Europeana DSI-4 Final report

September 2018 - August 2022

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Consortium partners

[Europeana DSI-4](#) was operated by a consortium of 24 partners, coordinated by the Europeana Foundation.

Introduction

Together with the European Commission and the Member States, the Europeana Initiative fulfils the European Union's aim to enable easy access to digital culture and resources, for citizens, education, academic research and the cultural and creative industries.

The Europeana Digital Service Infrastructure (DSI) showcased and provided online access to Europe's digital cultural heritage. As an initiative of the European Union, and funded under the Connecting Europe Facility (CEF), Europeana DSI-4 was the project that operated the Europeana DSI. The service was provided by a consortium of 24 partners, coordinated by the Europeana Foundation (EF).

The consortium collaborated with the Europeana Network Association (ENA), a strong and democratic community of over 3,500 experts working in the field of digital heritage. We also worked closely with the Europeana Aggregators' Forum (EAF), consisting of national, domain and thematic accredited aggregators.

This final report summarises the highlights of the four years of DSI-4, covering the timeframe from 1 September 2018 to 31 August 2022.

Over the past four years, the consortium partners, EAF and ENA worked in close collaboration towards our goals outlined first of all in the original DSI-4 tender and then in line with the Europeana Strategy 2020-2025 to provide a strong public service that supports Europe's cultural heritage sector in its digital transformation.
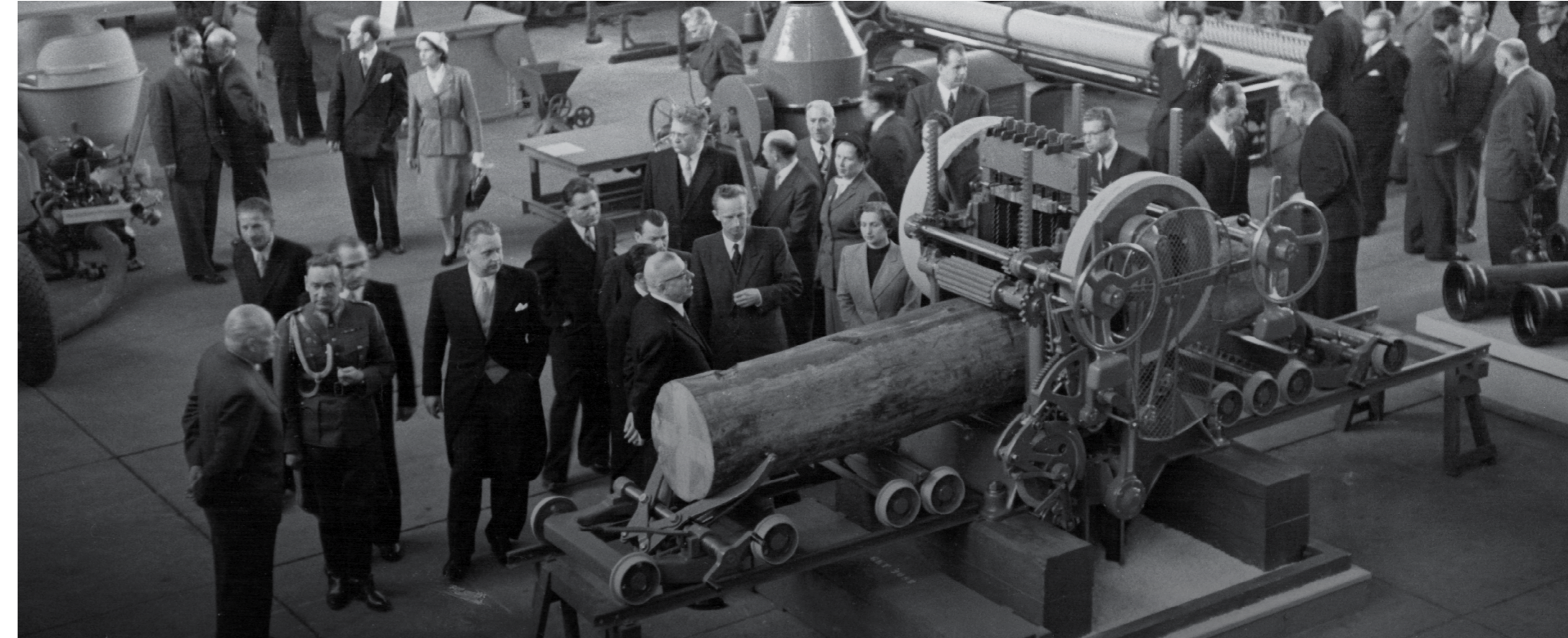
Messuhalli [...]. Väinö Kannisto. 1952. Helsingin kaupunginmuseo. CC BY

Implementation plans were supported by the European Commission and the Commission expert Group on the common European Data Space for Cultural Heritage (CEDCHE) and its subgroups.

Summary

Global challenges

Europeana's core values – that the work we do is reliable, usable and mutual – held strong throughout a period which held unexpected challenges for all of us, for our organisations and for our communities worldwide.

The sociopolitical landscape in which we operate has been changing, and the Europeana Initiative has shown that its members share a growing sense of responsibility in areas such as diversity and inclusion and climate action. These issues have an impact on every decision we make in all areas of our work.

From early 2020 onwards, the COVID-19 pandemic impacted the way we work, live, meet and communicate. It underlined the need and urgency for cultural heritage to be accessible digitally – for all, and from anywhere.

Threats to democracy have challenged us all, with repercussions for cultural heritage organisations, their dedicated professionals and the cultural heritage collections themselves, with Russia's invasion of Ukraine in 2022 a particular concern.

Despite these challenges, during the period of DSI-4, all members of the Europeana Initiative collaborated with great drive and resilience and together we strengthened the Europeana infrastructure, improved data quality and built capacity for digital transformation.

Himmelskarte, Kupferstich, 1661. Deutsche Fotothek. CC BY-SA

Highlights

The work carried out throughout DSI-4, whether related to data, engagement, networks or reuse, all contributes to our overarching goal of supporting the digital transformation of the cultural heritage sector.

In the four years of DSI-4, we have done extensive work to get to grips with understanding and defining exactly what digital transformation means. It affects all cultural heritage institutions, the large and the small, the well-resourced and those less so. And while we believe that it is of course to do with technology, we have come to understand that it is equally about mindsets and personal capabilities.

The impact of digital transformation is different for each individual organisation. Each change, no matter how small, contributes to a cultural heritage sector powered by digital and a Europe powered by culture.

Here are some of the highlights from our DSI-4 digital transformation journey.

Building capacity across the sector. During DSI-4, Europeana has developed tools, resources, frameworks and a leading events programme to provide cultural heritage professionals across the sector with opportunities to learn, develop their skills and expertise and improve digital practices. This work – articulated in a unifying Capacity Building Framework – has resulted in an approach to building capacity which has contributed towards a strengthened and digitally transforming sector. An example of our progress here is our events programming.

We moved from in-person events towards a full range of digital workshops, webinars, and our first-ever online-only annual conference. This change saw thousands – rather than the previous hundreds – of professionals come together from across the globe each year. Throughout DSI-4, over 19,600 people attended an event (in-person or online) or watched a recording.

Widening and strengthening our networks. During DSI-4, the Europeana Foundation, Europeana Network Association and Europeana Aggregators' Forum developed closer and stronger working practices, contributing together to Europeana's strategic development, and forming what has become known as the 'Europeana Initiative'.

A new scheme saw 40 aggregators certify their data expertise as Europeana Accredited Aggregators. The Europeana Initiative worked together on 13 Task Forces, seven Working Groups and developed seven area-specific communities. And we worked hard to invest in partnerships that can support the Europeana Initiative in its aim to digitally transform the sector, taking part in high-level meetings with organisations such as Europa Nostra, Time Machine and UNESCO.

An overarching achievement for our collective working is the development and implementation of Europeana's Inclusive Engagement Guidelines – a new mechanism for working together in an inclusive, respectful and kind manner.

AGM 2018 Vienna. Europeana Foundation. 2018. CC BY-SA

A concerted effort for high quality data. The Europeana Publishing Framework, which provides a definition of data quality and a method to manage and improve it, and Metis, a data aggregation infrastructure capable of processing and sustaining large volumes of complex data, are key tools that have been developed and improved during DSI-4. Our data publication is now faster and more efficient and contributes to data quality improvements. Over 117 million records were processed during DSI-4, increasing the quality of data in Europeana significantly. This progress in turn led to improvements in the products and services we offer, for example the introduction of entity collections that link objects together by concepts, or the ability to offer multilingual item pages.

By further implementing our aggregation strategy and investing in research and development, we have laid the foundations to publish more high-quality data in the future. Metis, along with the Metis Suite of supporting tools - notably the Metis Sandbox and the Statistics Dashboard - now forms a complete aggregation pipeline, making it easier to identify, report on and discuss data quality. With the Metis Sandbox, providers can validate and troubleshoot their data, and get pointers on how to increase their data's accuracy and quality.

Research and development efforts and experiments have seen advances in the areas of interoperability, multilinguality and enrichments (both at source and after ingestion), all with the goal of achieving higher-quality data in Europeana. Significant updates to our data model (EDM) mean we can now accommodate higher-quality data. To acquire richer data at source, we have experimented with new approaches for data aggregation. And we have begun to research and experiment with Artificial Intelligence to enhance both content and metadata.

Digital culture for all. Driven by increased knowledge about our audiences, the Europeana website was transformed during DSI-4. It shifted to a new platform using new technology and offered audiences better experiences in their own languages, more interactivity through their own Europeana accounts and the ability to create and share galleries. Exhibitions in all EU languages, interactive festivals and competitions, and a dedicated space for teachers all provided exciting ways to explore and use cultural heritage material.

Enriching research and education. We want educators, academics and researchers around the world to enjoy and use cultural heritage collections to enrich educational resources and open up new areas of research. With dedicated areas on the Europeana website just for teachers, grant opportunities for researchers, exciting partnerships, online courses and mentoring programmes, multilingual learning resources, and integration of Europeana content into external digital tools and services, Europeana is reaching more teachers, academics, researchers and students than ever before.

Contributions by innovative projects. During the DSI-4 period, Europeana integrated the outcomes of 19 Europeana Generic Services projects which delivered millions of high-quality objects to the Europeana website and enriched millions of metadata objects for enjoyment and reuse. The projects also developed innovative tools and services around aggregation, enrichment, 3D display, and user engagement, while also providing training on these topics to build capacity across the sector. And thanks to the work of these projects, hundreds of editorials were published which told the stories of Europe's cultural heritage in innovative and exciting ways.

Afbeelding van de lithosnelpers in het Grafisch Atelier (Pieterskerkhof 8) te Utrecht. 1987. Het Utrechts Archief. CC0

Digital transformation

During the period of DSI-4, the focus of the Europeana Initiative was fully articulated in a new mission: 'To empower the cultural heritage sector in its digital transformation.' The Europeana Strategy 2020-2025 outlined how this mission would be achieved, while a definition of digital transformation, validated across the sector, helped us to understand exactly what we were working towards.

This period has also seen the development of a wide range of activities which aimed to build capacity for digital transformation among cultural heritage professionals and institutions. Events and training develop skills, while tools and frameworks support impact and copyright practices, alongside resources and case studies. Collaboration between the Europeana Foundation, Europeana Network Association and the Europeana Aggregators' Forum has been key to this work.

Europeana Strategy 2020-2025 cover image. Europeana Foundation. 2020. CC BY-SA

Europeana strategy 2020-2025

The strategic objectives that DSI-4 was based upon when it began in 2018 covered making cultural heritage available online efficiently and in a way that engaged the public, Member States and cultural heritage institutions, and encouraged discovery and reuse.

By early 2020, these objectives were consolidated into the Europeana Strategy 2020-2025 – 'Empowering digital change'. In order to achieve the goals set out for DSI-4, the Europeana Initiative realised there was a larger horizon to address and articulated its mission as 'empowering the cultural heritage sector in its digital transformation'.

As the COVID-19 crisis developed, the relevance and urgency of a vision of a digitally powered cultural heritage sector taking its place at the heart of society was confirmed, and Europeana's core values – mutual, usable, reliable – were underlined.

The five-year strategy set out three priorities which have guided DSI-4 work ever since.

Priority #1: Strengthen the infrastructure

Challenge: Inefficiencies in technical infrastructure make it harder for institutions to share their collections online effectively.

Solution: The Europeana Initiative will invest in supporting innovation activities that keep the infrastructure aligned with state-of-the-art tech.

Priority #2: Improve data quality

Challenge: The lack of sufficient high-quality content and metadata highly affects the access to and visibility and reusability of digital content.

Solution: The Europeana Initiative will invest resources in activities related to metadata and content improvement. It will use new technologies like machine-learning algorithms to enrich metadata records.

Priority #3: Build capacity

Challenge: The needs of cultural heritage institutions are many and varied, so it's difficult to achieve consistency in digital output and mindset across the sector.

Solution: The Europeana Initiative will support institutions in their digital transformation. It will showcase the importance and added value of digitisation, adoption of standards, best practice and common solutions.

Support for the sector during COVID-19

During the period of Europeana DSI-4, the COVID-19 pandemic emerged as an immense challenge for the cultural heritage sector, as for society worldwide.

As Europe went into lockdown, as well as coping with massive changes to working lives ourselves, we shared examples of responses to the pandemic from across the sector, aiming to inspire professionals and help them to find support as activities moved online. We published posts and created a central 'hub' page to share resources, approaches and tools for engagement. Our events became digital, with a series of 'Culture from Home' webinars highlighting how cultural heritage institutions switched to online activities. Content on the Europeana website offered timely resources and learning scenarios.

A special series of online workshops 'Digital Transformation in the Time of COVID-19' provided space for cultural heritage professionals to reflect on and undertake strategic planning for this unprecedented time. The workshops began an ongoing process to understand the needs of the cultural heritage sector and resulted in two complementary reports which continue to inform approaches.

The pandemic highlighted the need for collaboration, and we worked with partners to advocate for cultural heritage. With Europa Nostra and the European Heritage Alliance we launched the Europe Day Manifesto – Cultural heritage: a powerful catalyst for the future of Europe to set out the key ways that the cultural heritage sector can contribute to Europe's recovery.

An accompanying Europe day webinar saw representatives of EU Institutions come together to discuss the role the cultural heritage sector should play in the transformation of Europe.

The disruption, challenges and suffering of the COVID-19 pandemic cannot be underestimated, but it also underlined the need for digital practices, working and engagement. This provided an opportunity to ensure long-lasting positive change, which Europeana continues to work towards as we empower cultural heritage institutions in their digital transformation.

The regular washing of hands. Lithograph, ca. 1960.
Wellcome Collection. 1960. CC BY 4.0

Defining digital transformation

DIGITAL TRANSFORMATION
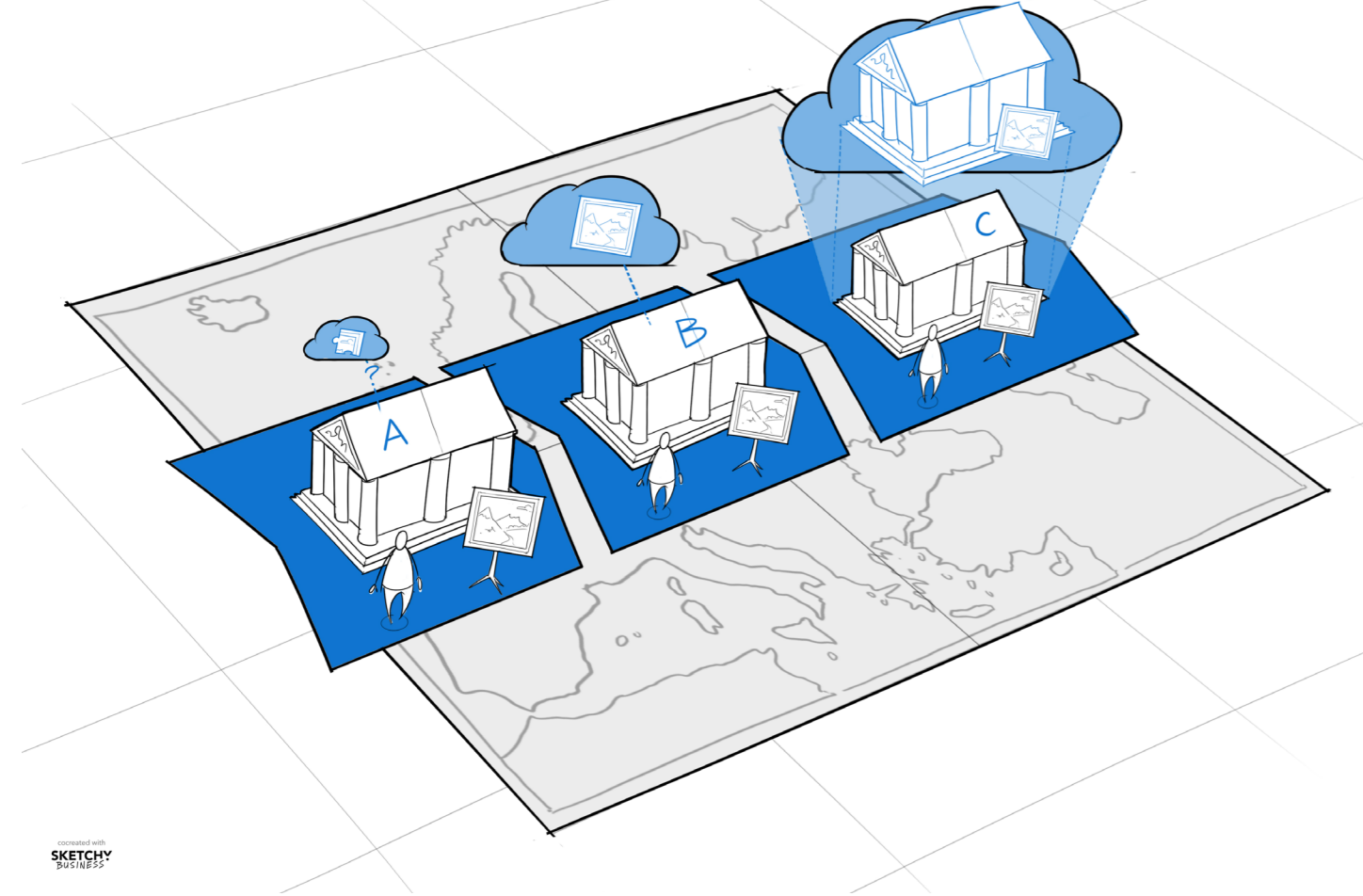
Visualising digital transformation. Europeana Foundation and Sketchy Business. 2020. Public Domain

As the Europeana Strategy 2020-2025 set out the Initiative's mission to empower the cultural heritage sector in its digital transformation, the need for a shared understanding of the term became increasingly important, particularly at a time of global crisis, when working and providing access to cultural heritage digitally proved more important than ever before.

Throughout 2020 and 2021, the Europeana Foundation worked with peers, partners and colleagues across the Europeana Network Association and sector to agree a common working definition of digital transformation that is relevant to the cultural heritage sector and our stakeholders:

> *Digital transformation is both the process and the result of using digital technology to transform how an organisation operates and delivers value. It helps an organisation to thrive, fulfil its mission and meet the needs of its stakeholders. It enables cultural heritage institutions to contribute to the transformation of a sector powered by digital and a Europe powered by culture.[1]*

We now use the definition to help shape our future strategies and priorities, so that a cultural heritage sector powered by digital can contribute to a Europe powered by culture. The definition will help us meet the needs of the sector, guide how we think about our impact and shape how we measure our success and, ultimately, the progress of the digital transformation of the sector.

Building capacity for digital transformation

When Europeana DSI-4 began, the Europeana Initiative had developed a number of resources to support learning related to specific topics, including the Europeana Data Model (EDM) and copyright primers. However, over the last few years, our work has pivoted to establish the development of skills and expertise among cultural heritage professionals as a core element of supporting the digital transformation of the cultural heritage sector.

This is evidenced by the move to develop increasingly structured skill-building resources, for example: training on the products and frameworks offered by Europeana, including on Metis Sandbox, Data Statistics Dashboard and rights statements; services and tools around specific topics of interest to the sector; and processes and guidelines which support our vision of capacity building. In addition we developed and published guidelines to standardise future development and delivery of training.

This work is reflected within the Capacity Building Framework developed, maintained and updated during this period. The Capacity Building Framework serves to support a shared approach to identifying capacity building activities that support digital transformation, and informs the approach we take to areas of focus across our work.

The work undertaken to develop this framework underlined the dependencies and overlaps in the strategic propositions of existing Europeana frameworks. Efforts were made to address and gain oversight of these, resulting in a harmonisation of all Europeana frameworks through a frameworks management template. Key to development of this template was shaping consensus of what capacity building for digital transformation should consist of, and what its key terms mean.

IMPACT
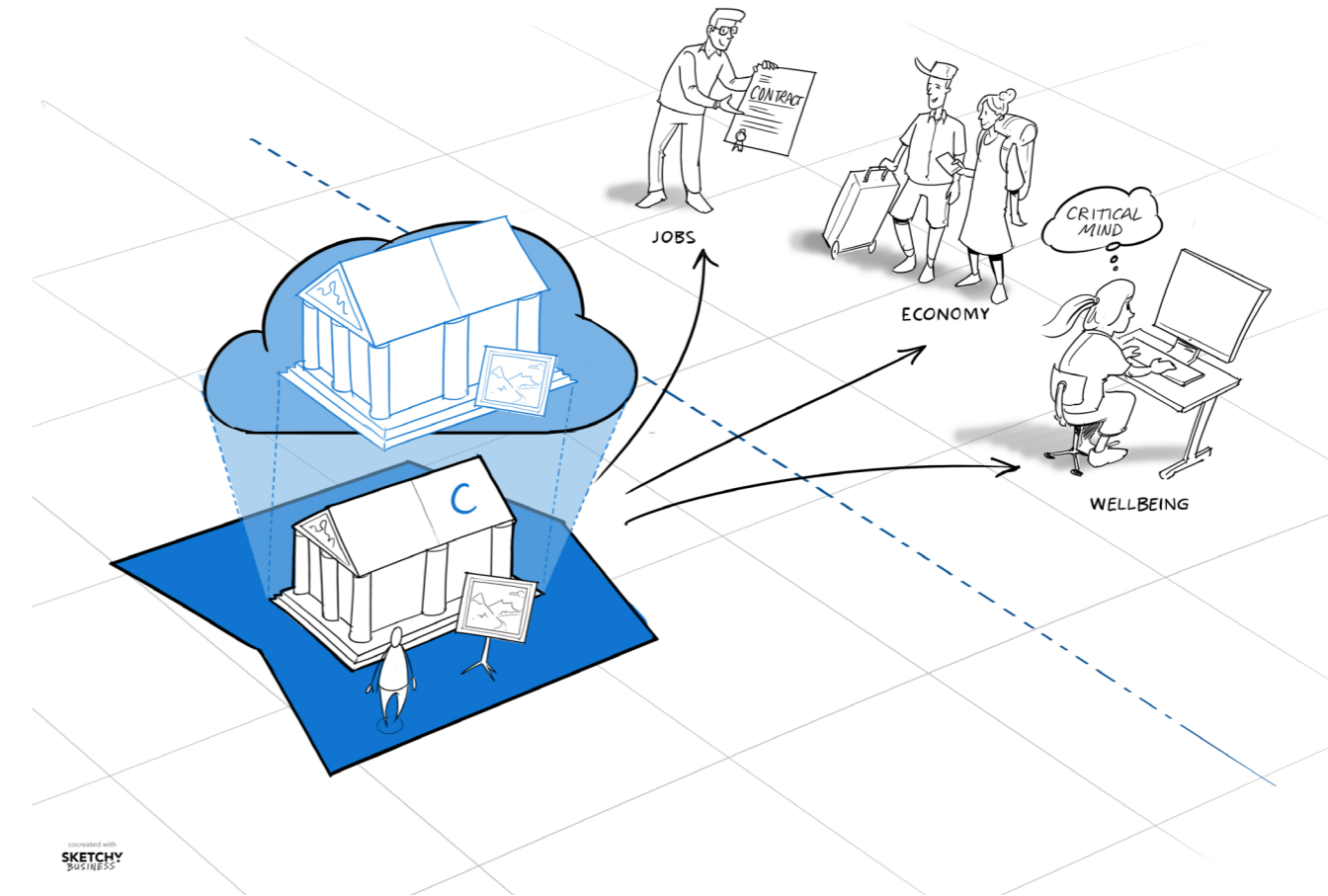
The Impact of Digital Transformation. Europeana Foundation and Sketchy Business. 2020. Public Domain

Definitions have consequently been developed and validated with our stakeholders, and are shared and maintained with our sector through an updated Europeana Glossary.

A high level of involvement of the ENA and EAF in our capacity-building activities has strengthened this work, which leaves us with a harmonised and strategic approach with which to support capacity building for digital transformation in the coming years.

The Europeana ecosystem:
deepening connections and convening for impact

The period of DSI-4 saw the collaboration between the three pillars of the Europeana Initiative – the ENA, EAF and EF – develop and deepen, reflected by the launch of several cross-initiative Task Forces, Working Groups and associated activities.

ENA, EF and EAF worked together to define the main areas in which they could be active in supporting digital transformation. The ENA and EAF assumed their roles in developing and strengthening the capacity of cultural heritage professionals by working with – and drawing from – the expertise of their members, sharing knowledge and learning from each other. Together, they contributed to developing the Europeana Capacity Building Framework, and running the Digital Leadership & Innovation development programme. Representatives of ENA and EAF took part in the cross-Initiative Digital Transformation Task Force. Diversity and inclusion was another area of shared interest, with ENA and the EAF contributing to the development of Europeana's Community Guidelines, and running a Task Force on the topic.

The internal governance of the EAF and ENA was strengthened to refine and develop the experience of their respective members, and build capacity across the sector. The Europeana Aggregators' Forum developed an accreditation scheme which formalises and acknowledges their expertise. To date, 40 aggregators have achieved this accreditation.

ENA has gone from strength to strength, with its original six special interest communities (Research, Education, EuropeanaTech, Impact, Communicators and Copyright) driving a wide range of activities, such as copyright resources and webinars, educational MOOCs, contributing to the further development of the Europeana Impact Playbook, running Task Forces on AI, 3D, and storytelling, and supporting the new professionals in the sector. In the final year of DSI-4, we were delighted to launch a seventh community, the Climate Action Community, which builds on the collective desire and support across the ENA, EF and EAF to foreground the climate crisis. In this period, 80 people have served as Members Councillors, and the Management Board that leads the ENA renewed its composition four times. The overall ENA membership has grown from about 2,200 (autumn 2018) to the current 3,759 members.

Beyond the Europeana ecosystem, Initiative partners also sought new collaborations and inter-network connections to raise awareness, build partnerships, enable peer-to-peer working and develop tools, services and events which support cultural heritage organisations in their digital transformation. This included taking part in initiatives with Europa Nostra, ESACH, Time Machine, UNESCO, the European Heritage Alliance, NEMO and 4CH amongst others.

Events: from onsite to online

A new events programme. At the beginning of Europeana DSI-4, the Initiative had defined an established series of in-person and on-site events held throughout the year (including EAF meetings in Germany and Sweden, the ENA General Meetings in Austria, a conference in Portugal and Presidency events in Romania and Finland).

This approach, however, pivoted dramatically during the DSI-4 period due to the Covid-19 pandemic, with events rapidly transitioning to being organised and delivered online. The Europeana Aggregators' Forum and Europe Day in May 2020 were the start of many online webinars and meetings, and in 2020, Europeana organised over 30 online events and reached over 2,000 people online (in comparison with 287 people in person in Lisbon in 2019 and 210 in Vienna in 2018).

In 2021-2022, we learned more about our online audiences through surveys and improved our online events. We assessed to what extent attendees had learned something from an event, we introduced a cafe format giving people the opportunity to have an informal discussion on a specific topic, and we created short recap videos for selected events for easy sharing. We also developed an events toolkit to support professionals working in the sector. In total, we reached over 19,000 people through our live events and their recordings.

We are now researching, developing and skilling our team in delivering hybrid events – combining both an online and on-site audience, and look forward to bringing our skills and knowledge into the coming period.

Presidency events. The meetings, workshops and conferences we organise together with the Member States holding the presidency for the Council of the EU form an important series of events. These events bring the CEDCHE Expert Group and relevant experts and policymakers together to discuss, align visions or form a shared understanding of important and challenging topics. Whether in person or online, these events seek to provide space for new ideas, discussion, insights and innovation.

Topics discussed during these Presidencies had wide relevance for both Member States and the sector. They included 'a vision for Europeana and the European cultural heritage' (Bulgarian Presidency, 2019), 'supporting strong national infrastructures' (Romanian Presidency, 2019), and multilingualism (the Finnish Presidency, 2020, this provided valuable input to the Europeana Multilingual strategy).

With Presidency events moving online, the fruitful discussions continued. The 2020 German Presidency Europeana conference explored 'copyright and capacity building', with the input collected during the event leading to a set of recommendations for the Europeana Initiative and for Member States, in order to support the sector. The following conferences explored 'digital capacity building in the cultural heritage sector' (Portuguese Presidency, 2021), and 'driving engagement and participatory approaches to digital cultural heritage' (an accompanying event of the Slovenian Presidency, 2021).

Finally, we explored 'building the common European data space for cultural heritage together' as part of the French Presidency in 2022. The conference stimulated reflection and helped create a basis for collaborative ongoing dialogue towards the building of the data space.

In Langenbruck beim Heuen. 1910. Kooperationinitiative Museen Baselland. CC BY-SA

Creating a shared approach to impact in digital cultural heritage

The completion of the Impact Playbook. The first phase of the Europeana Playbook (dedicated to Impact design) was published in 2017. The final three phases, dedicated to measuring, narrating and evaluating impact, were published under DSI-4 in 2019, 2021 and 2022 respectively. Each phase was collaboratively developed with colleagues and peers from the Europeana Foundation, Europeana Initiative and beyond, building on real-life experience and showcasing real case studies for which impact was measured and the Impact Playbook applied.

The Europeana Impact Framework led to the creation of the Europeana Impact Standardised Question Bank – the first collection of evaluation and impact assessment questions in cultural heritage and one of very few similar publicly-available resources in the cultural sector. It follows on from the standardisation of impact assessment in the Europeana Initiative, including standardisation of the long-term collection and monitoring of data relating to learning and capacity building, network development and more.

Metrics to evidence digital transformation. In the Europeana Impact Framework, we take a stakeholder-focussed approach to thinking about impact. This was also reflected in how we think about and try to evidence digital transformation. Digital transformation is contextual: it can take place at any scale and level. In line with the definition of digital transformation, we know that digital transformation is not only about technology but also skills and mindset. There are no agreed EU-wide indicators to measure digital transformation. Based on our work in DSI-4 we recommend that any metrics to measure digital transformation must be holistic, developed in partnership, benefit from wide consultation, and acknowledge the value of change at whatever scale or level it happens.

In DSI-4, we have begun to map out and collate metrics that could help us measure digital transformation in this way, and the launch of the ENUMERATE Self Assessment Tool presents a significant step forward in data collection, moving ENUMERATE from a biannual campaign towards a model of rolling data collection. However, ENUMERATE is not the only data source available that can help us build a picture of digital transformation. We set out a proposal for a cross-sector approach to measuring digital transformation on a collaborative, transparent, sustainable and long-term basis. This also reflects the findings and recommendations of the Digital Transformation Task Force, whose emphasis on a shared language and approach highlights the value that partnership working can contribute to 'accommodate the multiple, complex and layered perspectives and contexts that exist across the cultural heritage sector'.

Creating connections and capacity in the Impact Community. Alongside this, we have grown the Europeana Impact community whose members share a desire for a common way to speak about and measure impact in digital cultural heritage (in the past three years, the community grew from around 250 members to around 1,600 members). This community is shaping how we think about impact and how we build capacity in impact assessment. Its work led to two Impact Lite Task Forces which aimed to make impact assessment even easier to conduct by building capacity in Europe's heritage museums (and beyond).

Our capacity building in impact has led to a successful five-part webinar series on impact (2020-2021), where 289 people registered to attend one or more of the events. The majority of those registering were not Europeana Network Association members, showing the potential of this topic to bring new professionals into the ENA. We expanded discussions about impact more widely in the ENA's communities by organising a symposium in collaboration with the Research Community. The Playbook has been presented in conferences, featured in publications and brought to audiences including policymakers, educators and more.

Building capacity to navigate copyright

Throughout DSI-4, Europeana has focused strongly on following legislative opportunities to make digital cultural heritage available online, building the capacity of data providers and supporting efforts to increase the availability of digital objects in Europeana that are free from copyright limitations. As a result of these efforts, the amount of content available for reuse with no copyright limitations (that is, labelled PDM, CC0, CC BY or CC BY-SA) increased from 37% in May 2018 to 49% in August 2022.

To contribute to the fulfilment of the objectives in the Copyright Strategy 2020-2025, Europeana has continued to facilitate conversations with a range of stakeholders, connecting decision-makers with practitioners. We have worked with, for example, cultural heritage professionals through the Copyright Community, Member States during the German Presidency Event, civil society organisations such as Creative Commons, or the EUIPO as facilitators of the success of the Out of Commerce Works system.

We have built on years of advocating for copyright laws to reflect the needs of the cultural heritage sector, and have helped the sector follow and understand the evolving legislation and the extent to which it facilitates the dissemination of digital cultural heritage online and its reuse. As part of this, we have supported the transposition of the out-of-commerce works and public domain provisions in the 'Copyright in the Digital Single Market Directive' so that more digital cultural heritage can be legally made available online and is available for reuse.

We continued to support and collaborate with the Europeana Copyright community seeing it grow in membership significantly (from around 290 members to around 1,400 members in the past three years).

We have kept the sector informed of legal and policy changes via Pro News posts authored by the copyright community, social media posts and a number of events. We have further supported capacity building and awareness–raising in navigating copyright through training materials, good practice, guidelines, FAQs, translation sprints and other activities, often community-led. Towards the end of DSI-4, we set up a new format for knowledge-sharing and peer-to-peer support in this area – the Copyright Office Hours – which has had the support of other ENA communities and the participation of a range of experts.

Copyright Management Guidelines for Cultural Heritage Institutions. Europeana Copyright Community. 2022. CC BY-SA

Communicating to cultural heritage professionals

During the period of DSI-4, we focused on a strategic and evidence-based approach to communicate our work to cultural heritage professionals. This approach has worked to better implement market research and user understanding and focused on taking more holistic approaches to promoting our activity, learning from those results and refining them based on learnings to inform future promotional activity.

In 2020, we refined our benchmarking approach for all of our promotional activity so we can track performance and trends over time, using insights gained from evaluation to feedback to colleagues involved in product development and to refine promotional activity.

In 2021, we introduced an annual Europeana Pro user survey, which was refined and updated in 2022. This survey allowed us to begin to better understand the motivations, background and needs of the audiences that visit Europeana Pro, and to cross-reference results against audiences of the Europeana website.

Across the DSI period, we undertook a number of bespoke market research activities to help inform product development and audience understanding in a number of areas, including events, professional development and network offers across the sector and into product development. Since 2021 we have used some of this understanding to test holistic approaches to promoting our offer, specifically focusing on 'evergreen' content (outputs and outcomes that are still relevant, usable and useful to our audiences beyond their initial launch or announcement).

In the year after starting this benchmarking and testing activity, we saw a 203% increase in impressions (the amount of times our promotional activity was seen), and an 18% increase in engagement (the amount of times our promotional activity was engaged with). These numbers are collected based on promotional activity aimed at cultural heritage professionals on our social media channels (Twitter, LinkedIn, and Facebook), and our newsletters. The insight gained enables us to explore ways to increase the level of engagement, whilst continuing to raise awareness of our work.

Alongside this, we have worked to better position our efforts to cultural heritage professionals. One major milestone in DSI-4 was the design, development and implementation of a new Europeana Pro, which was developed with feedback from key stakeholders and has received an 80+% satisfaction rate each year since it was introduced (March 2020).

We have also adapted the positioning of digital transformation and capacity building on Europeana Pro as the world, and our offer, has developed. For instance, the new Europeana Pro brought our Services and Tools for professionals together in a coherent way, and as the move to digital brought on by the COVID-19 pandemic accelerated we developed our events and webinar sections to meet those needs. In the final year of the DSI-4, based on the market research, user understanding and holistic approaches, we brought together all of the work that has been happening in this sphere, and started testing a new section of Europeana Pro with key stakeholders. 'Learn with us' covers all aspects of our capacity building offer and, after further testing, has the potential to become a key component of Europeana Pro and our promotional activities supporting capacity building.

Finally, we introduced strategies for our key marketing channels to professional audiences, testing and refining approaches to increase followers, awareness and engagement. Across the DSI-4 we have seen a 240% increase in followers of our LinkedIn account (now at 11,250) and an 32% increase in followers of our Twitter account (now at 43,800). As a result of all of this activity, across DSI-4 we have seen traffic to Europeana Pro increase from around 258,000 in the first year, to around 313,500 in the final year (a 21% increase).

Our work was supported by the Europeana Communicators community which grew in the past three years from around 320 members to around 1,670. Contributions from the community included running a Task Force on storytelling, multiple webinars on storytelling and Culture from Home, and contributing to the annual conferences and the Digital Storytelling Festival.

Infrastructure and data quality

Aggregating high-quality metadata and providing access to high-quality digital assets has been a key goal throughout DSI-4. It requires clear criteria for data quality, an underlying framework, appropriate tools and technologies and good partner relationships. This is essential to enable high-quality data and to measure progress.

The evolution of our standards and frameworks, the development of our aggregation infrastructure and new technologies as well as the establishment of a solid structure for the aggregation landscape in Europeana DSI-4 provided a significant shift and enabled us to reach our DSI-4 goals, and confidently move into the next era at the heart of the common European data space for cultural heritage.

Improvements in data quality

Defining data quality. The Europeana Publishing Framework (EPF) was first published in November 2015, providing a clear way for Europeana to manage content and deliver it in higher quality to our audiences.

While the framework itself has been in use since 2015, the technical implementation of the content quality measures (content tiers) in Metis was completed in summer 2019, along with the development of a component to introduce the quality standard for cultural heritage metadata. Since both the content and metadata components have been in place, we have been able to

measure progress and seen a constant and continuous improvement in data quality (see charts below). The EPF and its supporting services and products (e.g. clear guidelines and a powerful aggregation infrastructure) have paved the way to publish high-quality data in Europeana.

For the last two years, we focussed completely on improving the quality of the database. While the total volume of the database stayed stable between 60 and 62 million records (including content tier 0 records), with 61.3 million records at the end of DSI-4, we have improved data quality in DSI-4 significantly: from 47% to 62% and 46% to 68% for content (tier 2+) and metadata (tier A+), respectively.[1] In order to achieve this increase, we processed many datasets sometimes multiple times to get them to the desired quality. Overall, we processed in total around 117 million records and 4,000 datasets during DSI-4[2].
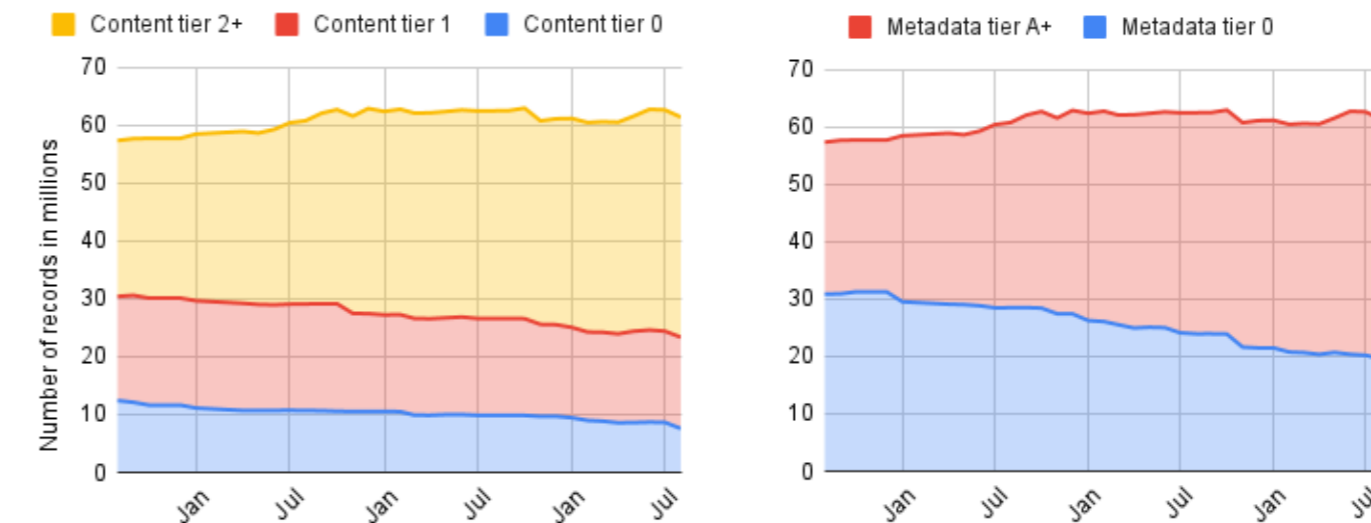
Total growth of the database throughout the last three years (since it has been possible to measure data quality) and the tier repartition during this time (including Tier 0).
Left: content quality.
Right: metadata quality.
Europeana Foundation. 2022.
CC BY-SA

Supporting Member States to contribute. While the DSI consortium contributed to the volume of data, EU Member States also made a significant contribution to both the volume and quality of data. The Europeana Common Culture Generic Services project was a key driver in improving and accelerating MS involvement in the last four years. Not only has it led to more and better data from established national aggregators (e.g. DDB – Deutsche Digitale Bibliothek, or Greek Aggregator searchculture.gr) or national aggregators under development (e.g. CulturaItalia), it also led to new aggregators developing and joining the Europeana Initiative (e.g. Estonian e-Repository or Digital Repository of Ireland – DRI) (see chart below). The work of Common Culture is still paying off almost two years after the end of the project, with a number of national aggregators using the established processes to continuously deliver high-quality data.
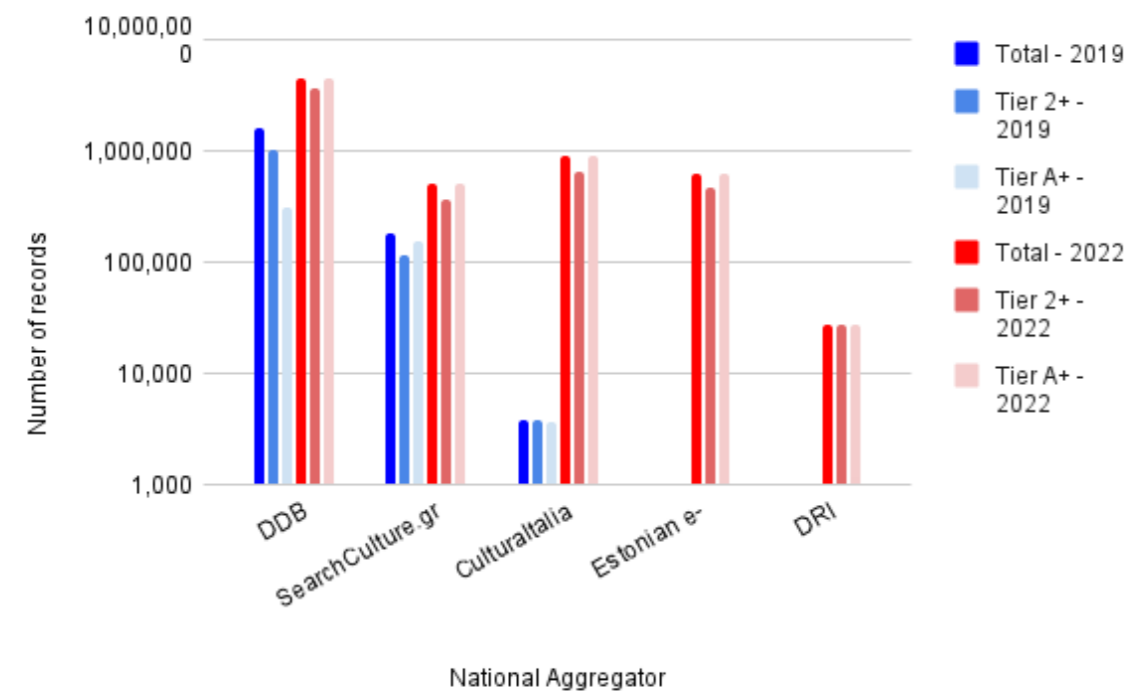
Data provided by five national aggregators between 2019 and 2022. DDB and searchculture.gr have grown, CulturaItalia has developed and the Estonian e-Repository and DRI have emerged, all focussing on providing high-quality data. Europeana Foundation. 2022. CC BY-SA

Accreditation for aggregators. The work to improve data quality greatly benefitted from the reorganisation of the aggregation landscape in 2019, when we completed the accreditation scheme for 37 Europeana aggregators; three more aggregators followed during the course of DSI-4 (Estonia, Cyprus and Technische Informationsbibliothek (TIB) - AV Portal). This not only clarified the benefits and responsibilities of each aggregator, but also streamlined the information flow and knowledge exchange between EF, the DSI and all aggregators. It united all aggregators under the Europeana Aggregators' Forum (EAF) - the third pillar of the Europeana Initiative. A sense of belonging and of all accredited aggregators working together to the same goals are key drivers for the publication of high-quality data.
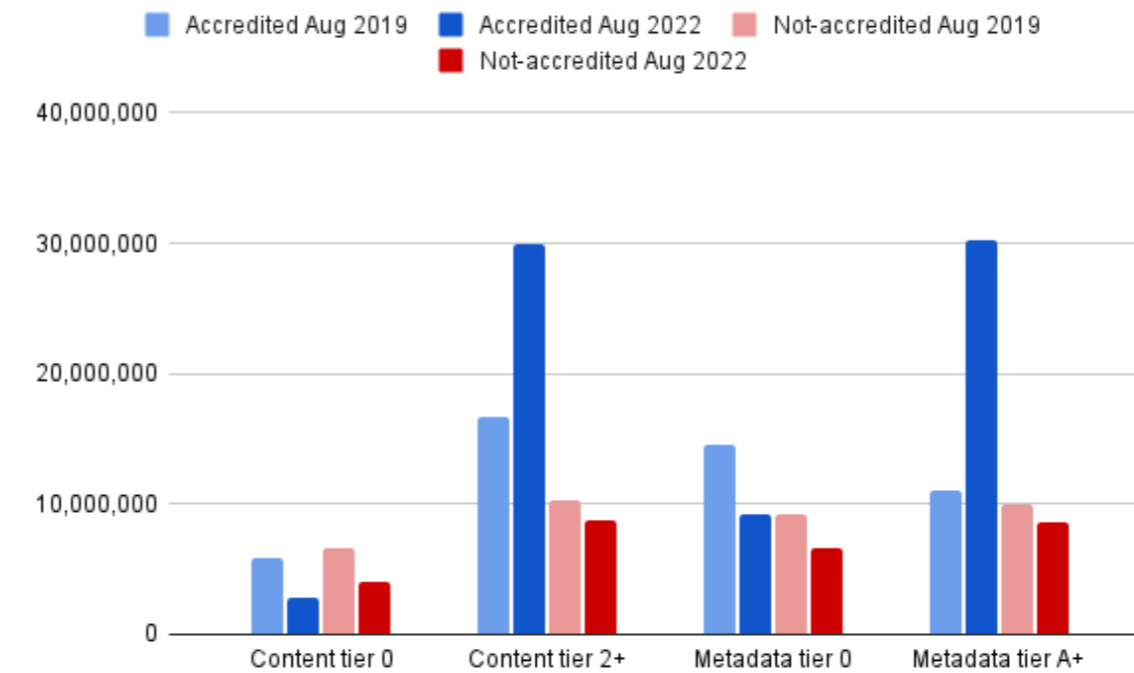
Data quality from accredited aggregators compared with data quality from not-accredited sources, showing the significant contribution (and increase) of high-quality data from accredited aggregators. Europeana Foundation. 2022. CC BY-SA

Collection highlights. With such a large volume of data processed and high-quality datasets published, it is difficult to pick highlights of cultural heritage collections that our work has made available. However, focusing on data of the highest quality as measured by the EPF (everything in content tier 4 and metadata tier C), we can pick four inspiring examples from across the DSI-4 period.

The children's book collection from the National Library of the Netherlands is a nice example of a high quality text collection, provided in DSI-4 Y1.

The Associazione culturale GoTellGo started in DSI-4 Y2 with their first items of street art, published via the DSI AGG MCA (MUSEU).

In DSI-4 Y3, the new aggregator in Ireland (DRI) published high-quality data supporting IIIF from the outset. A particular highlight was a small collection from Royal Irish Academy that was published using IIIF, providing high-resolution imagery and the ability to zoom into close details.

An example from DSI-4 Y4 is the 3D collections that were initiated during the Share3D GS projects but are constantly growing even beyond the end of this project.

Male portrait. C215 – GoTellGo Cultural Association. 2011. CC BY

An infrastructure supporting data quality

During DSI-4, we developed a data aggregation infrastructure capable of sustaining the ongoing processing of large volumes of complex data. This infrastructure was extended to support improvements in data quality. The result is a process that makes it easier to identify, report on and discuss data quality with providers.

A complete aggregation pipeline. Metis version 1.0 was released in production in November 2018. It was the first viable version of what would become the central pillar of Europeana's current aggregation infrastructure. It offers a complete aggregation pipeline, importing, transforming, validating and enriching metadata from and for aggregators. It is closely integrated with eCloud, built and maintained by PSNC, which provides the parallel processing framework that executes the Metis functionality and stores all successive versions of the data. Subsequent versions were released that brought consolidation as well as major pieces of new functionality. Features such as redirection, link checking, media processing and tier calculation were included and expanded on, turning Metis into the well-rounded and comprehensive product it is today. The quality of Metis is illustrated by the high throughput of data, with around 117 million records and 4,000 datasets being processed during DSI-4.

Around mid-2020, development of new features had gradually become more targeted and consolidation slowly gave way to 'regular' software maintenance, involving library upgrades and code modernisation. That is not to say that no major new features were added – highlights of this later period include depublication, incremental processing and, most recently, date normalisation and throttling for media processing.

Supporting data providers with purposeful tools. Around the same time, the Metis Suite came into being. This is a family of related applications, the most important of which are the Metis Sandbox (co-created with the Europeana Common Culture project) and Clio. Clio is a tool for detecting broken links that regularly scans a sample of records in the Europeana dataset to find broken links, and then reports on its findings. The tool has been instrumental in increasing the overall data quality.

The Metis Sandbox is a key component of the aggregation strategy and allows data providers to run a full ingestion workflow on their data themselves. This way they can test their data, review the resulting records and get feedback on their data's quality. This feedback comes in the form of a complete tier calculation report and a listing of detected field value issues. Training resources and an extensive user guide have been developed for the Sandbox and the application is gaining traction as a diagnostic tool for data providers.

Feedback from partners has been very positive. Tom Miles, British Library, says, 'It's been really useful having access to the Metis Sandbox for the Microsoft books dataset – I've been able to review this dataset using the sandbox and spotted several things that needed changing.'

The last application that makes up the Metis Suite is the Metis Statistics Dashboard (for statistics about the Europeana dataset). Together, all these applications provide a strong starting point for the further development that is foreseen for the coming years.

Deutsche Fotothek, Erdgeschoß, Negativmagazin. Bregulla, Siegfried (Herstellung) (Fotograf). Deutsche Fotothek. CC BY-SA

Innovation for higher-quality data

Research and development efforts and experiments have seen advances in the areas of enrichments, interoperability and multilinguality, all with the goal of achieving higher-quality data in Europeana.

Our work was supported by the EuropeanaTech community - a community of experts from the R&D sector making sure that the Europeana Initiative leads the way with technological innovation in the cultural heritage sector (in the past three years the community grew from around 1,080 to around 2,150 members). More specifically, via various Task Forces and Working Groups on key areas like data quality, AI, annotations, IIIF, 3D, Audiovisual content and the governance of the Europeana Data Model.

Europeana Data Model updates. Significant updates to our data model (EDM) mean we can now accommodate higher-quality data.

An EDM extension on provenance of enrichments (where they come from) allows Europeana partners to indicate that a piece of metadata ingested via Metis comes from a specific (automatic) enrichment process, such as automatic translation. This transparent indication means that such enrichments can be ingested next to more traditional 'authorised' metadata.

The EDM profile for annotations allows a more diverse range of enrichments (e.g. semantic tags or transcriptions/subtitles for cultural objects) to be submitted as complementary data by annotation services, via the Europeana Annotations API.

The same annotation patterns also underlie a set of recipes for full-text in EDM, which Europeana has developed to represent textual content associated with cultural objects, for example, video subtitles and text obtained from scanned newspapers via Optical Character Recognition (OCR). These patterns, which follow the W3C Web Annotation standard, are also compatible with IIIF best practices, making Europeana more interoperable with the data exchanged in the IIIF space: one of the IIIF recipes related to newspapers actually directly reuses examples from Europeana.

Richer data at source. Further efforts on data interoperability have focused on the creation of mappings between EDM and controlled and multilingual vocabularies used in our partners' metadata. These mappings enable us to enrich Europeana data with (multilingual) contextual information. We added new mappings and corrected existing ones, and updated the process documentation to make it more usable in Europeana's communication with data partners.

To acquire richer data at source, we have also experimented with new approaches for data aggregation. With our partners in the Common Culture project, we piloted harvesting metadata using Schema.org or IIIF APIs. In this way, the publication of richer (linked) data can be rewarded by the reuse of that data by both Europeana and other applications. In addition, Europeana played a key role (as co-chair and experimentator) in the IIIF Technical Specification Group that defined the IIIF Change Discovery API, resulting in the development of a piece of technology for better harvesting IIIF resources.

Enhancement after publication. The next area of innovation regards the evaluation and enhancement of data after publication in Europeana.

The EuropeanaTech Data Quality Committee has researched quantitative measures for metadata quality. While the 'metadata quality tiers' were deployed in the Europeana Publishing Framework as an instrument to report on general metadata quality level, more detailed reporting and error-fixing mechanisms are beneficial in tackling the so-called 'long tail' of data issues. So, to structure efforts on data reporting and enhancement, we embarked on a long-term effort to inventorise the data problem patterns we encounter. The first series of patterns is now included in the Metis Sandbox reporting mechanism.

Artificial Intelligence. Some of the quality issues that exist in Europeana are hard to fix or even to identify with simple techniques, for example, those relying on metadata-based heuristics. In DSI-4, we started to investigate whether Artificial Intelligence (especially the techniques that rely on Machine Learning) can help us progress with addressing these issues.

As part of a more general strategy around AI, which includes data sharing and development of suitable software interfaces, we have defined a first series of cases in which AI can help in enhancing content and metadata: image resolution enhancement, image tagging and detection of property marks. In the final year of DSI-4, we began to experiment with the first two areas. Image resolution enhancement, especially, has shown promising results - see image below for a before/after comparison of one object.
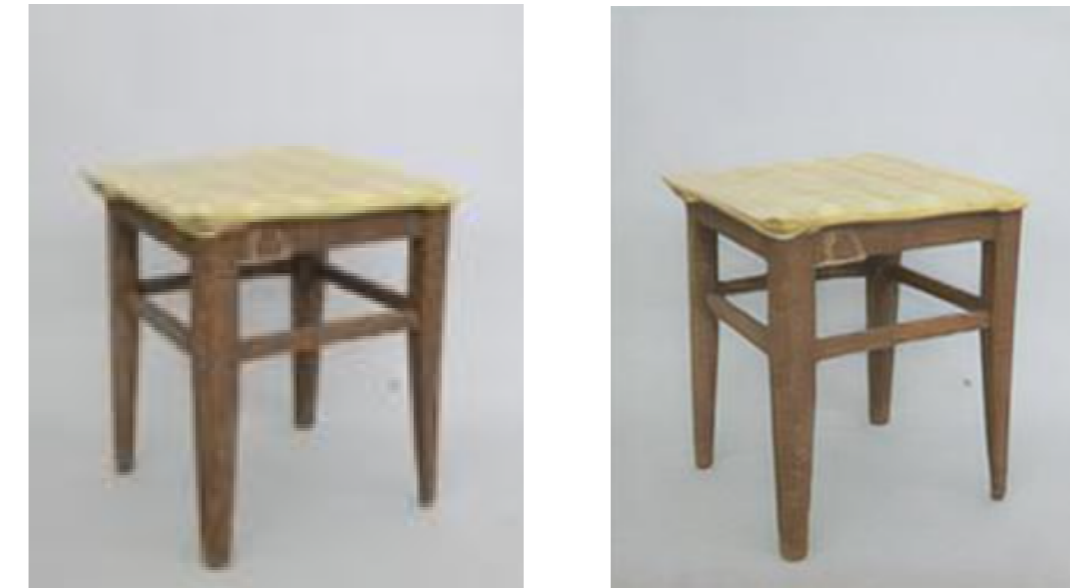
Example of image resolution enhancement for the object 'itsuin'. Helsinki City Museum. CC BY

Europeana Entity Collection and multilingual coverage

Contextual entities, when linked to the cultural heritage items Europeana aggregates, allow the creation of a semantically rich, multilingual and consolidated networked cloud of cultural heritage data. A new Entity Management service was developed to support the management, curation, and update of the Entity Collection. The Entity Collection has now become central to the further development of the search and browsing experience for everyone using the Europeana website.

The Entity Collection initially focused on gathering data about places, people, time periods and topics. In 2021, we introduced a new Organisation entity to capture data about the organisations providing data to Europeana in a more structured way. In DSI-4 we continued to curate the Organisation entities, increasing the amount of items linked to an Organisation entity. At this time, only half a million items (out of 53 million) are still missing a link to an Organisation.

The whole Entity Collection went through an important update in the final year of DSI-4 with new entities for Archaeology, Manuscripts, Sports, Fashion and the 20th century resulting in 9,018 new people and 1,764 new topics being added. The Entity Collection currently consists of more than 347,500 entities (people, topics, places, centuries and organisation entities).

As a consequence of this update, the multilingual coverage of entities has been tremendously improved: on average, there are 9.57 different languages available per entity, almost seven more than in the previous version of the Entity Collection. There is no longer a big gap between English – the most present language in the Entity Collection – and the rest. Currently English is present in 89% of entities, with the second-most present language being French at 74%.

Example of organisation page of National museum in Warsaw, Poland on Europeana.eu. Europeana Foundation. 2022. CC BY-SA

Participation and reuse

Participation in culture creates value in the cultural sector and society at large. We want to set high standards for participatory practices on our platform, in our campaigns and in the global cultural sector. And we want to see educators, researchers, culture lovers and creatives enjoying and reusing Europeana's digital cultural heritage via the Europeana website, our APIs, or other platforms, services or partnerships, to reach their own goals, whether that's enriching educational resources, opening up new areas of research, or creating new art, games and entertainments.

Making the Europeana website more usable, accessible and multilingual

A new content management system. We started DSI-4 in 2018 with a redevelopment of the website. For efficiency, we moved away from developing our own custom content management system (CMS) to using an out of the box CMS called 'Contentful.' This change freed up our time to further develop the user experience of the website, while 'Contentful' also provided a better experience to our editorial colleagues. The redevelopment also allowed us to implement a better URL and page structure and we cleaned up our code base to improve the performance of the website. We released the new website in November 2019 in a soft launch, and publicly released it in March 2020.

Improving the item page. After the release in 2020, we focused on the item page - the most visited type of page. We improved the media display, making it easier for people to view and interact with the media. We also reviewed the metadata section of the item pages to present information in a structured and logical manner. Benefitting from the further development of the Entity Collection and the API powering it, we added related entity collections to the item page display. Having both the entity collections and similar items displayed gives people the opportunity to explore related topics further.

Easier searching and browsing. In 2020, through user research we learned that most people come to the website to find something specific. So we invested in making it as easy as possible for people to find items. We redesigned the search page, including the interaction with the filters, to make them easier and return search results much faster. We added entity collection pages to our search results so people can choose to start their search from a narrower contextualised collection. An auto-suggest feature in the search box also supports better searching.

We improved search for the Newspapers Collection in particular with the ability to locate a search term within both a newspaper issue and the item itself by highlighting the search term. We also allow the user to continue to edit the search term on the item page. This functionality was later added to the 14-18 Collection to allow people to search within the transcriptions contributed by the users via Transcribathon.eu.
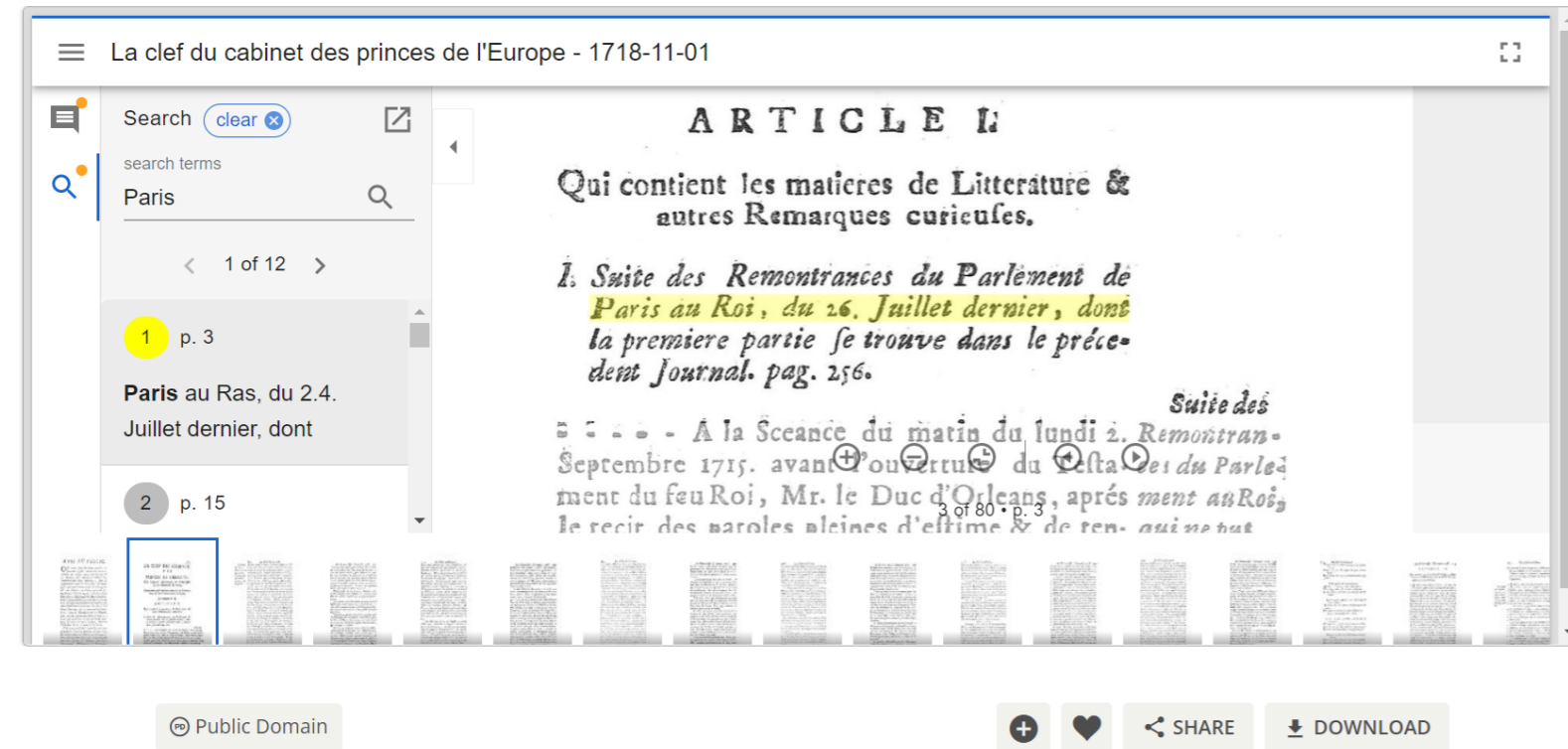
Example of a content search for 'Paris' within a Newspapers Issue. Europeana Foundation. 2022. CC BY-SA

In 2021, we worked on the Collection hub page to encourage people to explore more via ever-changing content - a new module displays topic and century entity pages and automatically updates them daily. We also developed a similar module for displaying one item from each newly ingested dataset which is also accessible from the Collections hub page.

At the start of 2022, we further improved the search page by increasing the number of filters and improving their interaction by displaying them together on the right hand-side and adding an autocomplete functionality.

Giving providers greater visibility. In June 2021, we introduced the Organisations collection to our website, giving more visibility to the cultural heritage institutions with whom we work.

Encouraging participation and engagement. In September 2020, we released the user galleries (delivered partly by the Europeana XX Generic Services project) as a soft launch enabling anyone to 'like' items and curate and publish their own galleries on the Europeana website (functionality supported by the User Sets API). After the soft launch, we continued to iterate on them and in January 2021, we did a public release.

In spring 2022, we introduced a search for editorial content. Now people can search for items, entity collections and editorial content on the website.

In July 2022, we released the new ‘Stories’ page where people can browse editorial content (stories). As part of this work, we also developed an automated connection between the editorial content and the entity collections. At the bottom of the blog posts and exhibitions, people can see and click on the related entity collections and vice versa. We also activated the tags so people can discover editorial content by tag.

About page and homepage redesigns. In autumn 2021, we redesigned the ‘About’ page to better inform people who we are and what we offer. We also released a notification informing people when a new feature is available on the website to highlight new developments.

In August 2022, we released a redesigned homepage with a new design style. The new homepage features the search function front and centre and puts more emphasis on different ways to browse our collection. We also introduced prominent calls to action to create an account and sign up for the newsletter. Additionally, we added a top level navigation item ‘For professionals’ to better promote the professional services we offer on Europeana Pro.

A multilingual website. In parallel to all these activities, we also continuously ensure that the website is fully available in 24 EU languages and Basque. The website user interface, homepage and item pages are now fully multilingual and more editorial content is available in multiple languages than before. On the Spanish version of the website we enabled a functionality allowing people to search across multiple languages.
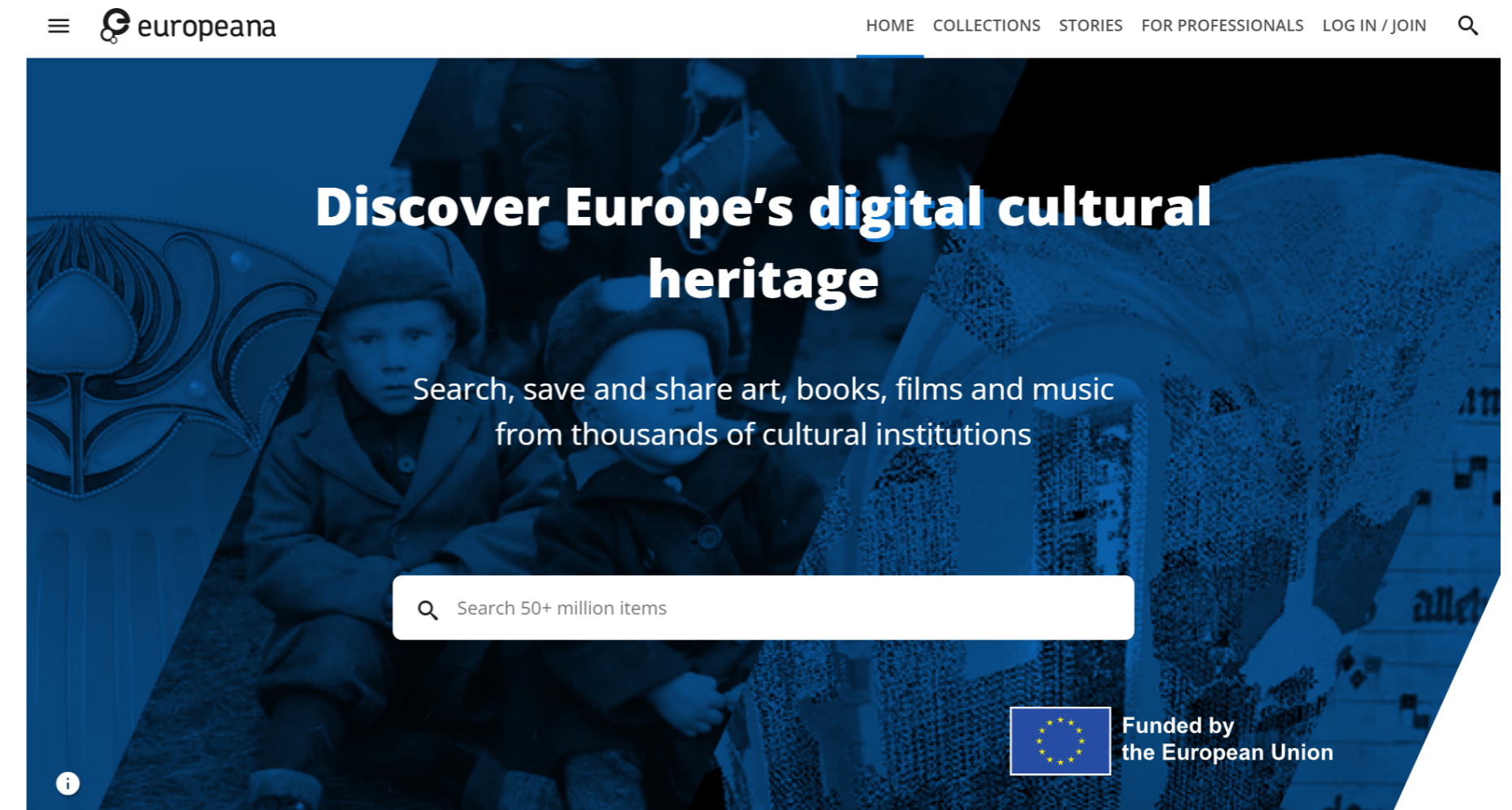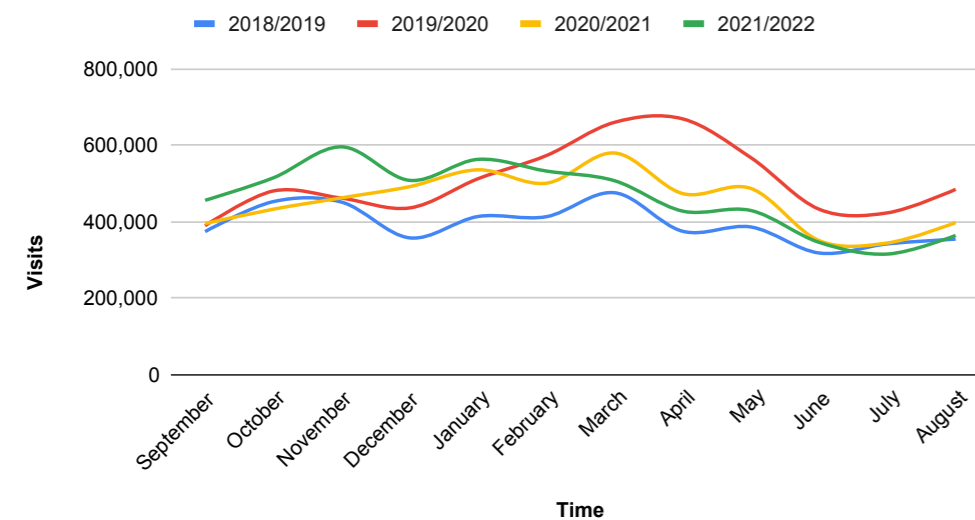
Europeana.eu homepage. Europeana Foundation. 2022. CC BY-SA

Traffic

The number of visits is our key success metric for the Europeana website with a target to reach 500,000 visits per month. In the past year, we saw about 463,500 monthly visits on average which is close to our set target.

At the beginning of the COVID-19 pandemic in 2020, we saw an exceptional spike of traffic as more people sought online options for cultural heritage. In 2021/2022, the traffic levels reverted to the pattern seen in previous years.

Traffic to Europeana.eu by month and year.[1] Europeana Foundation. 2022. CC BY-SA

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[1] In 2021/2022 a number of technological, behavioural and policy changes – specifically around data privacy – occurred which impacted the Europeana website and our ability to accurately and consistently report on users and usage.

Diverse editorial and powerful storytelling

To connect heritage and culture to people's lives today, we curated, published and promoted a diverse array of stories. From women's history to World War I, and from the Byzantine age to the fall of the Berlin Wall, our pan-European editorial brought history to life in hundreds of blogs, galleries and exhibitions. We worked with partners and contributors across Europe, and published our exhibitions in more languages than ever before. One highlight was our partnership with the Archives of the European Parliament which has so far resulted in six exhibitions, each one available in all 24 languages of the European Union, and many more exhibitions to come. Altogether, 38 exhibitions were published during DSI-4 and our exhibitions were consistently well received by online audiences (in the final year of DSI-4, for example, those received an excellent average satisfaction of 88%).

A focus on storytelling. From September 2020 to 31 March 2021, a Europeana Network Association Task Force on digital storytelling produced research and made recommendations based on examples of interesting, engaging and effective storytelling practices found around the web – particularly those that incorporate cultural heritage – with the intention of feeding into the development of the Europeana website as a 'powerful platform for storytelling'. An important outcome was the shareable resource 'Seven digital storytelling tips for the cultural heritage sector.'

The Task Force recommendations, and in particular the seven tips, were fed into the Digital Storytelling Festival, an online storytelling event run by Europeana in partnership with India's The Heritage Lab.

With the motto, 'Stories connect people. We think cultural heritage does too', the Festival (held in 2021 and 2022) encourages people to weave stories from the millions of openly licensed cultural heritage objects available today. At online workshops, webinars and in a dedicated publication, audiences were invited to discover tools and techniques to create digital stories, be inspired by amazing open access cultural heritage collections from around the world, and follow step-by-step tutorials created by experts in the culture sector.

Seasons and campaigns. As part of the European Year of Cultural Heritage 2018, Europeana held a migration campaign in partnership with museums, libraries, galleries and archives across Europe. Over 40 editorials and one exhibition called People on the Move were created exploring how migration has shaped the world, affecting everything from science to art.

Europeana held its first Women's Season in March 2019 in collaboration with European Commissioner for Digital Economy and Society, Mariya Gabriel. 19 editorial pieces were created along with the exhibition Pioneers: Trailblazing women in the arts and sciences. 11 interviews were highlighted on Europeana Pro, showcasing leading women in the digital and GLAM sector. Since then, it has become a yearly season, with new editorials on our Women's History feature page offering more diversity in the stories being told.

From September to December 2019, Euopeana's 'Europe at Work' season highlighted the public's work-related stories. Cultural heritage institutions across Europe shared collections showing the history, evolution and variety of society's rich working world. 182 stories were shared by the public and 55 pieces of editorial were created, along with the exhibition Still a Working Title.

Between October 2020 and April 2022, Europeana ran a Sport campaign with nine project partners across Europe. As part of the campaign, a Sport season ran in summer 2021 contributing blogs and galleries to the Sport feature page. An exhibition Heroes of the Olympic Games was also published showcasing the lives of 50 athletes and their achievements in the Olympics and Paralympic games.

In October 2021, Europeana held its first Black History Month season publishing 10 new editorial pieces for the Black history feature page and an exhibition Black Lives in Europe in an effort to highlight Black achievements in European history. As part of the season, four institutions working on promoting Black heritage were interviewed sharing their thoughts on the challenges and importance of representation in Black history. The season also ran an email course and an Instagram quiz sharing more stories of known and unknown Black figures throughout history.

Käsitöitä Nuorten Priden Normitorstai - tapahtumassa. Melissa Hanhirova. 2013. Finnish Heritage Agency. CC BY

Embedding Diversity and Inclusion

During the DSI-4 period, Europeana has worked to explore what Diversity and Inclusion (D&I) means to the Europeana Initiative and how we can do more to ensure our activities are inclusive and welcoming to all.

Accessibility. Our first efforts in D&I were around accessibility, including establishing that everyone can participate in and enjoy our events (e.g. providing subtitles to videos, assuring that our event venues were accessible to people regardless of their physical ability), and that our websites are accessible too (making our online platforms conform to WCAG standards). Improvements to the accessibility of our online platforms have also seen all images on the Europeana website alt-text enabled.

Editorial approaches. We have worked to publish editorial which gives voice to communities who have been minoritised and previously less well-represented in Europeana. Through our seasons such as Women's History Month, Black History Month and our Sports season, we have written more editorials with an effort to represent intersectional identities and stories. Topics include minoritised women, Black figures who are part of the LGBTQ+ community and Sports people with disabilities, all of which can be found on our Women's history, Black history, Disability heritage feature and Sports feature pages. We also wanted to bring in editorials from people of minoritised backgrounds and introduced an editorial grants programme to support those with unique lived experiences, which resulted in their contributions to our seasons and feature pages.

We now have blogs written by guest writers on topics such as ecofeminism in the middle ages and accessibility for people with low or no vision in museum exhibitions. We have also developed safety measures on the Europeana website which have included proposing a harmful content statement and a content warning module for editorial.

Collaboration across the Initiative. In DSI-4 Y3, a cross-team was created at the Europeana Foundation to harmonise D&I activity across the Foundation and provide a structure and clear mission to the work. Work at the Foundation was complemented by a cross-Initiative Diversity and Inclusion Task Force, which was set up to manage the development of an approach through consultation with professionals and peers from across the cultural heritage sector. A working group for aggregators was initiated to look into contentious content and descriptions on the Europeana website to understand the options and limitations in dealing with potentially offensive content and descriptions and the stakeholders affected by it.

ENA, EF and EAF members also developed and implemented Inclusive Engagement Guidelines which have become an integral part of how we collaborate, communicate and engage with each other in an inclusive, respectful and kind manner.

Improving awareness. Now, at the end of DSI-4, these developments mean that awareness of Diversity and Inclusion issues has been raised across the Europeana Initiative and we are seeing more engagement with Diversity and Inclusion topics. We see new Generic Service project proposals including tasks related to Diversity and Inclusion, we see aggregators and content providers working towards decolonising their physical and digital collections, and we see the need for more capacity building around Diversity and Inclusion in the GLAM sector being acknowledged.

APIs increasing reuse

Our approach to API outreach. The development of the API outreach strategy based on the user feedback gathered in the course of DSI-4 allowed us to better understand and support API users and structure our approach towards the promotion of the Europeana APIs. We focused on updating and further improving the documentation available for our APIs following updates to existing functionality and new developments.

We also developed more personal 1:1 support for API users. New onboarding and check-in messages were created to inform API users about documentation resources and to offer help when needed. This has resulted in several tech support calls with API users, and further dissemination of the Europeana APIs. For example, we provided personal support to higher education students at the University in Leuven, Belgium and Leiden University, Netherlands who started to use the Europeana APIs as a case study for personal projects. This exercise provided excellent feedback on what higher education students struggle with or find challenging about the Europeana API suite, and informs how we further develop documentation and capacity building resources for educators using GLAM APIs.

Our outreach activities brought us more insight into the user segments of the API reuser community. Analysis of our API Key signup form showed that about 48.2% of key holders identify as being part of the education sector, 22.3% identify as being part of the research sector, 8.5% identify as being part of the cultural heritage sector, 5.5% identify as being in the creative industries sector, and 15.5% selected 'Other'. Based on those numbers, we have added an increased focus on providing support to the education and research sectors as part of our strategy for API outreach in the coming years.

One example of API use comes from Belgian researcher Elizaveta Berquin who told us: '*I used the data extracted from the Europeana APIs to develop a web application to visualise Soviet posters for my master's thesis in Digital Humanities. Europeana is a powerful resource that gives access to a rich collection of digitised cultural heritage across Europe and can be used in many creative ways to explore almost any topic.*'

We also concentrated our efforts on increasing the visibility of our API suite. We promoted Europeana API services at relevant outreach events to increase awareness and usage (e.g. Futurs Fantastiques conference). As a result, we recorded in the last year of DSI-4, an average of about 16.1 million external API requests per month.

One major new commercial product was introduced using Europeana content - the video game '11:11 Memories retold'. 11-11: Memories Retold. DigixArt. 2018. CC BY-SA

IIIF range of APIs and full-text infrastructure. In the past four years, we have made several improvements to the full-text infrastructure, after its first release for the Newspapers Collection, resulting in extensions and additions to the Europeana range of IIIF APIs. We implemented IIIF Content Search API to support search and highlighting of search terms within a single Newspaper issue. We made adaptations so that it could also support subtitles/captions as other forms of full-text so that audio-visual materials could also benefit from the functionality offered for textual content. This resulted in the implementation of the recent IIIF Presentation API v3 which now also covers AV media and the support for multilingual variations of full-text, which are particularly relevant for subtitles, following the present emphasis in multilinguality. The introduction of IIIF Presentation API v3, together with v2, made it possible for the APIs to always make available a IIIF manifest when the provider has not supplied one in the source metadata. This fosters reuse by our users using external IIIF services and tools. Finally, last year, we made it possible for transcriptions, subtitles and captions submitted by partner services via the Annotations API to make their way into the full-text infrastructure so that they can be used by users on the Europeana website immediately.

Other developments. Besides the IIIF range of APIs, other APIs went through several improvements, some of which were further extended to support new functionality on the website but also support new types of integration where external services can provide data to Europeana. This was the case of the User Sets API and Annotations API. Besides improvements to already established APIs, there was the introduction of new APIs such as the Recommendation Service which recommends related items based on an item, a user gallery or even an entity collection. Finally, a new authentication and authorisation service was added to manage access to these APIs but also to support user registration, management and access to the website. This service is expected to grow into other services and offer Single-Sign On across the Europeana platform.

Innovating in education with digital culture

The four years of DSI-4 have seen extraordinary growth in the reuse of Europeana's cultural heritage content for education. This has been achieved by producing learning products with expert partners (learning scenarios, video tutorials, handbooks, online courses) using innovative practices; offering capacity-building opportunities for a newly established and flourishing community of practitioners (with an outreach of more than 10,000 formal and non-formal educators via key communication channels); and nurturing a well-established network of collaborators including Ministries of Education, key European non-profits (like eTwinning or School Education Getaway) and consolidated Edtechs (Unsplash or Canva). In the most recent period measured (May 2021-April 2022), the learning content produced with our main partners, EUN and EuroClio, achieved around 190,000 visits.

The work was supported by the Europeana Education community, composed of professionals who believe in the important role culture can play for innovative teaching and learning (in the past three years, the community grew from around 480 members to around 2,200 members).

Multilingual resources. Over the last four years, more than 1,000 resources in different languages have been designed by and for educators. For example, the Teaching with Europeana blog, launched in March 2019 and run in collaboration with European Schoolnet, currently displays more than 670 learning scenarios and more than 250 stories of implementation. During the last two school periods, the site had around 100,000 visits and more than 30,000 users a year.

Macedonia Studio team in the Built with Bits virtual space. Macedonia 2021. CC BY-SA

MOOCs to train educators. Thanks to our long-standing [partnership with European Schoolnet](#), in the last four years we offered the Europeana Education Massive Open Online Course 12 separate times (three in English and nine in other European languages). The MOOC aims to help educators integrate digital cultural items into their teaching, regardless of the subject, nationality and student age level, by using innovative pedagogies. The MOOCs trained more than 6,000 teachers with a potential impact on more than 72,000 students.

Strengthened collaboration with cultural heritage institutions. Another achievement of DSI-4 has been a strengthened collaboration with cultural heritage institutions in the development of educational products. The best example is the work done by EuroClio on [Historiana partner pages](#) and their [co-creation and training programme with GLAMs](#). The ultimate goal is to build the capacity in the sector to curate high-value pedagogical content from digital collections by bringing together the expertise of formal and non-formal education professionals. In recent years, EuroClio also intensified their train-the-trainer strategy to [multiply efforts at the national level](#) and amplified their [training resources online](#).

Raising awareness. The Europeana Foundation presented the Europeana Education offer at more than 10 events a year, (international conferences and local events), reaching thousands of professionals on-site and [online](#).

Engaging with students. Finally, putting the student at the centre of our activities with innovative tools to foster participation has been high on the agenda of Europeana Education. By engaging with relevant societal topics like diversity and inclusion in [Reinventing Beethoven](#) and the New European Bauhaus in [Built with Bits](#), both educational programmes have become flagships of our education community and scalable good practices for the future.

Encouraging digital culture reuse in research

The first Strategic Plan for Europeana Research was designed in 2019 and updated in 2020 and 2021. Its aim is to strengthen Europeana's outreach to academic and research communities and it is built on: fostering the reuse of Europeana data and the use of APIs and files for bulk download; building partnerships and collaborations with universities and research infrastructures; and supporting a community of professionals with a common interest in digital scholarship, especially in the Arts, Humanities and Social Sciences. We placed particular attention on developments in Digital Humanities, thanks to the Europeana Research Advisory Board which is composed of academics with widely recognised expertise in this field. Highlights of the last four years included:

Strengthening partnerships. Europeana benefitted from the participation of CLARIN (Common Language Resources and Technology Infrastructure) as an official partner in DSI-4, and the increasing collaboration with DARIAH (Digital Research Infrastructure for the Arts and the Humanities). CLARIN structurally harvested data from Europeana.eu and made them available through the VLO (Virtual Language Observatory), where they can be reused in combination with a variety of CLARIN tools. They also collaborated in the making of training material. DARIAH played a major role in making Europeana known to the most relevant catchment area of Europeana in academia and research.

In addition to events organised at universities all over Europe, the visibility of Europeana was ensured at the major events revolving around digital scholarship in Europe – such as the CLARIN Annual Conference, the DARIAH Annual Event, the Digital Humanities Conference and DH Benelux.

Growing a community. Since its launch in 2018, the Europeana Research Community remained the largest community within the Europeana Network Association. In the past three years the community grew from around 540 to around 2,500 members (two-thirds from academia and research and one-third from the cultural heritage sector). The Community ran a Task Force to investigate the state-of-play in data reuse and requirements, conducting a survey with over 300 respondents.

Collaboration with other external communities also took a step forward to include the GLAM Labs Community, with which Europeana shares a commitment to supporting computational access to digital collections. An example of this commitment is the development and publication of Jupyter notebooks for Europeana newspapers full-text with NLP (Natural Language Processing) tools within the partnership with CLARIN.

Encouraging reuse of digital culture. Europeana aligned itself with the Open Science movement, looking carefully and contributing to the development of the EOSC (European Open Science Cloud), and advocating for the FAIR principles. Europeana data and/or APIs gained space on platforms on which academics and researchers can find them more easily, such as the CLARIN VLO (Virtual Language Observatory), the EOSC Marketplace, the SSH (Social Science and Humanities Open Marketplace) and OCLC (Online Computer Driving Center).

Europeana became a partner of the EUDatathon, the European Union's annual open data competition that fosters the reuse of data on the portal in innovative apps, following the publication of the Europeana.eu aggregated dataset on the official portal for European data, data.europa.eu.

Renewed Research Grants Programme. Until 2018, the Research Grants Programme funded projects led by early-career scholars and revolved around the reuse of data from Europeana.eu and APIs. The last call with this objective focused on the Europeana 1914-1918 Collection.

The programme was renewed with a new format designed to support events that could bring together cultural heritage professionals, academics and researchers and result in the sharing of experiences and achievements through reports, videos etc. Calls for proposals were launched under the themes 'Digital Cultural Heritage for Open Science' and 'Crowdsourcing and Research', attracting 115 submissions. Changes in how we live and work, instigated by the COVID-19 pandemic, gave us the opportunity to test digital and then hybrid formats, significantly expanding the audience of these events.
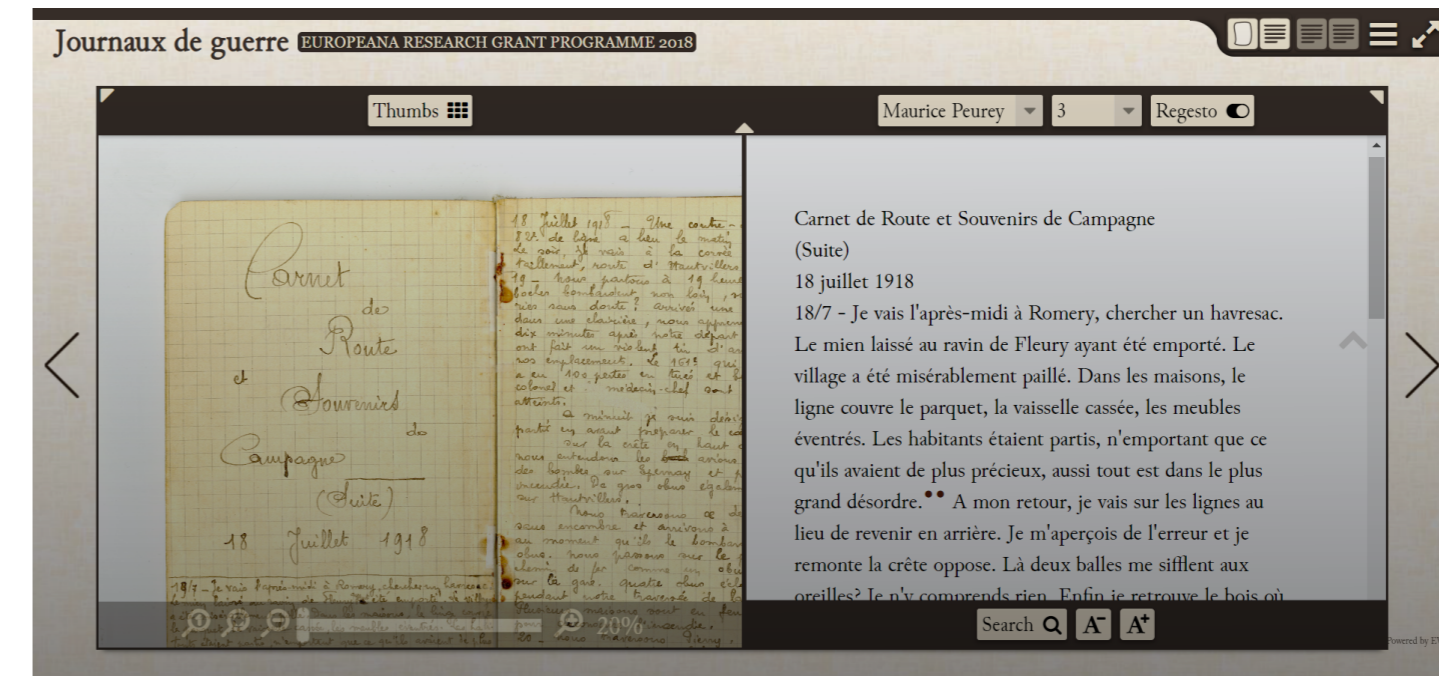
Upgrading History. Diaries from the War Front. Saverio Vita. 2019. CC BY-SA

Integrating Generic Services projects

Over the DSI-4 period, the Europeana Foundation integrated results from 19 Europeana Generic Services (GS) projects into the Europeana Core Service Platform (CSP). Eight GS projects from various CEF Telecom calls – Europeana, eTranslate, eArchiving and Open Public Data – are still running and expect to have their results integrated into the Europeana DSI (or future Data Space) by March 2023. An overview of all GS projects is available on Europeana Pro projects page.

EF supported the GS projects with ingestion of content and metadata, the implementation on relevant Europeana frameworks, policy and development guidelines, as well as on tool integration in the Europeana website, and dissemination of the project results.
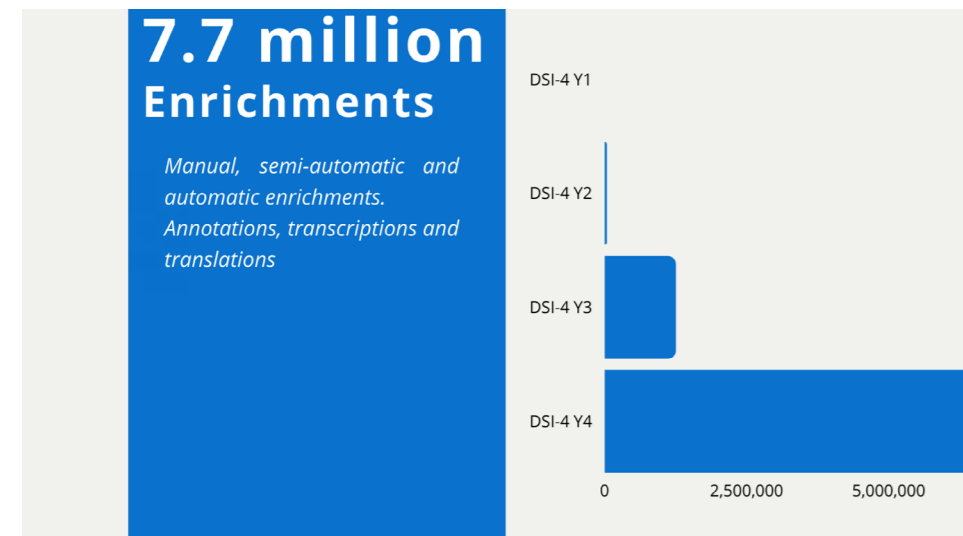
The GS projects contributed to improving the Europeana CSP in all performance areas: high-quality data, infrastructure, user engagement and capacity building. Below are highlights from the GS projects running during DSI-4.[1]

Data: over the DSI-4 period, the projects delivered over 12 million high-quality objects to Europeana. The projects enriched the collections on the Europeana website with content on a wide range of topics, including photography, manuscripts, archaeology, natural history, migration, sport, Chinese and Jewish heritage, the 20th century and more.
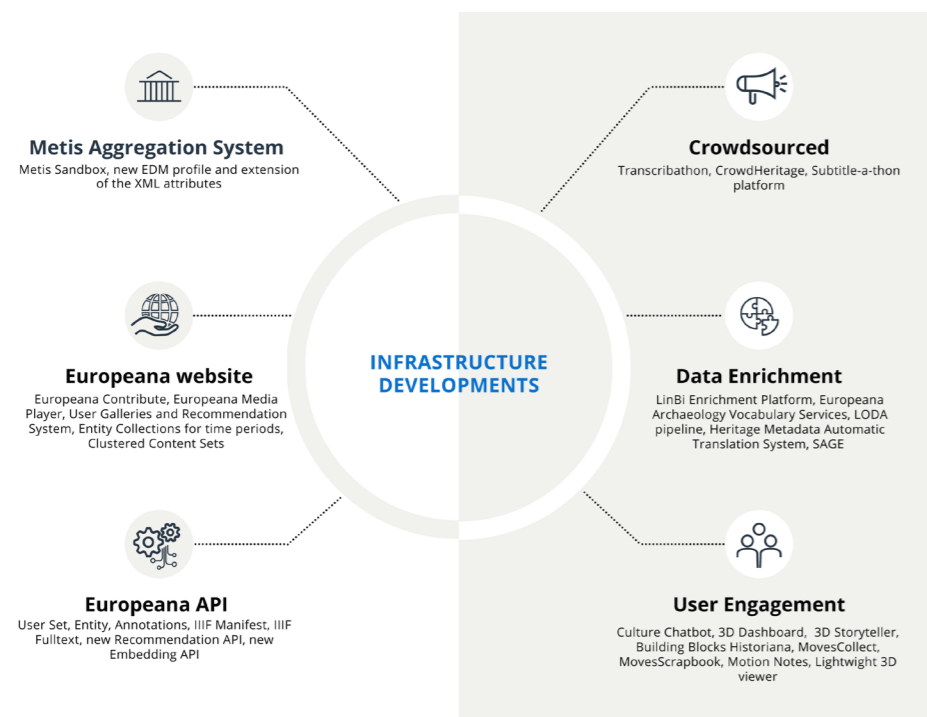
For example, Europeana Common Culture aggregated more than nine million records to Europeana as well as streamlined the aggregation process and strengthened the existing national aggregation network by establishing five new national aggregators which have all since been accredited (Ireland, Serbia, Latvia, Estonia and Croatia).

12 million
High-quality records delivered by GS projects

	Tier 2	Tier 3	Tier 4	Total
GS1 *	189,647	26,864	77,851	296,506
GS2	167	7,895	254	17,396
GS3	4,177,122	2,427,423	4,548,446	11,152,991
GS4	76,052	96,176	348,876	521,104
Total	4,452,068	2,558,340	4,975,427	**11,987,997**

GS1: The numbers shared do not count the data delivered by the Rise of Literacy project as there are no Tier measurements during the end of the project period.*

Content delivered by Generic Services Projects. Europeana Foundation. August 2022. CC-BY-SA

7.7 million Enrichments

Manual, semi-automatic and automatic enrichments. Annotations, transcriptions and translations

| DSI-4 Y1 |
| DSI-4 Y2 |
| DSI-4 Y3 |
| DSI-4 Y4 |

0   2,500,000   5,000,000

Enrichments delivered by Generic Services Projects. Europeana Foundation. August 2022. CC-BY-SA

Metis Aggregation System
Metis Sandbox, new EDM profile and extension of the XML attributes

Europeana website
Europeana Contribute, Europeana Media Player, User Galleries and Recommendation System, Entity Collections for time periods, Clustered Content Sets

Europeana API
User Set, Entity, Annotations, IIIF Manifest, IIIF Fulltext, new Recommendation API, new Embedding API

INFRASTRUCTURE DEVELOPMENTS

Crowdsourced
Transcribathon, CrowdHeritage, Subtitle-a-thon platform

Data Enrichment
LinBi Enrichment Platform, Europeana Archaeology Vocabulary Services, LODA pipeline, Heritage Metadata Automatic Translation System, SAGE

User Engagement
Culture Chatbot, 3D Dashboard, 3D Storyteller, Building Blocks Historiana, MovesCollect, MovesScrapbook, Motion Notes, Lightweight 3D viewer

Tools developed by Generic Services Projects. Europeana Foundation. August 2022. CC-BY-SA

Enrichments. GS projects have contributed richer metadata to Europeana by delivering 7.7 million enrichments. There are two types of delivered enrichments: those contributed manually by humans through crowdsourcing campaigns and those contributed by automatic enrichment tools. For example, LinBi project enriched more than one million objects with the 'LinBi Simple Vocabulary' that links colloquial concepts such as plant, animal or tree to scientific biodiversity data which increases the possibilities of reuse and awareness of the existing content from the Europeana Natural History collection.

Infrastructure. The projects developed innovative tools and services around aggregation, enrichment, 3D display, and user engagement. Some of these are now part of the Europeana Core Service Platform and have helped to enhance key areas of Europeana CSP such as Metis, the Europeana website and Europeana APIs. Others are available as stand-alone tools and are featured on Europeana Pro to the benefit of the whole sector. For example, Europeana XX: Century of Change developed the Smart Editorial Tool which consists of four different components[1] integrated into the Europeana Core Service Platform, the most well-known being user galleries and Recommendation Service (see Section 4.4). The Smart Editorial Tool provides curatorial support and user engagement in order to facilitate the search and creation of collections on the Europeana website. Finally, other projects established integrations with the APIs that can for the first time contribute enriched data to Europeana CSP on a regular basis. An example is Europeana Enrich GS which contributes transcriptions of hand-written documents made via a wide community at Transcribathon.eu.

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1   User Galleries, Similar items, the Entity Collection Curation flow and the Recommendation system

Type of editorials

254 Blogs

119 Galleries

12 Exhibitions
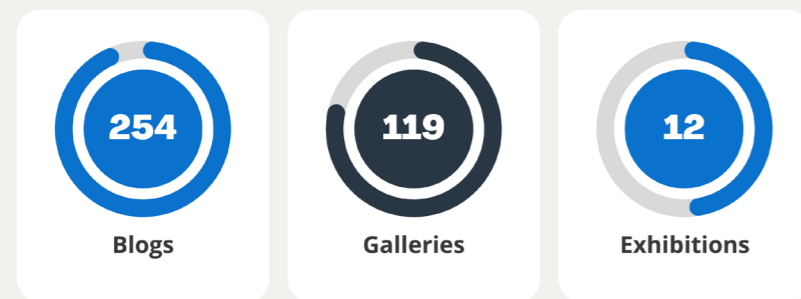
470+ editorial works

Collections created: Europeana Newspapers, Europeana Manuscripts, Europeana Migration. Feature pages: Jewish Heritage, Chinese Heritage, Middle Ages, Discover the 20th Century. Enhancement of the Entity Collection

Editorials created by Generic Services Projects. Europeana Foundation. August 2022. CC-BY-SA

CAPACITY BUILDING

45+ WORKSHOPS

Onsite and online, topics from copyright, educational tools, storytelling, agregation, data enrichments

6 BEST PRACTICES AND TOOLKITS

Event planning and marketing, user engagement with innovative tools, data aggregation, data enrichments

15+ WEBINARS

LODA vocabularies, FAIRifying data, semantic enrichments, copyrights, user engagement, tourism and digital technologies, impact

4 RECOMMENDATIONS AND STUDIES

Use of IIIF, knowledge exchange between curators and postsecondary educators, crowdsource methodologies in the cultural sector, policy recommendations

Capacity Building actions done by Generic Services Projects. Europeana Foundation. August 2022. CC-BY-SA

User engagement. The projects raised awareness of Europeana CSP and its collections by delivering more than 470 editorials to Europeana. The projects also engaged with the general public by hosting 31 collection days online and across Europe, and more than 20 onsite and online crowdsourced campaigns. The projects experimented and introduced novel editorial formats, such as podcasts and vlogs. For example, Migration in the Arts and Science project contributed to the Europeana Migration campaign, which ran 18 collections days in 12 EU countries. These participatory events involved museums, libraries, archives and audiovisual heritage institutions across Europe where they engaged more than 3,000 EU citizens to share their personal migration stories with Europeana. This gathered more than 600 individual stories, as well as 220,000 new digital collection records which were the basis of the Migration Collection on Europeana.

Capacity building. Finally, several projects made significant contributions towards capacity building in the sectors around relevant topics, from aggregation, AI and 3D to impact and diversity and inclusion. For example, CultureMoves project developed a new methodology for interdisciplinary workshops called LabDays. These workshops and an online toolkit provide dance artists and arts professionals access to dance/cultural content on Europeana to enable new forms of tourism engagement and educational resources.

Budget and realisation

Over the past four years the 'Deployment and Maintenance of Europeana DSI core services' (Europeana DSI-4) was funded under procurement by the European Union.

The funding for the entire period is 28 million Euro in total (7 million per year), for the entire consortium, covering the period from 1 September 2018 to 31 August 2022.

Table 1 presents the planned and the actual balance of efforts among the nine work packages, for the first and the second years.

During the third year, the work was restructured into four work packages, in order to reflect the priorities of the new Europeana Strategy 2020-2025, without modification to the objectives or the services of the contract.

Table 2 presents the planned and actual balance of efforts for the third and fourth years, among the four work packages of the restructured work plan, as well as on a task level.

No large deviations (compared to the planned balance or efforts) have been seen during the four years of delivering the contract. In most of the occasions where the actual effort was lower compared to the planning, this was due to outstanding vacancies.

Work Packages	Planning DSI-4	DSI-4 Y1	DSI-4 Y2
1. Platform maintenance and development	57.10%	55.94%	53.89%
2. Content supply	10.95%	10.54%	11.73%
3. Content reuse	9.69%	10.17%	8.06%
4. Communication and dissemination	8.93%	8.12%	9.52%
5. Network	6.44%	7.88%	8.64%
6. Impact of digitisation and reuse of cultural heritage	1.32%	1.15%	2.04%
7. Governance	1.96%	0.36%	0.22%
8. Phasing-in and phasing-out	0.50%	0.02%	0.00%
9. Project and programme management	3.11%	5.82%	5.90%
	100.00%	100.00%	100.00%

Table 1: Balance of effort over the period 1 September 2018 – 31 August 2020 (Y1-Y2). Europeana Foundation. 2022.

Work Packages	Planning DSI-4	DSI-4 Y3	DSI-4 Y4
1. Strengthen the infrastructure	**49.28%**	**50.01%**	**49.32%**
1.1 Easy data publishing	11.56%	12.47%	12.98%
1.2 Europeana website experience	14.92%	13.73%	13.61%
1.3 Reliable platforms	8.42%	9.21%	7.97%
1.4 Discoverability of digital cultural content	14.38%	14.60%	14.76%
2. Improve data quality	**17.80%**	**17.79%**	**18.96%**
2.1 Quality assured data	12.76%	12.11%	13.63%
2.2 Enriched data	5.04%	5.68%	5.33%
3. Build capacity	**26.34%**	**25.05%**	**24.46%**
3.1 Build capacity for digital transformation	10.71%	11.34%	9.94%
3.2 Nurture networks that support digital transformation	9.48%	8.37%	8.93%
3.3 Strengthen national infrastructures	6.15%	5.34%	5.59%
4. Programme management	**6.58%**	**7.15%**	**7.26%**
4.1 Programme management of Europeana DSI-4	5.96%	6.31%	5.96%
4.2 Relations with Europeana DSI Generic Services project	0.22%	0.66%	1.01%
4.3 Governance (DCHE)	0.15%	0.10%	0.20%
4.4 Phasing-in and phasing-out periods	0.25%	0.08%	0.09%
	100.00%	100.00%	100.00%

Table 2: Balance of effort over the period 1 September 2020 – 31 August 2022 (Y3-Y4). Europeana Foundation. 2022

Europeana DSI-4 Final report

September 2018 - August 2022

europeana