

Deliverable D8.3 TM Preparation Report 3

Abstract

The third Interim Progress Report describes how the CSA project advanced in the third 3-month period in relation to the quality criteria set out for the development of the Time Machine Pillar roadmaps and lists key activities planned for the last 3 months of the project.



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List of abbreviations

AI	Artificial Intelligence
CH	Cultural Heritage
CSA	Coordination and Support Action
ERIC	European Research Infrastructure Consortium (Legal entity for Research Infrastructures)
FAIR	Findable – Accessible – Interoperable – Reusable
GLAM	Galleries, Libraries, Archives and Museums
HE	Horizon Europe (The 9th Framework Programme for Research and Innovation of the EC)
ICT	Information and Communication Technologies
KPI	Key Performance Indicator
LSRI	Large Scale Research Initiative
RFC	Requests for Comments
SSH	Social Sciences and Humanities
TM	Time Machine
WG	Working Group
WP	Work Package

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1 Introduction

Time Machine (TM) is a Large-Scale Research Initiative (LSRI) built around the vision of creating the big data of the past, a distributed digital information system mapping the European social, cultural and geographical evolution¹. This huge digitisation and computing infrastructure will enable Europe to turn its long history, as well as its multilingualism and multiculturalism, into a living social and economic resource.

The objective of the TM CSA project is to prepare a detailed proposal for the Time Machine LSRI. The design is organised around four pillars, namely science and technology (pillar 1), TM operation (pillar 2), exploitation avenues (pillar 3) and framework conditions (pillar 4). The methodology foresees the elaboration of roadmaps for each pillar by working groups composed of consortium experts that have been submitted by the end of Month 8, in full compliance with the project work plan.

The TM LSRI proposal will be developed in WP8 of the CSA project on the basis of the pillar roadmaps. The work involves close coordination and follow-up of actions conducted in the different work streams of the CSA, in particular those of WPs 2 to 5. For this purpose, quality criteria have been defined (Deliverable D8.1) to ensure that the specifications for the final outcome are taken into consideration during the design process. Three quarterly reports have been scheduled under Task 8.1 of WP8 to assess progress in the different stages of the LSRI maturing process against the quality criteria.

The Interim Progress Report 2 (Deliverable D8.2) focused on quality criteria referring to the pillar objective, the research and innovation plans, the funding sources and the stakeholders to be involved. Conclusions of this assessment have been taken into account in the elaboration of the pillar roadmaps.

The present document is the formal deliverable D8.3 - Interim Progress Report 3. Its objective is to examine the other two topics of the roadmaps, namely the framework conditions and the risks and barriers. These topics are closely related to the objectives of pillar 4 that developed the accompanying actions supporting the implementation and outreach of Time Machine.

Progress is presented in section 2, starting with the framework conditions and risks and barriers identified in pillars 1, 2 and 3 and then presenting the main conclusions on the accompanying actions proposed in pillar 4. These findings are assessed against the quality criteria in section 3, while an overview of next steps is provided in section 4. The reference documents used for the assessment of work in Pillars 1 to 4 are the pillar roadmaps (deliverables D2.2, D3.2, D4.2 and D5.1).

The deliverable is supported by Annex A that describes the structure of the TM LSRI together with the roadmap methodology and Annex B that lists the quality criteria for the final TM document.

The intended audience comprises all members of the CSA project team.

¹ The expression Cultural Heritage in the document will often refer to every trace of European social, cultural and geographical evolution, which is wider than its current scope. A unique characteristic of this project is to design solutions respecting the cultural wealth of Europe as these developed for cultural heritage.

2 Progress achieved during the reporting period (Months 7-9)

2.1 Framework conditions

A synthesis of the main findings of pillars 1-3 is presented below.

Dissemination

The dissemination strategy should take into account that big developments in key areas of technology will be achieved in the next couple of years independent of the TM developments, especially in the fields of AI. The TM needs to capitalise those findings for its own goals directed at the big data of the past. This is compatible with the development of RFCs and the proposed funding mechanisms. It also allows us to leverage existing projects and funding sources in the European framework.

There are some European projects on Cultural Heritage and Data Infrastructure for GLAM and the Humanities and the Time Machine needs to be inserted in this context in order to be part of a bigger and coherent European infrastructure.

The TM is not only an archival infrastructure, but also a research hub and a research environment. It is important to make sure that those research results are part of a preservation and dissemination strategy based on FAIR principles. Currently there are some national still incipient initiatives at national level that try to push forward these principles (Germany, Portugal, etc.) but there is need to also make it work at a European scale. As a European LSRI, the TM can be a contributing factor to impulse proper research data management and dissemination.

Policy / Legal issues / Ethics

Policy framework

The following developments create a very positive policy environment for Time machine:

- The landmark declaration of cooperation for advancing digitisation of cultural heritage² that defines the following pillars of action:
 - A pan-European initiative for 3D digitisation of cultural heritage artefacts, monuments and sites.
 - Re-use of digitised cultural resources to foster citizen engagement, innovative use and spill-overs in other sectors.
 - Enhancing cross-sector and cross-border cooperation and capacity building in the sector of digitised cultural heritage.
- The European Framework for Action on Cultural Heritage³ that defines the following principles:
 - A holistic approach, looking at cultural heritage as a resource for the future and putting people at its heart.
 - Mainstreaming and integrated approach across different EU policies.
 - Evidence-based policy making, including through cultural statistics.
 - Multi-stakeholder cooperation, encouraging the dialogue and exchange among a wide range of actors when designing and implementing cultural heritage policies and programmes.
- The Commission Decision (22.02.2019). Adopting Creative Commons as an open licence under the European Commission's reuse policy.
- The EU recently adopted CC BY 4.0 and CCO to share public documents including photos, videos, reports, peer-reviewed studies and data.
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² <https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-digitising-cultural-heritage>

³ https://ec.europa.eu/culture/content/european-framework-action-cultural-heritage_en

- The UNESCO Charter on digital heritage conservation (2004) formulated recommendations regarding digital long-term preservation issues, that will be tackled by TM infrastructure:
 - (article 4) “Awareness-raising and advocacy is urgent [...] sensitizing the general public to both the potential of the digital media and the practicalities of preservation”.
 - (article 5) “To preserve digital heritage, measures will need to be taken throughout the digital information life cycle, from creation to access.”
 - (article 7) “[...] main criteria for deciding what digital material to keep would be their significance, and lasting cultural, scientific, evidential or other value.”
 - (article 11) “Preservation of the digital heritage requires sustained efforts on the part of governments, creators, publishers, relevant industries and heritage institutions”.

Data management

Every country usually has own policy on the data management. For example, the common policy in Germany is to keep all Primary data inside of the country on local servers but metadata can be shared with all partners from other countries. Data repository should be able to support selected policy and be flexible enough to switch Storage layer (Inside/Outside) or Access levels (Open/Close) if policy will change.

Since GDPR law was finally approved by EU commission, TM repositories should be GDPR compliant. Respective measures for anonymization of living persons must be set into place.

Even in the Creative Commons framework the chain of attribution is hard to keep. Many sources might be proprietary. The European Commission could support TM and cultural heritage by additional legislation that e.g. links open data policies to support of cultural heritage and cultural heritage digitization and research projects.

There are current studies aiming to foster use of open access licences (CCO or CC BY) amongst EU partners. The TMO should stay updated with those proposals as they serve the same goal as the TM: the use of open access licences within the TM network.

Specific aspects related to exploitation avenues

GLAM

Framework	Proposed action
IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems ⁴ / AI ethics	Check dependencies on pillars 1 and 4

Creative industries

Framework conditions	Proposed actions
Pan-EU regulations for ethics guidelines with respect to AI ⁵	Work with industry to position Time Machine as a leading example of “responsible AI”

Smart tourism

The Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (GROW) launched in 2007 its policy regarding Sustainable tourism. Key priorities include:

- Increasing tourism demand, from within the EU and beyond
- Improving the range of tourism products and services on offer
- Enhancing tourism quality, sustainability, accessibility, skills, and ICT use
- Enhancing the socio-economic knowledge base of the sector
- Promoting Europe as a unique destination

⁴ <https://standards.ieee.org/industry-connections/ec/autonomous-systems.html>

⁵ <https://ec.europa.eu/digital-single-market/en/news/have-your-say-european-expert-group-seeks-feedback-draft-ethics-guidelines-trustworthy>

- Mainstreaming tourism in other EU policies.

In a worldwide perspective, on the basis of the 17 Sustainable Development Goals (SDGs) set by the UN for 2020-2030, the UNWTO defined its priorities regarding the tourism industry:

- Making tourism governance ‘fit for purpose’
- Building competitiveness – key to sustainability for tourism industries
- New ways of financing sustainable tourism

The implication for the TM ecosystem is that sustainable tourism should be one of its priorities and that its local TMs offered as 3S ecosystems fit perfectly into the request of both the EU and UNWTO to govern the industry on a “fit-for-purpose” basis (glocal) and not on a global approach which seems to be governed by the agenda of big tourist industry stakeholders which in many cases is not aligned with local policies.

Smart cities, urban planning, land use & territorial policies.

The following framework conditions have to be taken into account when further refining the roadmap for exploitation to smart cities, urban planning, land use & territorial policies:

- Solve the licensing issues –open licenses are not always consistent, but most scientists do not care which can become a problem later.
- It is crucial that archives describing cities and territories can enter the scope of the Public-Sector Information directive in Europe.
- Set up a unifying identification framework for the core data.
- For the crowdsourcing/citizen data: sustainable, fair data management solutions (e.g., the Solid framework by Tim Berners-Lee at MIT, which gives users the freedom to decide where to store and how to manage their own data: <https://solid.mit.edu/>).
- For the democratic debating platform: an editorial mechanism that respects freedom of contribution but counters misuse of the platform (e.g., discrimination, illegal content, etc.), as has developed on Wikipedia.
- A legal framework for organisations to commit to achieve a compromise between expressiveness and tractability in a brokering process of their heterogeneous sources for a given application.

Knowledge transfer

Specific aspects related to exploitation avenues

Scholarship

Framework conditions	Proposed actions
Copyright and IPR regulations	Support take up of RightStatements.org
Privacy regulations (e.g. regarding the collection of user data for the TM infrastructure)	comply with latest GDPR guidelines

Education

Framework conditions	Proposed actions
Privacy issues	The idea of the ‘historical lookup’ layer on the internet entails privacy issues; e.g., the ‘personalized, localized references to historical data’ are then tied to the location of the user (of e.g., Google search).
Copyright issues	Propose the adoption of RightStatements.org.

GLAM

Framework	Proposed action
Different copyright policies on a national level	Check dependencies on WP5

Framework	Proposed action
Data ownership aligning to GDPR ⁶	Set up a process to monitor compliance within TM
Copyright and rights management	Check dependencies on pillars 1 and 4
Data storage contracts	Check dependencies on pillars 1 and 4
Compliance to data quality standards	Since GLAMs will also act as data contributors: Align with other WPs to comply with data quality standards

Creative industries

Framework conditions	Proposed actions
Copyright and IPR regulations	Support take up of RightsStatements.org

Exploitation of results

Specific aspects related to exploitation avenues

Creative industries

Framework conditions	Proposed actions
Pan-EU support actions for research and business in AI ⁷	Demonstrate added value towards decision making
Investigate how a good balance between private and public interests can be safeguarded as society is continuing its digital transformation	Short term: how the “Shared Digital Europe” ⁸ vision can be used to support the vision of the Time Machine Organisation. If this model falls short, look at other options.
Capacity building limitations and fragmentation	Provide opportunities for cross-sectoral collaboration and harmonise EU regulations
Reliance on service providers and vendors	Work with service providers and vendors to develop new standards and infrastructures that support ease of integration and interoperability

⁶ <https://eugdpr.org/the-regulation/gdpr-faqs/>

⁷ <https://ellis.eu/letter>

⁸ <https://shared-digital.eu/>

2.2 Risks and barriers

A synthesis of the main findings of pillars 1-3 is presented below.

Pillar 1

The risks and barriers for this pillar can be divided in different categories:

- (1) **Risks involving funding sources.** The funding from some institutions might be interrupted for reasons outside of the TM's control. More generally, the funding received might not be enough to perform all the innovative and ambitious goals of the project. Thanks to the modular system of development and the planned Time Machine Organisation it is possible to prevent this risk up to a certain degree, as they guarantee that the project is not dependent on one particular funding source and that at least some important milestones will be met and will generate positive contributions to the field. In the worst-case scenario, the TMO act as a hub to connect different institutions and projects will be able to work with limited funding. Yet, development and implementation of RFCs will become less likely.
- (2) **Risks involving external technological developments.** The development of some technologies in the private sector might reach breakthroughs that make the current developments in the TM slightly outdated. However, the wide network and strong links with experts and institutions throughout Europe guarantees that the TM will be up-to-date with the main technological developments at any time and will be able to adapt. The “on top funding” mechanism will enable to assimilate break-through developments to a certain degree.
- (3) **Institutional barriers.** Groups performing research in Humanities and Social Sciences have academic traditions that might not incorporate the developments and tools provided by the TM. The TM needs to get contact with this field of research and foster innovative quantitative work on the Big Data of the Best with convincing results that make the case for the value of the TM for historical research clear. TM funding mechanisms incentivise cooperation with the TM.
- (4) **Commercialisation vs. public access.** Risk in used linked data services which were previously open moving to commercial models / behind paywalls. TM will link TM funding mechanisms towards public domain and open access data models.

Pillar 2

Potential Risks and Barriers	Likelihood	Impact	Proposed risk-mitigation actions
There is a linguistic bias preventing some potential partners to join the network	Low	High	Connect with all linguistic communities and ensure the accessibility of project's material to the greatest number of partners. General exchanges should be made in English or in specific community's languages when requested by the project's needs. The multilingual nature of Europe and relevant European community's, needs to be taken into account when designing communication strategies. Some communications, for instance with developers, will be mainly in the English language, others will have to be organized/undertaken by native speakers.
Rules are too restrictive and prevent a great number of potential partners to join in	Medium	High	Rules and recommendations should be designed and approved by partner's representative with the aim of being the most inclusive. Their shape should be adaptable enough to prevent such issues and allow change over time.

Potential Risks and Barriers	Likelihood	Impact	Proposed risk-mitigation actions
Cooperation amongst LTMs partners is missed	Medium	Medium	Cooperation will be stated as a value within the Vision, Mission and Values Charter. Time and resources will be dedicated to team building: workshops, break-out sessions, excursions (to member's laboratory, libraries, archives). Mixed projects involving different typologies of partners will be encouraged with rewards (label or extra advertisement).
Lack of money during a PWTML process	Low	Medium	Funding plan is required to launch a PWTML and it will be closely monitored by the TMO to ensure sufficient funding. When the situation still happened, TMO with the help of the LTML would provide help for extra grants application.
An LTM is sued for non-respect of intellectual property rights	Low	Medium	Organise prevention sessions, and involve specific institutions used to deal with legal constraints in the process. Dedicate trainings materials. Offer external guidance (Legal Office).
Partners struggle to understand how to use TM technologies and TM components	Medium	Medium	Guidance and Trainings means adapted to member's need are developed, using different formats (e.g. tutorials, videos, online courses, guide). A specific guidance office replies to question.
Technical components on the partner's side are preventing massive data extraction	Low	Low	A PWTML conformity-entrance brick focus on allowing conformity to technical TM's requirements. Time Machine Box provide for data storing and encoding to the ones requesting it.
The quickly changing nature of various communities / communication technologies necessitates a constant engagement at the risk of not being aware of critical changes.	High	Medium	Special care needs to be taken to ensure up-to-date information on the most important partners/communities.
Ensure the activities are (and are perceived) as mutually beneficial to both the communities and the TM	Medium	Medium	Efforts, especially with volunteer communities need to be taken. The most dedicated contributors can be reached if the persons involved individually benefit from the engagement, especially in relation to professional communities. Contributions need to be made visible and transparent.

Pillar 3

Scholarship

Potential risks and barriers	Likelihood	Impact	Proposed risk-mitigation actions
Low participation from the scholarly community due to little integration with more practical or accessible platforms (e.g., Google datasets, Google images, Google search...).	High	High	Seek exhaustive integration with other platforms used for scholarly research (for data collection, search, etc.), increase user options and ensure that data be linkable.
Scholarly community does not have the technical expertise to access the TM ecosystem.	Medium	High	Ensure that TM data is easily accessible outside of TM interfaces, via, e.g., more user-friendly and popular interfaces. Ensure that linked data literacy not be a requirement for TM usage.
Scholarly community does not find data analysis justifiable or better than traditional methods of analysis.	Low	Low	Ensure that the TM ecosystem be presented to SSH scholars not (just) as “revolutionizing” traditional SSH methods, but as building upon these constructively.

Education

Potential risks and barriers	Likelihood	Impact	Proposed risk-mitigation actions
The technology we propose is yet to be developed	Medium	High	Support grassroots/bottom-up development of TM software, techniques and platforms, such as in focused Time Machine data sprints / academy workshops.
Support from education programs is yet to be found	Medium	Medium	Present Time Machine applications and analytics as fitting within the same domain as informatics and programming courses already offered at secondary schools.
Younger users do not pick up on Time Machine applications.	Medium	Medium	Ensure that Time Machine applications are well-integrated within already existing, popular reference platforms.
Education staff cannot pick up on Time Machine applications and analytics due to inability to work with digital technologies.	High	Medium	Ensure user-friendliness in <i>both</i> Time Machine applications and analytics (e.g., SPARQL).

GLAM

Potential risks and barriers	Likelihood	Impact	Proposed risk-mitigation actions
GLAM institutions do not see the benefit of Time Machine in their role as data contributors, data	Low	Medium	Proper dissemination and roadmap design, proper frameworks

Potential risks and barriers	Likelihood	Impact	Proposed risk-mitigation actions
processors or data users			
GLAM institutions cannot carry out quality control of contributed data	Low	Medium	Streamline data control mechanisms, standardize processes and workflows and communicate them
GLAM institutions cannot afford to participate in Time Machine for legal, financial or other reasons	Medium	Medium	Provide frameworks and workflows that help mitigate any legal or financial hurdles for institutions, especially aid with copyright clearance
Inconsistent GLAM data and Time Machine data	Low	Low	Establish proper synchronization mechanisms
Concerns that open data could prevent monetizing collections	Low	Medium	Provide best practice examples that show that GLAM institutions can greatly benefit from open data Provide a licensing framework that does not interfere with open data paradigms Find a good balance between open source and commercial models, and find ways to monetize the outcomes
Diverse needs/profiles within GLAMs	Low	Medium	During the first few years of establishing Time Machine, different profiles of GLAMs will be addressed
Replacement of the analog object	Medium	Medium	Communicate that the replacement of the analog object with the mere digital representation is not a Time Machine objective
The participating institution wants to withdraw previously contributed objects / data from Time Machine servers	Low	Low	Design a process that allows withdrawal of objects
GLAMs collecting additional forms of analog and digital artifacts besides well-established objects in the future	Medium – High	Medium	Design the Time Machine Box object-indifferent and extensible to make Time Machine compatible with hybrid collection traditions at GLAMs

Creative Industries

Potential risks and barriers	Likelihood	Impact	Proposed risk-mitigation actions
Low participation from stakeholders in the creative industries	Medium	Medium	From the early stages mobilise key players in the sector and demonstrate the positive economic, social and cultural impact.

Slow uptake of the technological innovation	Low	Medium	Connect with ground-breaking industries, start-ups and entrepreneurs who have the resources and are eager to experiment.
The roadmap does not meet stakeholder expectations	Low	Medium	Iterative consultations with stakeholder groups and monitoring of the latest developments in the field.
Political decisions that reshape legal and economic frameworks	Low	Medium	Identify ambassadors in different branches of the creative industries who would promote Time Machine initiate and help to lobby for resources needed to realise the exploitation potential.
Unsustainability of infrastructures that connect creative, media and entertainment industries with the data offered by TM	Low	High	Strategically position the innovation needs and continuously measure the impact of cultural data exploitation to secure sustainable support for it.
Lack of awareness about the exploitation possibilities in the industries	Low	Medium	Develop strategies for continuous engagement.

Smart tourism

The risks should be addressed for the commercial exploitation of research results:

- Local legal framework defending owners' intellectual property rights to images of their own property (mostly buildings or churches), which may hamper crowdsourcing of images for a local TM
- Multilingualism and multi-cultural aspects are barriers that have to be considered in the light of tourist growth from China South-East Asia
- Risk of following the agenda of the tourist sector in local TM rather than set own agenda.

Smart cities, urban planning, land use & territorial policies.

The notion of validity: some results about land dynamics or urban regulation can be true for some cases but not adaptable to others. This can lead to conflicts. A solution could be to see TM as a solution to get inspiration and not the mirror of the truth.

We also need to know if some content is too attached to a community and that this could impact the communication strategy about the Time Machine. This risk can be mitigated by having a conceptual framework for assessing the different semantic levels of the data, and a policy and workflow for evaluating data quality and provenance (both automatic and checked via crowdsourcing).

There is a risk to have a bad ecological footprint: solutions proposed is to have call for missions (digitisation or machine learning) to foster these activities on TM projects that have an important added value.

If laws are more and more grounded on data, it is important to preserve data integrity in the law.

2.3 Main results of Pillar 4

Dissemination

The Dissemination Action Plan of TM aims to underpin the grand aim of the Time Machine in the process of definition of a new role for Digitized Cultural Heritage of Europe that is widely co-created, adopted and sustained by all related stakeholders across Europe and the World.

Towards this grand objective, the dissemination strategy aims at building awareness of the goals and achievements of TM, but also at securing the engagement of all stakeholders, including scientific communities, research institutions, scientific communities, the private sector, innovators, decision-makers and the general public, to the actions related to the operation of TM and the exploitation of its achievements.

It is developed to meet the dissemination and promotion requirements of TM including stakeholder monitoring mechanisms to continuously identify and profile relevant stakeholder groups as well as strategies and workflows for continuous stakeholder specific dissemination, communication and engagement. These are closely connected to a further development of brand strategy, message development and the setting of operational goals and actions.

Dissemination plan contains the main efforts of dissemination at internal and external levels. It sets forth the efforts of TM partners intended to build channels of cooperation and influence for stakeholders and to disseminate knowledge and awareness regarding TM in a decade between the years 2020-2030. It offers a framework to complement the research and innovation processes and results throughout the TM.

Policy / Legal issues / Ethics

The Action Plan of TM on Policy, Legal Issues and Ethics aims at analysing EU and Member State-related policies, legal aspects and ethical issues referring to CH and in particular, its protection, preservation and use for developing societal and economic benefits.

This Plan offers actions to examine policy, legal and ethical issues related to the scientific, technological and operation goals. Mechanisms for taking timely action towards addressing policy, legal and ethical issues are defined. In this respect a helpdesk, useful guidelines and tools are described to manage TM foundation and its activities. These constitute the services for internal structure and research and innovation endeavours of TM members, their engagement with stakeholders and the other external actions.

The actions of this plan are framed by the scientific and technological endeavours of Pillars 1, 2 and 3 to lay down the conditions and requirements for reliable policy, legal, ethical and infrastructural frameworks and tools across the target sectors of Cultural Heritage.

Knowledge transfer

The Action Plan of TM on Knowledge Transfer is designed to facilitate the process of translating the efforts of TM from their early stages of development to a state where the results are offered and used for technological and social impact. The vast knowledge graph resulting from TM, professionals in Cultural Heritage and education will navigate the past in radically new ways and add value to their work.

Towards this grand aim, TM's capability to generate IP and manage it across TM members, target sectors and actors needs an agile knowledge transfer framework. This Action Plan on Knowledge Transfer is based on the principle of enabling effective and purposeful interactions among TM stakeholders namely between ICT and SSH scientists, researchers specialising in different disciplines, and professionals of the CH, as well as among other scientists, private sector professionals, decision-makers and the general public.

It entails actions to fully exploit the results of knowledge graph as the central technology structure of the TM. Thus, it proposes a structure for data and IPR management. This is to develop and implement necessary measures for protecting the interest of parties involved to the novel research activities of the TM and ensure a protected information exchange.

Exploitation of results

The Action Plan of TM for the Exploitation Support Structures is designed with the aim in mind to use the results acquired by Time Machine for further commercialisation, for further research and projects, for informing related policies, for shaping and creating markets, services and products, for skills enhancement, and for addressing societal challenges. Exploitation actions revolve around the principle of innovation for purposeful action. Exploitation Action Plan is developed upon this background to enable concrete utilisation of the results by TM Organization itself and by other entities and target groups involved with TM. Upon this background, this Plan aims to propose a strategy for exploitation within the context of its surrounding conditions, based on clear and measurable targets. It also aims to help identifying the key assets for exploitation, the related actors, the sectors and the markets with potential importance for TM results and processes. It sets forth structures to implement, review and maintain exploitation targets and processes across TM Organisation. The actions proposed in this Action Plan aim to ensure alignment and a common perception among the TM partners for the exploitation structures and mechanisms of TM results. Exploitation processes will iteratively use and feed in dissemination routes to reach and engage relevant stakeholders for co-shaping exploitation process for the TM results.

3 Assessment - next steps

3.1 Framework conditions

Quality Criterion: Policy measures, legal issues, broader socio-economic developments that may have a positive or negative effect on the proposed R&I plans are identified and discussed

TM Pillar 4 Roadmap for Innovation and Outreach rests on the policy, legal, socio-economic and technological conditions and structures surrounding the TM efforts. Pillar 4 entails actions to provide timely assessment of framework conditions, formulate fit for purpose services for the use of TM and external digital cultural heritage community and help capacity building among TM members.

Action Plan on Dissemination and Exploitation provides structures and services to closely follow and adopt to technological changes and breakthroughs (making up of one part of framework conditions) with possible impact on TM. Stakeholder communications tools, exploitation services and trend-watching process offered are among the foreseen actions serving for timely action. These are tackled in more detail in section 3.2 of this report.

Action Plan on Policy, Legal Issues and Ethics of Pillar 4 is particular concerned with policy and regulatory framework conditions as described in section 2.1 of this report. This Plan is based on the implementation of the Directive on Open Data and Public Sector Information (PSI III Directive) by middle 2021, implementation in the MS' of the DSM copyright Directive (DSM Directive)-by middle 2021, GDPR- already fully in force in the EU MS', and ethical issues.

The implementation in the MS' of the DSM copyright Directive (DSM Directive) and the Directive on Open Data and Public Sector Information (PSIII Directive) is expected by middle 2021. It can reasonably be expected that in the next 10 years the PSI III Directive and the DSM Directive will have a strong influence and impact on MS' policies and legislation. They will strongly affect the strategy and the policies of TM project since the two mentioned Directives regulates, among many other issues, the digitisation of CH that belong to the Public-Sector Bodies of the EU MS' and the copyright issues related with the digitised CH.

Pillar 4 also address the requirements related to the development of the other Pillars. Specifically, Pillar 4 tackles the digitisation and dissemination of CH datasets that belong to the Public-Sector Bodies of the EU MS'. This is about the implementation of the PSI III Directive. Pillar 4 proposes actions to enable cooperation and action of TM in support with the TM members that belong to the Public-Sector Bodies.

Pillar 4 sets forth actions to provide timely and accurate guidance on legal and regulatory issues for TM community. Pillar 4 offers support structures and services to help selecting the suitable, appropriate and adequate license in order to open and disseminate the dataset (CC0, CCBY, other licenses). The final decision remains in the authority of the MS'. It is also aimed to enable adoption of standard licenses policies/guidelines in the TMO.

Pillar 4 foresees to provide support in use and implementation/adoption of EU guidelines which is of fundamental relevance (EU Commission recently adopted CC BY 4.0 and CCO to share public documents). TM Organization, in respect of the domestic legislation of MS', should help and assist single TM Members for implementing a suitable license policy in order to achieve and to strike the balance between the scope of TMO and the scope of the single TM Member. The supportive structures (helpdesk, recommendations, etc.) foreseen in Pillar 4 will provide service to address this need.

Charging Policies for the re-use of documents (more specifically datasets) are among the framework conditions to be tackled for effective functioning of TM. Pillar 4 will provide support and recommendations to TM Members in order to draft a business plan that strike the balance between the general principle of free of charging stressed in the PSI III Directive and the expected ROI. In this respect, Pillar 4 foresees supportive measures for:

- Adoption of the free of charge principle or the marginal cost principle;

- Introduction of mitigation and exception in order to allow Public Sector Bodies (PBS) to generate revenue to cover a substantial part of their costs relating to the performance of their public tasks;
- Adoption of an appropriate and detailed business plan for the GLAM environment (strong cooperation with Pillar 3)

Different copyright policies are existent at national level which is in need of harmonisation and ensuring a common policy. DSM Directive aims at harmonizing copyright in the EU, and to update the copyright framework in as provided by the Digital Single Market policy and strategy

The proposal of Pillar 4 (reflected in its foreseen actions) is for a strong cooperation, collaboration and interaction in support of the TM Members that belong to Public Sector in order to follow the implementation of the Copyright DSM Directive in the MS' and to adopt a common policy, within TM Members, for Digital CH materials in respect of Copyright and related rights. In that respect, Pillar 4 will refer and make best practices such as Europeana, ODI, MS' expertise and knowledge available for TM community.

Pillar 4 will also focus on specific issue to be addressed in the IPR Copyright environment related to DCH:

- Copyright of datasets available in the public domain.
- Use of protected content by online content-sharing service providers
- Protection of the public domain works and visual arts
- Adoption by MS' of Collective Licensing with an extended effect - potential distortion of market competition
- Text and data mining
- Use of out-of-commerce works by cultural heritage institutions.

Since the TM mostly deals with historic data, many aspects of the recently introduced GDPR do not apply, although the project's management will ensure that all operations remain GDPR-compliant. Action Plan on Policy, Legal Issues and Ethics of Pillar 4 reflects on adoption of standards anonymisation procedures, techniques and tools in order to ensure the anonymisation of the datasets and prevent the potential de-anonymisation. It also entails actions to set forth privacy by design and privacy by default tools in the digital CH.

With respect to ethical issues Pillar 4 suggest the adoption of a data ethics policy in order to implement good practice around how data is collected, used and shared. This is of particular relevance when data activities have the potential to impact people and society, directly or indirectly. Specifically, it is needed to prevent Cognitive Bias in the creation of the dataset also in respect of AI. The actions will refer to best practices of the Open Data Ethics Canvas, Europeana, OKN Foundation Ethics.

In handling the framework conditions, Pillar 4 boost the role of TM Legal Helpdesk to give advices and consultation to TMO Members. This helpdesk will be a body of knowledge and support on the policy, legal and ethical issues and conditions for TM members and TM stakeholders. Pillar 4 also proposes policy, legal, ethical guidelines, toolkit and recommendations for digitization of CH both for internal and external use.

3.2 Risks and barriers

Quality Criterion: Risk factors and barriers for obtaining the targeted achievements are identified and mitigation strategies are formulated

Under Pillar 4, the risks and barriers are tackled through long term, encompassing actions. These actions are grounded by the work of Pillar 1-2-3 and will be realised in strong connection with the TM community.

1) Hindrances related to external framework conditions (technological progress)

It is foreseen that external technological developments - rapidly changing the rules of competition - might pose challenges to TM to keep up with immediate updates. TM is striving for and needs to be fed by scientific and technological breakthroughs in AI, Big Data and Semantics. If necessary mechanisms are not settled, the technological developments might reach breakthroughs that could make the current developments in the TM outdated. In this respect, both internal grassroots/bottom up mechanisms and external mechanisms to enable a strong network of stakeholders` are foreseen by Pillar 4.

Dissemination Action Plan of Pillar 4 pays special attention to stakeholder relationship management for TM. Supported by TM stakeholder forums and TM stakeholder screening tool, relevant communication and knowledge exchange channels will be built. Private sector communication is handled as an individual task to build mutual flow of scientific and technological knowledge and to establish partnerships. The Knowledge Catapult of TM will entail dedicated online tools, services, workshops, forums and events to foster knowledge exchange via bringing together researchers, GLAMs, business actors, policy makers, CH practitioners and investors. This is expected to galvanize the linkages with critical actors to keep TM up-to-date with the main technological developments.

Moreover, the exploitation structures and measures designed for TM will help to closely follow and adopt to technological changes and breakthroughs with possible impact on TM. The Exploitation Plan will be handled by an Advisory Board. This Exploitation Advisory Board will ensure proper implementation of the Plan, its continuous adaption to changing needs of TMO and its target markets/sectors/avenues for exploitation. TM Innovation Hub will bridge the gap between laboratory and marketplace for TM. This hub will foster innovation communities to scrutinize technological progress and initiate joint responses among TM and external actors.

An individual action is dedicated to trend watching for exploitation avenues which will support the main exploitation workflows of TM and continuously inform TM innovation endeavours about most recent trends. Technology, trends and needs in the target sectors and new exploitation avenues will be continuously identified and communicated to Exploitation Advisory Board and TMO members. It is aimed to propose an analysis of market trends, potential customers and users, financial sources and stakeholders for the research and innovation efforts of TM.

TM also foresees bottom-up funding models in close cooperation with researchers, private sectors, public authorities and other stakeholders, which will enable bourgeoning of novel ideas. Thus, beyond being a follower; TM is willing to boost novelties in target technology sectors.

TM through Pillar 4 aims to open up new and sustainable avenues for funding which is in need of strong trend watching and in response alignment of TM research and innovation topics and outputs with contemporary technological developments. Pillar 4 is built upon structures and mechanisms to strongly support TM in keeping up with the recent technological challenges and even being the leader of technological breakthroughs in target sectors.

2) Insufficient funding for TM and its exploitable results

It is foreseen that the funding received might not be enough to perform all the innovative and ambitious goals of the project. And the funding from some institutions might be interrupted for reasons outside of the TM's control.

TM's strength is raised upon the rich scientific and technological content and is to be tackled in different layers which call for varied support programmes and sources at regional, national and European levels. Pillar 4 sets the ground to ensure financial sustainability for TM to reach its full potential. Concrete structures and mechanisms are set forth in the Exploitation Action Plan of TM in order to reach and attract various funders, contributors, projects, investors, supporters and collaborators. Support structures to enable funding for TM are mostly based on existing skills and endeavours of TM members. Those structures and services would not be hindered by limited/lack of funding and continue the efforts to support TM.

TM Exploitation Action Plan under Pillar 4 foresees various structures/services (e.g. TM Networking Label, TM Funding Monitor, Partnering with Funders, TM Cooperative Funding, TM services for Funders, Seed investment funds, TM Funding Schemes, etc.) to develop and maintain funding

related links with a wide array of sources. It is underpinned by an Exploitation Management Plan and Exploitation Advisory Board to manage necessary channels (especially including funding sources) for exploitation of the results produced by TM (knowledge, innovation, invention, service, etc.).

Moreover, exploitation models will be proposed to open up new funding opportunities for TM. Those models are meant to be granular enough to propose business cases for each exploitable result of TM with regards to exploitation avenues of Pillar 3. Ensured by an individual action area exploitation models will service for financial sustainability of TM.

Nonetheless, TM financial sustainability is backed up by a specific task area entailing actions on partnering with projects, partnering with funders for targeted funding schemes and co-finance options, enabling industrial funding, entrepreneurship and exploitation support and building links with philanthropic organizations and sponsors.

It is aimed to act in diverse domains with diverse actors to enrich and sustain funding opportunities and avenues for TM.

3) Institutional Rigidities of TM

The institutional hindrances are seen as restrictive rules preventing potential partners to join, roadmaps and plans falling short to meet stakeholder expectations (in general unmet stakeholder expectations), unsustainability of infrastructures to link TM data with creative, media and entertainment industries.

Pillar 4 sees the need to enable a flexible structure for TM for inclusiveness and participation. TM has a strong community engagement and ownership, powered by grassroots engagements and bottom up driven efforts. Roadmap for Innovation and Outreach offers mechanisms to reflect and sustain this strength of TM to overcome any possible institutional rigidities of TM hindering enhanced success of the organisation.

Flexibility and responsiveness of TM is needed to keep the TM scientific and technological endeavours up-to-date, include promising actors to TMO in a timely manner, enable enhanced participation of stakeholders to TM efforts, increase responsiveness of TM to external challenges (technological, financial, etc.) and ensure sustainability of TM at European and global scale. Dissemination Action Plan of Pillar 4 aims to offer structures enabling openness, inclusiveness and transparency for the desired flexibility and responsiveness of TM.

Dissemination strategy aims to be built on mutual linkages of communication and influence between TM and its stakeholder groups. This will be ensured by Dissemination and Promotion Strategy managed by TM Central Communication Hub. The dissemination actions aim at provide timely and accurate feedback from a wide range of stakeholder groups; scientists, national and European authorities and funding bodies, private sector, LTMs, national, European and Global cultural heritage associations, philanthropic organizations, citizens. TM Central Communication Hub will be supported locally and at stakeholder levels through national and stakeholder communication hubs. These structures will help local and stakeholder level infusion of dissemination and communication efforts.

Relations with stakeholders will be managed via a dedicated task area aiming to offer tailored approaches and mechanisms for each stakeholder group (to be) involved with TM identified by other Pillars. TM Stakeholder Forums will serve as a tool in order to drive the TM related processes and to include as many stakeholders in its development process as possible. The Stakeholder Forums will be engaged in a continuous consultation process on specific topics, roadmaps, several practices of TM, etc. supported by the project website, dedicated workshops and events. They will be invited also to take part in the consultation processes organised for maintaining and enhancing dissemination practices (in connection to RFC foreseen in Pillar 2). The TM Citizen Communities are envisaged to be developed around LTMs where pilot actions such as data sprints will actively engage specific communities interested in TM. Stakeholder level actions are foreseen for international and European organizations, scholars, citizens, policy makers.

The Pillar 4 Roadmap for Innovation and Outreach aims to scrutinize the effectiveness of participatory processes, structures and framework conditions (stakeholder communication; dissemination channels; partnerships of projects, associations, funding bodies, TM Manifesto,

knowledge management tools, etc.) in order to feed TM to reconfigure its structures, principles and processes for enhanced inclusiveness.

TM aims to build upon existing exploitation structures for Big Data of the Past and offer novelties for enhanced articulation of TM results (data, product, process, research, etc.) for target sectors and exploitation avenues. Supported by a wide array of structures/services for generation of partnering and funding modalities, Pillar 4 aims to reduce the problem of unsustainability of individual or a set of structures currently available for exploitation of TM data.

4) Low accessibility, (utility) and participation

Hindrances are mentioned with regards to lack of cooperation among LTMs, low participation from scholarly communication, GLAMs, creative industries, educators.

TM aims to stand as a community of communities to catalyse the relations not only between itself and digital cultural heritage stakeholders but also among the related stakeholders themselves. Pillar 4 Roadmap for Innovation and Outreach envisages mechanisms for an intensified interaction to foster European Research Area in Digital Cultural Heritage and to strengthen the impact of TM at technological, societal and economic domains.

The dissemination strategy not only aims at building awareness of the goals and achievements of TM, but also aims at securing the engagement of all stakeholders, including research institutions (curricula in Digital Humanities, publications), organisations involved with the management of patrimony (fully integrated platforms for crowdsourcing and citizen science), the private sector, decision-makers and the general public (targeted communication actions), in the actions related to the operation of TM and the exploitation of its achievements.

Besides, the stakeholder specific communication and dissemination channels, Pillar 4 envisages multi layered support structures (help desks and hubs) providing granular support for individual business and stakeholder cases both for TM members and external actors. They are dedicated to understand the hindrances and propose firm purpose solutions for enhanced visibility, accessibility and participation.

This multi layered structure comprises: (a) central hub structures which are responsible for coordination, strategic development, cross-domain activities as well as 2nd level support; (b) national / stakeholder specific subsidiaries which are enrolling activities on national / domain level, reporting and operating 1st level helpdesks; (c) including external consultants as a 3rd level support to provide specific consultancy, developments or supervision. All three levels are conducted and controlled by (d) boards to supervise / strategic goalsetting.

Working links with LTMs, scholarly communication, actions towards GLAMs and industrial actors are among the top priorities of dissemination and exploitation related measures of TM. LTMs will be supported for their research and innovation efforts through the measures proposed in Pillar 4 Roadmap. LTMs will act as local facilitators, vectors and representations of TMO. Communication channels will be sustained and strengthened with LTMs for their enhanced success and progress. LTMs will be the focal point of knowledge management for TM. Knowledge Transfer Action Plan envisages developing / conceptualizing APIs / technical & non-technical exchange with LTM, third parties / externals: e.g. servicing, instancing. Principles, guidelines and structures will be offered for including – connecting to LTM Knowledge quality management: The principles and structures for evaluation and quality management (QM) for internal processes will be developed.

TM also plans to disseminate into training programmes, which will be handled by Pillar 4 in cooperation with Pillar 3. In this respect, the creation of educational material, the anchoring of digital tools and TM content in education of scholars, professionals and wider public is of interest. Training programmes for researchers, GLAM professionals and PhD students by including extant instruments on EU and national levels will be developed and maintained. Scalable training programs for large scholarly audiences as learning materials and formats to familiarising and involving large scale audiences via unsupervised training courses or Massive Open Online Courses (MOOCs) will be offered. Partnering mechanisms with educational programs and events will be developed. These mechanisms will be developed through providing an overview about all school, student and

vocational training programs of relevance for the TM as well as mechanisms to place “own” topics in syllabuses as well as events.

4 Forward planning

The time plan for the TM CSA is shown in Figure 4-1.

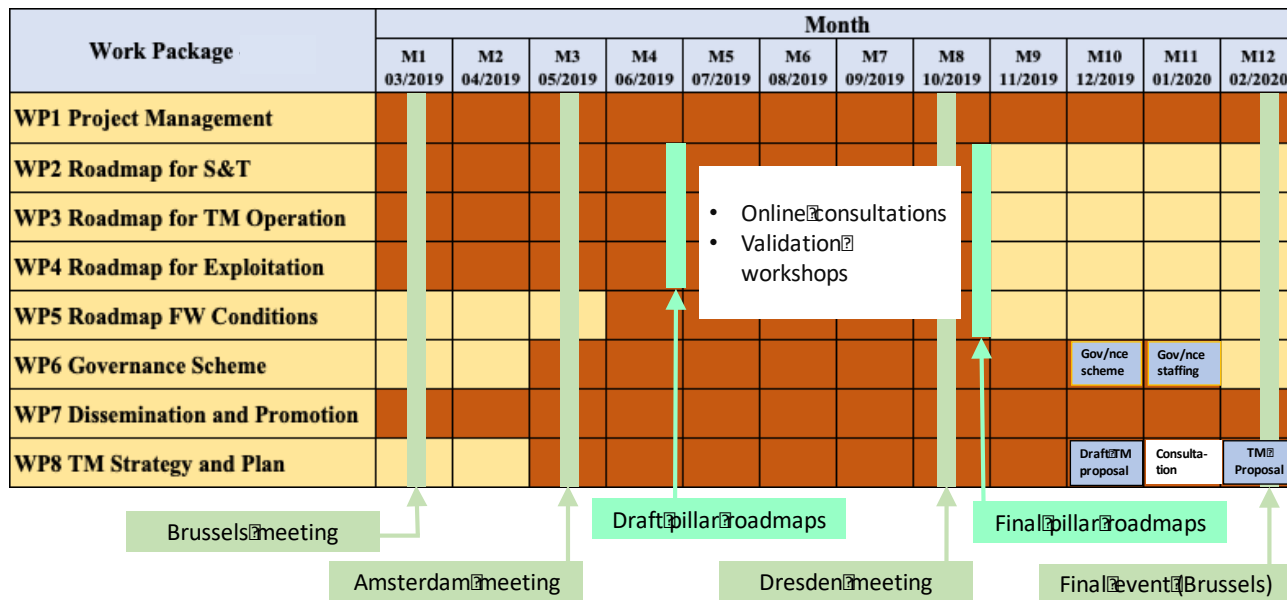


Figure 4-1: TM CSA Time plan – reporting period: Months 7-9.

The reporting period was characterised by the following events:

- The second annual Time Machine Conference was held from 9 to 11 October 2019 in Dresden with 370 participants.
- Validation workshops in the form of panel discussions have been organised in this conference, with the participation of external stakeholders for each TM pillar.
- The working groups have used conclusions of the on-line consultation and validation workshops to prepare the final pillar roadmaps.
- The final pillar roadmaps have been submitted in the first week of November 2019.
- The CSA mid-term review report was received on 21 November 2019. The project will respond to the comments and recommendations within the 30-day deadline.

The work in the next three months will be organised around the following targets:

- The roadmaps developed for the Time Machine pillars will be used to develop first a draft (Month 10) and then the final proposal for the TM LSRI (Month 12).
- The process involves thorough reviews of work plans, budgeting assumptions, required resources, funding sources and framework conditions (policy, legal, ethics, support environment) that facilitate implementation. The objective is to avoid duplication of effort, and to exploit synergies, while performing a final check that the proposed governance scheme is fully compliant with the operational requirements.
- The draft proposal will be presented to the TM Ecosystem through a public consultation (Month 11).
- A high-level conference is foreseen on Month 11/12), involving senior decision makers from the private and public sector. A validation workshop/panel discussion is also foreseen.
- Feedback received from the public consultation and workshop/panel discussion will be used to shape the final version of the TM LRSI proposal (Month 12).

Annex A: The Time Machine roadmap methodology

Overview of Time Machine

Time Machine is designed as a LSRI, understood to be a structured cooperation of an already broad network of stakeholders involved with developing/drawing value from the big data of the past, and, therefore, aiming to create substantial socio-economic impact, by implementing a strategic research and innovation agenda. The initiative is articulated around four pillars shown in Figure A-1, together with their corresponding thematic areas.

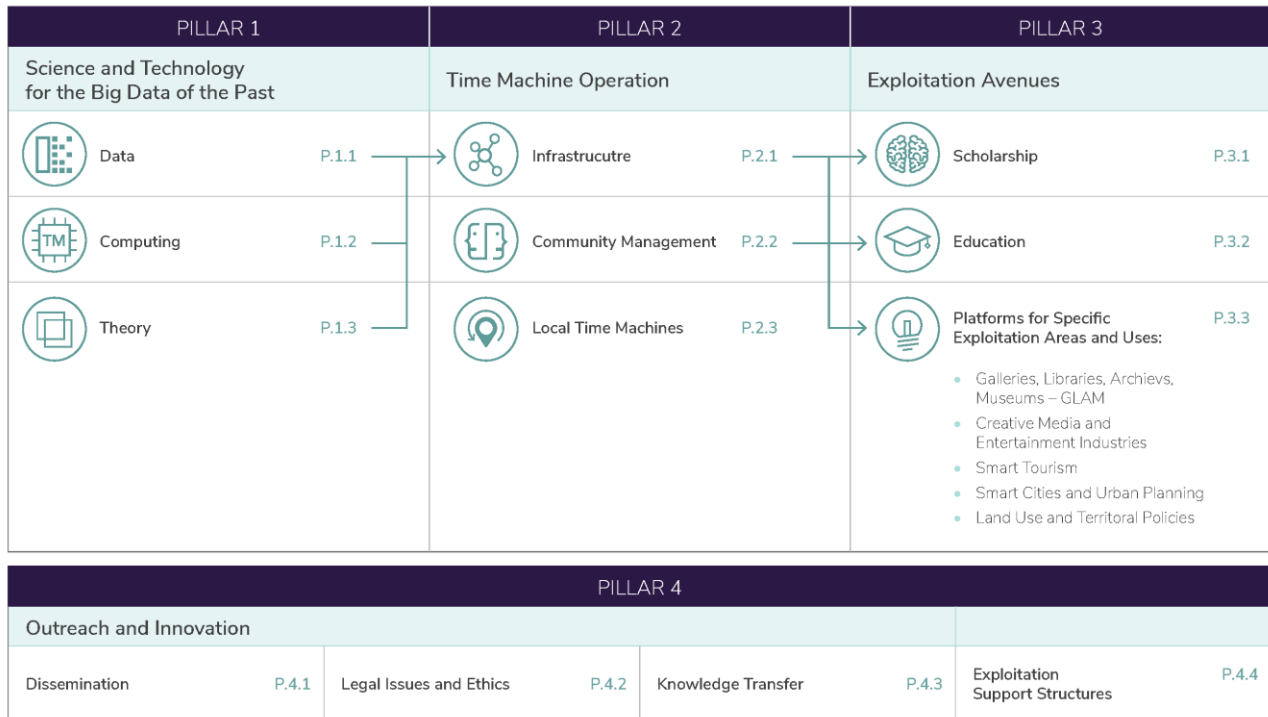


Figure A-1: The TM Pillars and Thematic Areas

Developing the roadmaps

Time Machine is based on a common understanding of the:

- Expected achievements in terms of science and technology that are ambitious, realistic and measurable
- Specific timeframes, where concrete intermediate results will be produced
- Substantial qualitative and quantitative effects for key existing and developing economic sectors
- Requirement to continuously interact with policy/decision makers in order to optimise the implementation process
- Necessity to combine different sources of funding, creating synergies across and promoting efficient utilisation of different funding instruments
- Need for an integrated and holistic approach to maximise impact.

The Time Machine roadmap is the reference document that consolidates and describes this understanding and, therefore, providing the guidelines for all actors involved in the implementation of the TM LSRI. It should, therefore, outline the strategy, the organisation of work to achieve stated goals and outcomes over specified time frames, necessary resources and criteria of success. This reference document will be produced following the TM structure in the pillars and their corresponding thematic areas shown in Figure A-1

In the CSA project, the development of roadmaps is organised in work packages (WPs). The pillar roadmaps are elaborated from detailed plans at the level of each thematic area, undertaken by working groups (WGs) composed of subject matter experts from the TM consortium. Work in pillars

1-3 (WPs 2-4) has started in month 1 and will be concluded by Month 8 (October 2019), after the integration of feedback received from consultations with external stakeholders. Work for Pillar 4 (WP5) has started in Month 5 (July 2019), building on specific needs identified in pillars 1-3 and finish by Month 8 as well.

The starting point in each WP is a background document for the pillar describing the objectives, the current situation, and the priorities to be addressed. During roadmap development, the WGs describe and assess the state of the art, define priorities and examine alternative development routes for each thematic area, through internal workshops, own expert judgements, consultations with external experts as required, and document / data analysis. Their conclusions, as initial (Month 4) and, then, final (Month 8) drafts, are checked for coherence and compliance with the TM objectives, and are integrated into the pillar roadmap.

During this stage, the roadmaps for the pillars 1-3 also identify and describe:

- The funding sources, as well as corresponding mechanisms and processes to be followed in the contractual relations with the different funders;
- The large variety of stakeholders to be involved, their corresponding roles and, therefore, the needs in terms of management and coordination for the programme;
- The framework conditions relating to policy, legal aspects and ethics that have to be taken into account;
- The approaches and measures that address any barriers to market entry and/or facilitate the commercial exploitation of research results.

These aspects form the basis for the second stage of the design: the first two are used to shape a robust governance scheme (WP 6), while the last two will enable us to design the accompanying actions (WP5 - Pillar 4) supporting the dissemination and outreach of TM in the EU and internationally, as well as creating the enabling environment to maximise the societal and economic outcomes of Pillar 3.

Coordination also involves using the main conclusions from the pillar roadmap drafts to organise:

- Stakeholder workshops with selected representatives of academia, business and policy making.
- Stakeholder online consultations.

These actions aim to receive comments, integrate views, build consensus and ensure commitment to TM objectives and endorsement from a wide range of TM stakeholders. This is an important interaction of the WPs that develop the Pillar roadmaps and the horizontal WP7 that deals with dissemination and promotion:

- The Pillar roadmaps define the stakeholders to be involved (actors and funders).
- WP7 defines the overall dissemination strategy, part of which is to approach the stakeholders identified in WPs 2-5 and undertakes the promotion actions to raise interest and incite participation in TM.
- So, among other things, WP7 creates the favourable conditions for all stakeholders to participate in the road-mapping events organised in WPs 2-5.

In the final stage of the CSA, the findings of the previous stages are put together in the TM reference document presenting the TM strategic objectives, along with detailed methodologies and required resources, as well as the management and operational scheme that will drive the programme through its 10-year span.

Annex B: The quality criteria for the Time Machine roadmap

Taking into account the nature of the LSRI and design process (Annex A), the development of the pillar roadmaps is based on the quality criteria presented below.

Roadmap sections	Quality criteria
1. Pillar objective	A clear mission statement is developed for the pillar, describing how the pillar contributes to the Time Machine vision
2. Research and Innovation plans	A master plan is developed describing the baseline, the expected ambitious outcomes and the methods to achieve them
a. State of the art	A thorough review of relevant scientific, technological and business fields constitutes the pillar's baseline
b. Targeted achievements	Concrete targets are defined for addressing the relevant scientific, technological and innovation challenges
c. Proposed methodologies	The path to the targeted achievements is elaborated to a sufficient level of detail - interdependencies with other pillars are identified
d. Milestones	Critical points to evaluate progress in the proposed developments are determined
e. Key performance indicators	A set of metrics is developed to assess progress made in the different pillars / thematic areas
3. Funding sources	Realistic options, including alternatives, are identified for the funding resources of the proposed R&I plans
4. Stakeholders to be involved	The key actors that will validate, contribute and/or support the proposed actions have been identified and are informed/involved in the elaboration of the R&I plans
5. Framework conditions	Policy measures, legal issues, broader socio-economic developments that may have a positive or negative effect on the proposed R&I plans are identified and discussed
6. Risks & barriers and ways to address them	Risk factors and barriers for obtaining the targeted achievements are identified and mitigation strategies are formulated