. Number of viewed messages since the relaunch of the ReInHerit chats: note the spikes in correspondance of the first two chats on gaming and cultural heritage, while the third spike is due mainly to the Summer School in Matera.

The following table shows an overview of the ReInHerit chats hosted on the Digital Hub. In these chats, the moderator prepares some questions and prompts for the audience and moderates the discussion: so far, these chats have been held by the ReInHerit team at UNIGRAZ, with the plan to invite more moderators during autumn 2023, as the project gets closer to its ending and all consortium members will be focused on the dissemination of their research results.

Date	Topic	Moderator
18.01.2023	Industrial Heritage	Jasmin Sandriester (UNIGRAZ)
25.01.2023	Cultural tourism in rural areas	Jasmin Sandriester (UNIGRAZ)
01.02.2023	Digital transformation and cultural heritage in rural areas	Jasmin Sandriester (UNIGRAZ)
28.06.2023	Gamification in Cultural Heritage	Sina Krottmaier (UNIGRAZ)
05.07.2023	Serious games in Cultural Heritage	Sina Krottmaier (UNIGRAZ)
Planned	Videogames and engagement in Cultural Heritage	Sina Krottmaier (UNIGRAZ)
Planned	3D models and digital preservation	Chiara Zuanni (UNIGRAZ)
Planned	Sustainable digital strategies post-COVID	Chiara Zuanni (UNIGRAZ)

Table 1. ReInHerit Chats programme.

To conclude, this section has reported on the analytics of the Digital Hub during the first year and the measures taken to evaluate and increase engagement with it. Data will be collected until the end of the project, in parallel to the continued evaluation of the users' experience.

4. The future of the Digital Hub

The Digital Hub will be enriched with material until the end of the project. In particular, as mentioned above, the content provided by WP5 (Best Practices) and the documentation of the game (in WP3) are the two sections which will require most effort in the coming months, while other content will be completed gradually, following an established and on-going workflow (in particular, webinars, podcasts, and documentation of the performances).

The 'News' section will also be regularly updated until the end of the project, in liaison with MATERAHUB (managing the project website, also with a 'news' section) and CYCLADIC (managing the project's social media). Similarly, more chats and uses of the forum will be promoted.

This section, however, focuses in particular on the policies and strategies that needs to be considered once the project ends, to guarantee the availability and use of the Digital Hub. First, the report will review the digital sustainability of the platform; secondly, it will discuss the management approach.

4.1. Digital sustainability

The digital sustainability of the Digital Hub was considered since the beginning of its development. For this reason, the Hub was developed as a static website, guaranteeing its long-term preservation, and the choice of added services also was carefully planned. The long-term preservation of the Digital Hub and its content; the Forum; and the added services will be discussed in the following sections.

In addition, it should be noted that the code of the Digital Hub, as of any other application developed within ReInHerit, is hosted on GitHub, the established repository for code.

4.1.1. Sustainability of the Digital Hub

The Digital Hub has been developed as a static website, using Gatsby (a REACT-based static website generator), and is paired with Netlify CMS (a Content Management System for static websites). The code of the Digital Hub is hosted on GitHub, and the website is also deployed to a GitHub repository – and published as a set of GitHub Pages (see D4.2 for details). By hosting the website on GitHub, the Digital Hub avoids the use of a server, consequently reducing maintenance costs and ensuring a better long-term sustainability of the platform. Currently, the Digital Hub is available at a dedicated URL (<https://reinherit-hub.eu/>), with this domain reserved for five years (until 2027) and the possibility of renewing it for another five years. Still, once the domain will not be paid for anymore, the Hub will remain available on its GitHub pages URL (reinherit.github.io), a free domain ensured by GitHub. In short, the Hub can remain online at zero costs (no server; no required domain) thanks to its setup as a static website hosted on GitHub.

As mentioned, the backend code is entirely hosted on a standard repository for programmers (GitHub), supporting the long-term preservation of the infrastructure's codebase. Furthermore, in a static website, once a page is deployed, the content is stored as HTML and delivered to the user directly – without the need of being regenerated every time a user calls a page. This is a crucial difference from dynamic websites (e.g. those built on Wordpress, Wix, or Squarespace), which generate each web page 'on-the-go' by pulling data from a database, processing them through a web application (usually written in .php), and presenting the final result to the user.

As a consequence, a static website, as the Digital Hub is, offers improved security and sustainability in comparison to a dynamic website. Having fixed content stored and served "as it is" to the user means that this content can withstand more reliably and consistently malicious attacks (since the data cannot be affected by malicious scripts generating on-the-go problematic content). Importantly, once generated, the content remains stable in the long-term (in contrast to dynamic websites, where the need of regenerating content for each user exposes the website to the need of regularly updating and maintaining plugins and other dependencies necessary for the final page). In short, static websites generate their HTML once and serve this result to all future users, thus guaranteeing a better sustainability of the web pages (for more details, see D4.2, p.11) and a better protection against malware and changes in the dependencies.

To conclude, the digital sustainability and long-term maintenance of the Digital Hub has been planned from the beginning of its development and is ensured by:

- 1) open source code on GitHub;
- 2) domain covered until 2027, subsequently redirecting to the free GitHub pages domain;
- 3) its nature as a static website, protecting it from malicious attacks;
- 4) its nature as a static website, guaranteeing the preservation of the content as it is (due to its independence from plugins updates and dependencies).

4.1.2. Sustainability of the Forum

The technical infrastructure of the Forum is now provided by Zulip, an external service with a robust architecture and strategy to ensure the long-term sustainability of the content.

As it will be discussed below, the sustainability of the forum is ultimately dependent on its use and governance, with users maintaining it active and moderating the content. Closer to the end of the project, an evaluation of the forum's success and discussions among the consortium will establish a policy for its future use – while the content already published by then will remain available in any case.

4.1.3. Sustainability of other services

The Digital Hub includes a series of external services, most notably Netlify CMS; UploadCare; and Google Analytics.

Netlify CMS is used to facilitate the publication of content by consortium members during the project: once the project will conclude, its use will be limited to project coordinator (BOCCF) and lead developer (UNIGRAZ) for updating the portal in case of necessity. The sustainability of this service is again due to its nature as a CMS for static websites, embedded in the code published on GitHub. However, in case of any problem with the Netlify CMS, the management of the Digital Hub content and its update will also be possible directly through GitHub, hence guaranteeing any necessary updates.

UploadCare is used to manage images and PDF files uploaded on the Digital Hub, thus facilitating the delivery of this content. It is, again, a popular and reliable service for file management in web development, with a sustainable outlook. However, since this is not technically a repository, a backup copy of all the content present on UploadCare will be stored on secure servers (UNIGRAZ and/or BOCCF), guaranteeing a quick solution for adding this content to the Digital Hub in case of any (unlikely) failure of the UploadCare service. It should be noted that the content stored on UploadCare does not include any personal data or sensitive material, since it consists of the thumbnail and images shown on the Hub and some of the PDFs (research factsheets; webinars slides).

Finally, Google Analytics might also remain active for a limited period post-project conclusion – with an even more limited data collection for monitoring purposes.

In addition, the Digital Hub includes also content not directly managed by the Digital Hub developers (UNIGRAZ), and independently setup and linked by the consortium partners. This content consists of:

- **Toolkit applications:** the code for these applications is hosted on GitHub and linked in the Hub and in the ReInHerit Team GitHub page. The applications themselves are hosted on Heroku, a common service for publishing this type of applications, by MICC. As mentioned,

the GitHub code will remain available, while the long-term availability of the Heroku demonstrators will be evaluated by MICC.

- **Game:** the game is also hosted on GitHub, in a separate repository managed by CYENS – and, as such, will remain available.
- **Immersive performance applications:** the code for these applications is also hosted on GitHub and managed by CYENS; a public version of the application for the second performance is downloadable from common app stores (Apple Store; Android Store).
- **Tablet Application:** this is an application developed for the travelling exhibitions, included as a subdomain on the Digital Hub, but hosted independently by the Graz Museum, in collaboration with external developers, on a separate server.
- **Online Collection:** the online collection has been developed as a separate Wordpress-based portal by Graz Museum, in collaboration with external developers, and it is hosted on the same server as the tablet application. The Graz Museum has committed to its management and preservation post-project ending.

	Responsible	Hosted on	Sustainability outlook
Digital Hub	UNIGRAZ	GitHub	No server and domain costs. Stable pages and content.
Hub service: CMS	UNIGRAZ	GitHub	Stable solution. Limited need post-project ending.
Hub service: image/files management	UNIGRAZ	UploadCare	Stable solution. Possible transfer to GitHub for additional sustainability.
Forum	UNIGRAZ	Zulip	Stable infrastructure. Governance needs to be clarified.
Toolkit applications	MICC	GitHub and Heroku	Stable solution. Demonstrator visibility on Heroku will be evaluated.
Game	CYENS	GitHub	Stable solution.
Performances applications	CYENS	GitHub	Stable solution. Availability of performance-specific app for download will be evaluated.
Exhibitions: Tablet application	Graz Museum	Wordpress (museum server)	Limited post-exhibitions need for exhibition-specific visualisation.
Exhibitions: Digital collection	Graz Museum	Wordpress (museum server)	Commitment to maintain it.

Table 2. Overview of technological sustainability for the components of the Digital Hub and responsibilities among consortium partners.

4.2. Policy and management post-project ending

The Digital Hub has been developed by UNIGRAZ and it is the main output for presenting the project applications and research. As such, all consortium members will be included in any decision on its future.

Once the project ends, administrative rights on the Digital Hub will be retained by UNIGRAZ (as the developing partner, with expertise on the Hub technologies) and by BOCCF (as coordinator). The preservation of the content and the resources on the Hub will therefore be ensured by these two

project members. Since the Digital Hub's aim was to present and document the outputs produced during the project, no more content is planned as part of the resources for professionals and the applications and exhibitions proposed to a broader audience. However, news might still be updated by Consortium Members with project-related events and reflections.

However, the participation of the community – through the adoption of the ReInHerit applications, the use of its resources, the hosting of a travelling exhibition, or contributions to the digital collections – will still be encouraged, and documented.

In parallel, as mentioned above, an evaluation of the Forum and the engagement of its participants will lead to decisions about its future governance structure. It will be necessary to evaluate and assign responsibilities for maintaining a safe and positive environment on the forum, by creating a group of moderators who will be able to remove disruptive and/or malicious users and promptly remove any inappropriate content. Depending on the growth of the Forum during the last part of the project, and the interest of the Consortium members, a decision will be taken prior to project ending on this governance structure and on which partners will be involved in monitoring and maintaining the forum.

5. Conclusion

This deliverable has presented the policies and workflows implemented during the first year of the Digital Hub, showing the progress in enriching its content and the solutions and changes adopted since D4.2. At the time of the first deliverables describing the Digital Hub (D4.1, Requirements; D4.2, Report on the Digital Hub), the Hub had been just launched, but was not yet in use by the consortium partners. As expected, once partners began to upload their content small changes to design and functionalities of the platform needed to be implemented and have been described in the first part of this deliverable. Similarly, the introduction of new formats, such as the podcasts, required the creation of new sections in the Hub. The major change was represented by the change of Forum infrastructure, moving to a new service that proved more accessible to users. This deliverable also presented an overview of the analytics documenting the progressive interest in the Hub during its first year, and demonstrating the positive results of a change in the forum platform.

The Hub's content will be completed by the end of the project, and the next challenge will be its sustainability. The second part of this deliverable focused on this aspect, considering both technological and management perspective for the long-term maintenance of the Digital Hub. It has been noted that, thanks to its nature as a static web site, the Hub and its content will be easily maintained, at potentially zero costs, post-project ending. Similarly, the codebase of all the applications – managed by the relevant partners – will also remain available (and will be reachable through the links in the documentation pages of the Hub).

It has been noted as the addition of new content post-project ending, especially in regards of the news section, will be discussed further within the consortium, but does not require additional technical solutions. Similarly, the management of the Forum to ensure a safe and welcoming environment and avoid the risk of malicious users posting damaging and/or inappropriate content will be discussed in a future meeting with consortium partners, and the final decision will draw on the analytics of the forum and an evaluation of the interest in maintaining it in the future.

In conclusion, this deliverable has shown the policy and management of the ReInHerit Digital Hub during its first year; it has demonstrated how its digital sustainability will be easily maintained; and it identified the decisions that will need to be taken in the coming months in relation to its future management.

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