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From: Support Action Centre of Competence in Digitisation

Project acronym: Succeed   Project Number: 600555

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Project Coordinator: Universidad de Alicante

The following deliverable:

Deliverable title: Best practices and management procedures for centres of competence

Deliverable number: D7.6

Deliverable date: 13/11/2013

Partners responsible: KB

Status: ☒ Public   ☐ Restricted   ☐ Confidential

is now complete

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The deliverable is:

☒ A document

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Sent to Project Officer: **Sent to functional mailbox:**   **On date:**

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The sustainability of European centres of competence in digitisation and digital preservation: good practices, possible scenarios and recommendations

Support Action Centre of Competence in Digitisation (Succeed)

November 13, 2013

Abstract

This report describes the current landscape of centres of competence in the digitisation and digital preservation domain, analyses three possible scenarios for their future, and draws some recommendations for their sustainability. The analysis and conclusions are based on the stakeholders' experiences with existing centres of competence. The content has been developed with the help and support of the partners in the Succeed project, in cooperation with representatives of the centres of competence listed hereinafter.

The document will support the European Commission in the preparation of the initial calls scheduled for the next EU Framework Programme for Research and Innovation (Horizon 2020) within the context of the Connecting Europe Facility (CEF) to improve Europe's networks and infrastructures, and the Commission Recommendation of 27 October 2011 on digital preservation, digitisation, and online accessibility of cultural material.

This outcome of the Succeed project (scheduled for November 2013) will be part of a more elaborated roadmap for the sustainability of centres of competence (project deliverable D7.7, scheduled for December 2014). The roadmap will include, in addition to a long-term vision, a report on the current best practices for setting up centres of competence, and an exploration of new types of funding, business opportunities beyond the European Union, and the role of public-private partnerships.

Document information

Deliverable number	D7.6	Start: M1	Due: M9	Actual: M11
Deliverable name (DoW)	Best practices and management proce-dures for centres of competence			
Internal/External	External			
Activity type	SUPP			
Participant	UA, **KB**, INL, PSNC, BVC, BL			
Estimated person months for this deliverable	5.00			
Dissemination level	PU (public)			

Document history

Revisons				
Ver-sion	Status	Author	Date	Changes
0.1	Sustainability workshop in The Hague[1]	Succeed partners, OPF, IMPACT, VCC-3D and V-Must.net repre-sentatives	12.03.2013	
0.2	Draft	Rafael C. Carrasco	5.07.2013	Document created
0.3	Joint meeting	KB, UA, BVC	6.09.2013	Draft updated
0.4	Draft	Rafael C. Carrasco, Irene Haslinger	30.09.2013	Feedback from other competence centres (VCC-3D, OPF, IMPACT, V-MusT.net) collected and compiled
0.5	Joint meeting	KB, UA, BL	15.10.2013	Pre-final version
1.0	Final	Rafael C. Carrasco, Irene Haslinger	11.11.2013	Final version with comments from the internal supervisor

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[1]The minutes of the workshop and the list of participants are available at `http://succeed-project.eu/publications`.

Approvals				
Version	Date of approval	Name	Role	Signature
1.0	10.11.2013	Jean-Philippe Moreaux (BnF)	Internal supervisor	OK

Distribution (this document was send to)			
Version	Date of sending	Name	Role
0.3	13.09.2013	Succeed members in WP7 and leading persons in all centres of competence in the digitisation and digital preservation domain: APARSEN (David Giaretta), IMPACT (Rafael Carrasco), OPF (Ross King, Neil Grindley, Margriet van Gorsel), PrestoCentre (Marius Snyders), VCC-3D (David Arnold), V-MusT.net (Daniël Pletinckx)	
0.5	31.10.2013	Jean-Philippe Moreaux (BnF)	Internal supervisor
1.0	13.11.2013	European Commission	
1.0	13.11.2013	All Succeed partners (Intranet)	

About this document

This document is a public deliverable (D7.6) of the Succeed project (FP7-ICT-600555). The title has been slightly modified for enhanced consistency with the deliverable description, as contained in the DoW.

In addition to the members of the Succeed consortium, the following persons made valuable comments and suggestions: David Arnold (vcc-3d), Margriet van Gorsel and Hildelies Balk (OPF), Daniël Pletinckx (V-MusT.Net).

Copyright statement

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Executive Summary

The term innovation gap describes the inability to take fundamental inventions, produced by R&D projects, into at least the preliminary stages of commercial development. In the context of building a framework for large-scale digitisation and digital preservation of the European cultural heritage, the centres of competence were conceived as key pieces serving the purpose of bridging the gap between European R&D projects in the field and the ongoing digitisation programmes.

At present, there are six centres of competence operating in this area, originated after projects funded by the EU, which provide a comprehensive coverage of all aspects of digitisation and digital preservation. However, there are partial overlaps in expertise and in their target members. Moreover, all these centres face similar and, in some cases critical, challenges —such as reaching stable and balanced funding, and suitable legal status—, while delivering complementary and differentiated services for their stakeholders.

The initial vision described a scenario where reinforced cooperation between the existing centres minimises the risks and contributes to a more effective delivery of high quality services by the centres. However, the tepid response towards establishing a framework for cooperation advised to consider a second scenario where excellence is promoted through variable funding and competition. For completeness, the stand-alone perspective has been also considered.

Good practices are derived from the information provided by the existing centres of competence. The identification of the main features concerning staff, membership fees and benefits, business models, legal issues, and governance provide the starting point for a more elaborate presentation of best practices, which will be part of the roadmap (Succeed deliverable D7.7) scheduled for December 2014.

The European Commission and the existing centres of competence themselves can contribute, through the implementation of some strategic measures, to the long term sustainability of the knowledge transfer implemented by the centres. The most important recommendations resulting from this analysis are:

1. The centres of competence should discuss whether there are any incentives for more intensive cooperation —for instance on the basis of the three scenarios outlined in this document—, and if so, what these possible forms of cooperation could be. The number of possible scenarios outlined in this document is by no means exhaustive.

2. Existing centres of competence should start pilots for collaboration.

3. The EC should explore and discuss various scenarios with the centres of competence, including the role of the EC in the different scenarios.

4. Europe should invest in the creation of a technical platform with a shared infrastructure providing basic digitisation ad preservation services.

5. The EC should invest in finding an adequate solution for the legal status of the centres of competence.

6. Europe should stimulate the development of a process for certification of procedures and standards in which the centres of competence can reach the status of certification institutes.

7. Europe should encourage the launch of shared training programmes and facilities (on basic skills for the digitisation and digital preservation of cultural heritage) that may also extend beyond Europe.

1 Introduction

1.1 Why were Centres of Competence in Digitisation founded?

The term innovation gap was coined to describe the inability to take fundamental inventions (produced by R&D projects or by industrial research) into at least the preliminary stages of commercial development. For example, the implementation of innovative tools for digitisation generated by R&D projects in a production environment is often impeded, not only by limited awareness of these results, but also by the lack of sufficient resources for their adaptation, maintenance and further development.

The idea of addressing the innovation gap problem by setting up centres of competence came up in the context of building a framework for large-scale digitisation and digital preservation of European cultural heritage. Centres of competence in digitisation and digital preservation were conceived as key pieces in this framework, serving the purpose of bridging the gap between European R&D projects in the field and ongoing digitisation programmes. This role for centres of competence was first discussed in November 2006 during a meeting of the European Commission with experts from member states, organised by the Directorate General for Information Society and Media in Luxembourg.[3] The European Commission did not define any specific directions for the format of these centres, but rather advised the stakeholders to further develop the concept in the way that would be most feasible for their specific part of the domain.

Meanwhile, the Commission Recommendation of 27 October 2011 on the digitisation and online accessibility of cultural material and digital preservation proposed to optimise the use of digitisation capacity, and achieve economies of scale by pooling digitisation efforts by cultural institutions and cross-border collaboration, and building competence centres for digitisation in Europe. It also called for the application of common digitisation standards, as defined by Europeana in collaboration with the cultural institutions in order to achieve interoperability of the digitised material at European level. Furthermore, the recommendation encouraged partnerships between cultural institutions and the private sector in order to create new ways of funding the digitisation of cultural material, and to stimulate innovative uses for it.

In this context, several projects funded by the 7th Framework Programme of the European Commission (FP7, started in 2008) included the development of a (physical or virtual) centre of competence as one of their objectives: IMPACT, 3D-COFORM (under the name vcc-3d), V-MusT.net, PRESTOPRIME (PrestoCentre) and APARSEN. In parallel, the results of the FP6 project PLANETS, finished in 2010, had already been sustained in the Open Plan-

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[3]See http://www.minervaeurope.org/events/documents/competence-centres_en.pdf

ets Foundation (OPF), an organisation which can also be characterised as a competence centre. At the end of 2010, the representatives of these projects reported on their progress in a concertation meeting[4] It was decided to continue this exchange of ideas, and to start working on a document on centres of competence that could be used by the European Commission in the decision making process for new funding programmes.

Every project mentioned has now established a competence centre in its specific part of the digitisation or digital preservation field (with the exception of APARSEN, which will be up and running in 2014), while struggling with parallel organisational, legal and financial issues. This document provides an overview of current good practices, expresses a vision for the future of centres of competence under different scenarios, and proposes a number of actions.

1.2 Overview of the centres of competence

This section briefly describes the existing centres of competence in the digitisation domain, their relation to the different steps in the digitisation workflow, and the knowledge areas covered by their expertise. A separate description of the main features of each centre can be found in sections 2.6– 2.11.

In order to analyse the support provided by the centres of competence, it is worth mentioning that the digitisation of cultural heritage involves three complementary processes:

- the creation of digital content;

- the long-term preservation of digital objects;

- the deployment of services for the dissemination and exploitation of digitised content (for example, mobile platforms or online digital libraries).

Each type of activity (digitisation, preservation, and dissemination/exploitation) calls for specific fields of expertise; therefore, the coexistence of specialised centres of competence is a plausible landscape. Of course, further specialisation is possible depending on the type of content involved: printed, three dimensional, audiovisual, etc. For instance, the IMPACT Centre of Competence in Digitisation concentrates on resources for historical printed text, whereas APARSEN addresses preservation within a very general scope.

Altogether, these competence centres provide a good coverage of complementary areas of expertise in the main aspects of digitisation (see figure 1). However, the picture also reveals possibly insufficient coverage of some areas such as the exploitation and dissemination of textual content.

A complementary perspective is offered by table 1, which summarises the profiles of the target members, according to the information received from

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[4]The report of the meeting is available at `http://www.succeed-project.eu/files/` `overview.pdf`

	Activities	Format
Open Planets Foundation	Preservation	Mainly text
impact digitisation.eu centre of competence	Digitisation	Text
VCC-3D Virtual Competence Centre for 3D in cultural heritage	All	3D
v-must.net Experience the Future of the Past	Digitisation & Exploitation	Mainly 3D
PRESTO CENTRE	All	Audiovisual
APA RSEN Alliance Permanent Access to the Records of Science in Europe Network	Preservation	All

Figure 1: The landscape of European Centres of Competence in Digitisation

each centre. The available information reflects that there is a considerable overlap between the member segments the centres of competence target.

In summary, the centres of competence provide a comprehensive coverage of all aspects of digitisation and digital preservation, although there is a partial overlap both in expertise and, especially, in their target members.

1.3   What are the challenges and risks?

European centres of competence have been designed as knowledge hubs disseminating expertise to a wide community of stakeholders. In the particular case of the digitisation and digital preservation domain, centres of competence are expected to support the transfer of knowledge between organisations with the objective of boosting the digitisation and preservation of European cultural heritage. In addition to this core activity of knowledge transfer, these centres of competence raise awareness, encourage the use of digitisation standards, foster the pooling of efforts by cultural institutions in order to optimise the use of resources, and contribute to the development of public-private part-
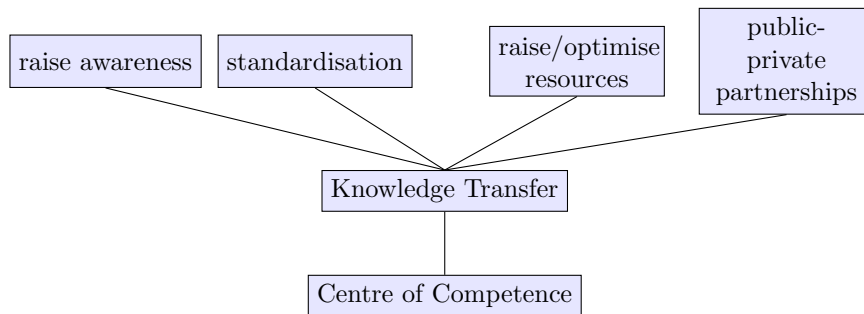
Table 1: Member segments targeted by the centres of competence.

Centre of Competence	Targeted member segments
IMPACT	• OCR software companies • Natural language processing researchers • Image processing experts • Digital libraries • Libraries and archives with active digitisation programmes
OPF	• Libraries • Archives • Digital preservation practitioners and researchers • Technology providers
V-Must.net	• Museums • Research organisations • Industrial partners (creative industry, software developers)
VCC-3D	• Owners and curators of artefacts (museums, cultural heritage sites and visitor centres, individuals) • Research organisations • Individual researchers • Conservators • Restorers • Exhibition designers • Creative and cultural industries • Suppliers of documentation tools, including both data and metadata
PrestoCentre	• Archives • Research and commercial organisations
APARSEN	• Not available for this report

Figure 2: The main activities of a centre of competence aiming to bridge the innovation gap.

nerships (see figure 2).

In practice, the centres of competence in digitisation and digital preservation scout for and collect requests from cultural heritage institutions. These requests can be for technical support, training or consultancy. After collecting the requests, the centres connect each request with the most suitable supplier, facilitate the communication between the involved stakeholders and coordinate or assist in the responses. This brokering role of the centres of competence meets, however, a number of challenges:

- In order to keep the operational costs low, permanent staff is often scarce in the centres of competence. This limits the amount of assistance that can be given by the centre itself.

- Internationalisation beyond the geographic scope covered by the members of the centres (for example, to non-European countries) requires additional investments (in order to solve technical and legal issues), and travel expenses, especially when in-site assistance is required.

- The centres of competence are not the holders of intellectual property rights, which often remain with the members. As a consequence, specific legal agreements must be signed (except for open content and software).

In addition to these challenges, the centres of competence face a number of risks that may threaten their sustainability:

- The centres of competence are unable to attract a sufficient number of stakeholders. A low number of members reduces their capacity to respond to requests for technology and consultancy, and a reduced number of contracts results in insufficient funding.

- The centres of competence compete for overlapping member segments which, in the current economic climate, have limited budgets for membership fees and are thus forced to choose between the centres.

- Expertise in digitisation is scattered among the different centres of competence, whose fields overlap partially. Stakeholders, especially smaller institutions with limited access to technological networks, may not have enough information to differentiate each centre's profile, and to select which one should be contacted for a particular need. As a consequence, part of the target group is not reached.

- Member institutions lack funds to start new research and innovation programmes, which makes it difficult to keep their technology offer up to date.

- No suitable legal body is available to adequately represent the members of the centres of competence. International organisations like the centres need a stable legal structure which, on the one hand, does not need to be modified when the management moves to a different country (for example, because of rotating leadership) and, on the other hand, conforms with local regulations and legal expertise.

- Large ICT companies offering digitisation and preservation technology dominate the market, using their own distribution networks, and leaving little room for other initiatives involved in the dissemination of knowledge.

In conclusion, the centres of competence need to face some critical objectives such as reaching a balanced funding and a stable legal status while delivering a complementary and differentiated branding towards their stakeholders.

1.4 What are the strengths and opportunities?

The existing centres of competence share some features that can be regarded as strengths, helping them to achieve their fundamental goals:

- The centres already have a strong multidisciplinary and international coverage.

- Most of their members have former experience in cooperative R&D projects, a feature which contributes to their expertise and networking capacity.

- Members of each centre contribute with their own networking capabilities to create extensive and focused networks of expertise.

- The relative maturity of the digitisation and digital preservation field. Indeed, the preliminary map of the digitisation landscape elaborated by the Succeed consortium (public deliverable D7.2) has identified around
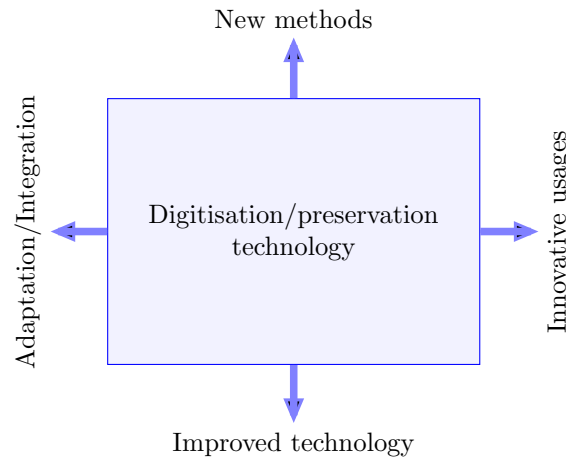
Figure 3: The frontiers for the evolution of digitisation and digital preservation technology in relation to role of the Centres of Competence.

250 institutions that are active in this domain, including over 120 cultural heritage institutions (museums, galleries, archives and libraries), nearly 20 research institutions, and over 40 companies. These numbers reflect a sufficiently critical mass of stakeholders in the domain, which could create an active network of institutions providing mutual support for a more effective advance of their digitisation programmes and technologies.

In addition, there are a number of fronts where the centres of competence can contribute to the advance of the state-of-the-art in digitisation. Schematically, digitisation and preservation technology can progress in four different directions (see figure 3, clockwise starting on the left): the adaptation and integration of techniques for a better exploitation in productive environments; the discovery of new methods and techniques; the innovative exploitation of consolidated methods to new environments and applications; the improvement of the existing technology.

The centres of competence can contribute to the advance of technology in all four directions, especially in those related to their core activity (knowledge transfer and dissemination), i.e. activities along the horizontal axis.

In particular, for the adaptation and integration of resources, the centres can:

- Advise cultural heritage institutions to choose and implement the most adequate tools for their digitisation and preservation workflow.

- Promote the use of open standards and open resources, together with a better interoperability between the tools applied to every step in the digitisation workflow (content creation, preservation, dissemination).

- Assist cultural heritage institutions in the seamless integration of independent, complementary tools in their productive environment, helping them work together.

- Provide comprehensive benchmarking services where users of digitisation tools can identify the technologies which best fit their needs.

- Implement and disseminate professional training and certification in digitisation technologies.

In addition, the centres of competence also facilitate innovative usages of content; since the centres, maintaining a close-up view on the knowledge in the domain, they can help define the requirements to produce suitable content for innovative applications of the existing technology. This mediation role can result in the establishment of new public-private partnerships.

With respect to the vertical axis in figure 3 (improved technology and new methods), the centres of competence can:

- Provide input to the developers of new or improved technology by collecting open questions in the field, and communicating them to the research groups.

- Promote the definition and adoption of simplified, harmonised licensing schemes for tools and resources.

- Offer certification for scanning, storage, indexing and other data services to process and preserve cultural content. The certification can be carried out for each digitisation project and for each technology or service provider in this domain. This service would strengthen the independent role of every centre in the digitisation scene.

Summarising, the centres benefit from the multidisciplinary and comprehensive background of their members, and base their capacity in the large European community of institutions involved in digitisation programmes or offering digitisation and preservation technologies. They may also acquire a leading role in technological certification and implementation of professional training in their domain.

2 Good practices for sustainability

As a new infrastructure type in the European digitisation and digital preservation landscape, the existing centres of competence have established a number of good practices that contribute to the sustainability of the centres. A good practice is:

- Effective with respect to the objectives.

Challenges	Risks
• Staff available • Internationalisation costs • Legal issues	• Low number of members/lack of stable funding • Overlapping target members • Insufficient R&D output from new projects • Competition of largest companies in disseminating knowledge • Geographic dispersion of knowledge • Inadequate legal forms
Strengths	**Opportunities**
• Multidisciplinary • International • Experience in cooperation in R&D • Strong networking capabilities • Sufficiently critical mass of stakeholders in the field	• Advise on right tools for entire workflow • Promotion of open standards, resources and interoperable tools • Harmonisation of licensing schemes • Seamless integration • Benchmarking services • Certification • Professional training • Establish public-private partnerships for innovative usage of existing technology • Collect research questions from the field and communicate them to research groups

Table 2: A summary of challenges, risks, strengths and opportunities for the centres of competence in digitisation and digital preservation.

- Sustainable in the long term.

- Replicable and adaptable.

- Economically affordable.

However, the early stage of development of the centres does not allow drawing definitive conclusions. The centres of competence are continuously collecting practical issues that arise, before they share information on the way they are handled. However, it is already possible to identify the key features which must be traced and analysed in order to determine viable approaches. These features revolve around five topics: legal forms, services (business models), staff, memberships, and governance, and they are described below (sections 2.1 to 2.5). This section also provides a description of the practices by every centre (sections 3.6 to 3.11). This information will be the starting point for a more elaborate discussion of best practices, to be a part of the roadmap (deliverable 7.7).

A comparison of the individual centres of competence leads to the following observations:

- The website is usually the main hub for knowledge transfer and dissemination.

- Multilingualism has not been fully addressed. For example, all the websites are offered in English, limiting the potential impact in some geographic regions (for example, South America).

- Opportunities for revenue seem to be dependent on the specific area within the field.

- The target members' profile has a strong influence on the establishment of the membership fees: large and medium size libraries have a consolidated tradition in managing subscriptions while museums expect lower fees.

- V-Must.net is the most enterprising centre; it was already very active as a centre during the project while successfully initiating new projects and gaining revenues. Currently, it has 47 members (10 companies, 19 museums, 7 public institutions and foundations, and 11 research centres and institutes).

- IMPACT has been very active in engaging commercial partners. Currently, its members include 4 European and 1 non-European companies, in addition to 14 libraries, and 5 research centres.

- OPF has a strong community in the digital preservation field involving at least 10 libraries/archives, 2 research centres/networks, and 1 company.

- VCC-3D is developing from 3D-COFORM where the strong emphasis on practical deployment of 3D documentation and training is encouraging. There are expectations of strong membership potential from cultural institutions with interests in three dimensional (3D) representations. Currently it gathers 15 research institutions, 1 museum, and 3 companies.

- PrestoCentre has created the largest community, gathering around 120 members, including 26 commercial providers.

2.1 Legal forms

The established centres of competence are all non-profit organisations such as:

- UK's Community Interest Company[5] (CIC), a company limited by guarantee and not having a share capital. This form has been adopted by VCC-3D.

- Company limited by guarantee and not having a share capital. This is the legal form of OPF.

- International Non Profit Association (INPA, under Belgianlaw). This is the case of V-MusT.net.

- Non-profit foundation. The PrestoCentre is a non-profit foundation while the IMPACT centre of competence has been launched as part of a non-profit foundation although the final legal status is decided.

Apparently, there is no transnational legal body which is appropriate to represent the members of the centres of competence, does not need to be changed when the management moves to a different country, and conforms with the local regulations and the (essentially national) expertise of members. This problem must be addressed in the immediate future.

2.2 Business models

The income of the centres of competence is a mix of membership fees, paid services and project funding. Examples of paid services provided by the centres are:

- Technical support using the software development infrastructure.

- Peer review.

- Code reviews.

- Events.

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[5]http://www.bis.gov.uk/cicregulator

- Webinars and training.

In general, to achieve a stable financial situation, we predict that revenues will consist of:

- Research projects (with public or private partners).

- Membership fees (sector dependent, as mentioned above).

- Core funding for sustaining the infrastructure.

2.3 Staff

For the optimal development of the activities of a competence centre the following staff profiles are required:

- Technical: deals with the selection, validation and support of the technological tools and services of the centre.

- Commercial: ensures the sustainability of the centre by engaging stakeholders in the centre as members

- Legal: advises the centres on different issues such as what legal form should be established, or what licensing agreements should be reached with the content holders and the tool providers.

- Managerial: is in charge of the day-to-day activities of the centre, receives the payment of member fees, issues certificates, prepares documentation, coordinates requests submitted to the centres, and assists the commercial staff in their activities.

Some of these profiles can be shared by the centres if a cooperation model is established as described in section 3.1.

2.4 Membership fees and benefits

The benefits of membership usually include:

- Involvement in strategic development of the centre (roadmapping)

- Participation in events, training, webinars, hackathons

- Influence in the selection of tools and access to support when integrating these tools in their organisation

- Participation in the network and meeting international experts and potential consortium partners for projects

However, membership fees, and thereby the business model chosen by a centre, are sector dependent. Libraries can ask for relatively high fees for subscription, while museums cannot. As an example, the IMPACT Centre of Competence business model is based on the following principles:

- Reduced-fee memberships: this can only be achieved if the operation costs remain low.

- Low-cost basic services: basic services provided by the centre to its members (mainly online services) are free of charge.

- Pay-as-you-go advanced services: should a member need a service that cannot be provided at relatively low costs, pay-as-you-go fees will be established in agreement with the service providers.

- Sometimes the best solution to a specific technological request is provided by a non-member organisation and, since the centre must be technologically neutral, this can be perceived as a limitation in the benefits of membership. The proposed approach is to open requests first to members and only later, when no expertise of members matches the request, to non-members.

2.5　Governance

Governance relies in all cases on a small core facility consisting of:

- A director/business developer.

- A technical coordinator.

- Administration staff.

- A web coordinator.

For example, the management structure of the IMPACT Centre of Competence in Digitisation is divided into two parts:

- Executive Board, the maximum decision-making body, responsible for the general policy and operation of the centre.

- General administration, in charge of the day-to-day organisation and administration.

Roles and operations are influenced by the fact that the centre was the result of a European union funded project (IMPACT), where some of the project partners turned into founding members, who constituted, after concluding the corresponding deed of creation of the centre, its Executive Board. After the formal constitution of the centre, the Executive Board is open to all premium

members. The daily administration is undertaken by the Fundación Biblioteca Virtual Miguel de Cervantes with the support of the Universidad de Alicante (two of the founding members).

2.6   The Open Planets Foundation (OPF)

The Open Planets Foundation (OPF) addresses core digital preservation challenges by engaging with its members and the community to develop practical and sustainable tools and services to ensure long-term access to digital content.

Background: the Open Planets Foundation (OPF) originates from the Planets project (FP6, 2006–2010), which brought together sixteen major research and national libraries, national archives, leading technology companies, and research universities. Planets successfully developed digital preservation best practices, prototype tools, and demonstrators to help ensure long-term access to our digital cultural and scientific assets.

Vision: the OPF believes that developing and sustaining digital preservation practices requires an open community that actively shares its knowledge and experiences. The OPF founders foresee that making tools available under an open source licence where and when possible will stimulate the adoption of the digital preservation practices.

Mission: the OPF's mission is to ensure that its members around the world meet their digital preservation challenges with solutions and techniques that are widely adopted and actively being used by memory institutions and beyond.

Legal Entity: company limited by guarantee and not having a share capital.

Office: London.

Governance: board of Company Directors, appointed by the Members.

Management: executive director, communications manager, senior developer.

Business model: membership organisation.

Customers: libraries and archives, digital preservation practitioners and researchers, technology providers.

Revenues: membership fees varying from 2.5 to 10K English pounds.

Facts & figures:

- OPF currently has 17 members.

- OPF is involved in the FP7 SCAPE project, and JISC-funded SPRUCE project.

Success factors in building the OPF from the Planets project:

- Early consultation of consortium on sustainability of results (1 year before project end).
- Ensuring commitment to membership of project partners.

Success factors in maintaining the OPF:

- Ongoing commitment from members.
- Continued engagement from the wider community through the website and wiki, and at hackathons and webinars.
- Growing an active community of developers and preservation practitioners.
- Being a part of external projects (SCAPE and SPRUCE).

Challenges:

- Encouraging and supporting the use of tools and services promoted by OPF.
- Attracting new members.
- Engaging non-experts and decision makers who deal with preservation issues in the community.
- Finding project funding to support activities.

2.7   IMPACT Centre of Competence in Digitisation

The IMPACT Centre of Competence in Digitisation is a productive network of experts in digitisation of historical text material such as books and newspapers. It provides tools, services and facilities for all parts of the digitisation workflow and it advances the state-of-the-art in the field of document imaging, language technology and the processing of historical text.

Background: the IMPACT Centre of Competence is building on the research and development of partners from the IMPACT (Improving Access to Text) project, (FP7, 2008–2012). The IMPACT project brought together libraries, imaging scientists, industry partners and digitisation professionals. The aim was to develop new approaches to OCR and language technology, as well as strategies and a forum for sharing best practice and expertise. The form and business model Centre was conceived in a series of workshops with all stakeholders in the consortium, resulting in a sustainable environment for digitisation solutions both from IMPACT and from other sources.

Vision: the vision of the founding members of the IMPACT Centre of Competence is that we can make digitisation better, faster and cheaper by fostering the collaboration of research institutes, private sector partners and cultural heritage institutions. Key values of the Centre are impartiality, willingness to share expertise, innovation and dedication to making the content of European printed collections accessible to the community.

Mission: to make digitisation of historical printed text in Europe 'better, faster and cheaper' by sharing expertise and providing tools for all parts of the digitisation workflow and by providing tools, services and facilities for further advancement of the state-of-the-art in this field.

Legal entity: part of non-profit foundation of hosting organisation (decision on form for independent entity pending).

Office: Madrid.

Governance: Board of premium members and Expert Advisory Board.

Management: manager and developer; distributed effort of members in website maintenance, software maintenance, business development.

Business Model: combination of membership and pay-as-you-go.

Customers: content holders (libraries, archives, museums); research institutes in the fields document imaging, OCR, language technology and the processing of *noisy* text; service providers (software and integrated services).

Revenues: membership fees, varying from 600 to 10K Euro; fees for services, project funding.

Facts & Figures: IMPACT Centre of Competence currently has 9 premium members and is in the process of registering approximately 40 standard members.

Success factors in building the Centre of Competence:

- Strong 'home base' in the commitment of original IMPACT consortium, created by continuous engagement with all stakeholders (series of workshops and face-to-face meetings over three years).
- Partners most involved in building the Centre successfully tapped their network to extend the Centre beyond the IMPACT consortium.
- Distributed organisation and shared costs.
- Sound business model with 3 customer segments that each benefit from the presence of the others.

- Support of the EC (extension IMPACT project, advice, encouragement).

Success factors in sustaining the impact Centre of Competence:

- Users keen to test and use tools and resources provided.
- Interoperability platform developed by IMPACT allows showcasing and testing of tools.
- Considerable interest of private sector companies in the Centre.
- Obtaining project funding for activities that support the aims of the Centre.
- Keeping the costs low.
- On-going enthusiasm and commitment of partners.

Challenges:

- Responding to the expectations of potential and current members.
- Integrating tools and services in the website.
- Highlight the features and roles that these tools can perform compared to what already used by institutions.
- Bridge the gap between research tools/results and everyday concerns/practices of institutions.
- Supporting implementation of tools.
- Keeping innovation alive in the long-term.
- Continuing to identify and attract target customers and stakeholders.

2.8   Virtual Competence Centre in 3D

The Virtual Competence Centre in 3D (VCC-3D) provides advice, training and consultancy in the practical deployment of 3D digitisation, documentation, analysis, tools, and visualisation to the cultural heritage sector.

Background: VCC-3D continues and expands the work of the EU-supported 3D-COFORM project (*Tools and Expertise for 3D Collection formation*) (FP7/2007–2013 grant agreement 231809). This, in turn, dates back to aspects of the research agenda developed under the EPOCH Network of Excellence in Processing Open Cultural Heritage, co-funded by the EC for the period 2004–2008.

Vision: to become a sustainable organisation capable of providing access to independent advice for individuals and organisations investigating the potential use and operational impact of incorporating 3D documentation of objects and collections within their collections management activities.

Mission: as a Community Interest Company the mission of the VCC-3D is quite explicitly to "serve its community" and a major difference in this respect is that there is an "asset lock" which prevents disposal of the company's assets other than to the benefit of the community. The mission of the VCC-3D is therefore to achieve the above vision and provide help and advice to individuals and organisations considering the role(s) of 3D documentation of objects and collections in their activities. This will include organisations making 3D collections available digitally for use by collection management professionals, for professional use and for communication to a wider audience using 3D technologies. To achieve this, the VCC-3D will provide membership services, consultancy, and training for individuals and for organisations in the cultural and heritage sectors who wish to use 3D technologies integrated into their portfolio of activities in ways which are sustainable as well as economically and practically viable over the long-term.

Legal entity: the VCC-3D was established as a legal entity in the form of a UK Community Interest Company (CIC).

Office: Brighton.

Governance: initial board of five directors, and up to 20 shareholders expected to be drawn initially from the members of the 3D-COFORM consortium. The relationship to the 3D-COFORM coordinating organisation has been clarified, and the appropriate independence from any one organisation has been strengthened.

Management: James Stevenson, David Arnold, Jaime Kaminski, Franco Niccolucci and Mike Spearman are the current directors.

Business Model: the VCC-3D is based on a mix of membership subscriptions and benefits; and services provided to members, contracting organisations, and individuals.

Customers: owners and curators of artefacts (museums, cultural heritage sites and visitor centres, private individuals); research organisations, individual researchers, conservators, restorers, exhibition designers, creative and cultural industries; suppliers of documentation tools, including both 3D data and metadata, creation and management tools.

Revenues: the VCC-3D has yet to start trading and is currently applying for start-up funding.

Facts & figures: approximately 10 shareholders at present.

Success factors in building vcc-3d:

- Finding the right legal model.

- Start-up funding to cover initial costs and market presence.

- Final identification of shareholders committed to the vision and mission.

- Commitment of advisors and other membership service providers to the vision and mission of the VCC-3D.

- Attraction of members to join and contribute to a minimal core infrastructure.

- Cooperation of supply organisations.

Success factors in sustaining vcc-3d:

- Establishment of a sustainable business model for the long-term.

- Penetration of 3D technologies into the CH sector (probably reliant on establishing adoption in other sectors —e.g. creative industries and further adoption of cultural content in the entertainment sector).

- Establishment of a critical mass of high quality content.

- Demonstrable and sustainable value added of 3D in the business operations of cultural institutions.

- Recognition within the supplier sector of the advantages of brokerage and neutral advice and the needs to avoid over-selling experimental technologies.

- Integration of 3D-awareness in other aspects of *cultural informatics*, such as co-referencing, long-term preservation, etc.

Challenges: getting through the start up phase in circumstances where the EC priorities have moved away from Cultural Heritage and appear to have lost sight of its importance as a USP for Europe in the global context.

2.9   Virtual Museum Transnational Network (V-MusT.net)

V-MusT.net is a centre of competence for the integration of digital collections and virtual environments in virtual and physical museums.

Background: many of the technologies that can be used in virtual and physical museums are mature, but nevertheless are not taken up by museums. This observation has brought the Network of Excellence V-MusT.net to the conclusion that the way these technologies are applied require significant changes. These problems can be summarised as follows:

- Digital technologies and tools need to reflect the real needs of the museum responsible, as digital technologies are still mainly seen as presentation tools that do not support the documentation and research goals of museum experts.

- The available digital technologies do not comply to the quality criteria of museums.

- The available digital technologies have very little support for maintaining, updating and exchanging digital assets and applications.

If the centre of competence intends to advise in the domain of digital heritage, it needs to provide answers to these three types of issue.

Vision: the V-MusT Competence Centre focuses on applying digital technology to projects for museums and cultural heritage organisations, and acts as a service broker. This means that the Competence Centre takes the responsibility to undertake specific projects for customers (museums, cultural heritage institutions, governmental organisations), but subdivides the work, and subcontracts the parts to members that have the assets to perform the job.

Mission: the mission of the V-MusT Competence Centre is threefold:

- The V-MusT Competence Centre wants to provide services for the museum and cultural heritage community that fit with the needs of that community; comply with the required quality criteria; and can easily be maintained, updated and exchanged with other members of that community.

- The V-MusT Competence Centre wants to support its process by defining the needs of this community, exchanging knowledge about digital heritage, and providing training.

- The V-MusT Competence Centre wants to provide these services in a way that is sustainable, scalable, and stable, for a period of at least 15 years, using a knowledge base to support its activities

Legal entity: International Non Profit Association (INPA), to be established in 2014 in accordance with Belgian law.

Office: the V-MusT Competence Centre will consist in a start-up phase of people working for the different partner organisations, coordinated by Visual Dimension bvba in Ename, Belgium. In a later phase, it will employ a small number of people based in a physical office, probably located at one of the partners' venues. This small group of people will consist of a director/coordinator, a secretary, a legal expert and a website/database expert.

Governance: the V-MusT Competence Centre will have a managing director, a Board of Directors, a General Assembly, a Museum Advisory Board, and an Expert Advisory Board. The statutes define the tasks, rights and responsibilities of each of these bodies.

The V-MusT Competence Centre includes members which are companies, research centres, university departments, museums, cultural heritage organisations, and individual experts. Each organisation is represented in the General Assembly, and elects a Board of Directors. The Board of Directors appoints a managing director for a specific term.

Management: the daily management of the V-MusT Competence Centre is undertaken by the managing director. The Board of Directors decides on the global directions, manages the members and decides on the global use of the budget. The General Assembly elects the Board of Directors and approves by voting the general decisions of the Board of Directors, including the use of the budget.

Business Model: the V-MusT Competence Centre has three major activities. It implements projects in the museum and cultural heritage domain, provides training for that domain, and is active in further developing and improving digital heritage methodologies.

When implementing projects, the V-MusT Competence Centre appoints a Project Coordinator and assigns parts of the project to the most suited members. These members will be companies if the technology and the methodology are known and defined, or research centres if the technology still needs to be defined or developed or if the methodology is not established yet. If there are fundamental research questions, universities will be involved. The V-MusT Competence Centre subcontracts the different parts of the project to its members. In this way, the V-MusT Competence Centre provides one-stop-shop solutions with a high level of quality and cost-effectiveness.

The V-MusT Competence Centre has three sources of income:

- 15% overhead fees on the project cost of projects implemented by the Competence Centre. Estimations show that about 60% of the income in the startup phase comes from this overhead fee.
- Membership fees. Each member pays a yearly membership fee, in the order of 300 euro. Organisations will be willing to pay the membership fee as it gives them access to international high-profile projects, excelling international partners and free training. Estimations show that about 40% of the income in the startup phase comes from membership fees.
- Training. We think that this activity in itself should try to be break-even, so it does not provide income. The main advantage

is that the members' employees can attend training courses free of charge, while all other organisations will be charged.

The total income covers the costs of marketing, proposal preparation, travel, contracts, knowledge base, website, and training in a break-even way. This approach is very scalable as there are very little fixed costs, nearly all costs are variable costs.

The V-MusT Competence Centre can participate in research projects by hiring the required people (from its large group of members and contacts) with fixed term contracts.

Customers: the V-MusT Competence Centre's customers are museums, cultural heritage organisations, and governmental organisations (such as provinces, cities, . . .) that want to implement digital heritage projects or to be trained in digital heritage.

Revenues: the V-MusT Competence Centre is a non-profit association; this means that it tries to make its operations perfectly scalable, in other words it tries to avoid fixed costs as much as possible so that it can break even with nearly any volume of business. This is achieved by subcontracting people from partner organisations for specific jobs. As soon as the business is well established, the V-MusT Competence Centre can switch to a small number of permanent staff (fixed cost).

Any profit by the V-MusT Competence Centre is re-invested in training its project coordinators and members.

Facts & Figures: the V-MusT Competence Centre aims at involving a high number of members, 200 in the initial phase. In the startup phase, it would aim for an income of 150.000 Euro to cover the costs. A target business is the creation of temporary museum exhibitions.

Success factors in building V-MusT.net:

- Engagement of community through extensive training programme.
- Obvious need for the quality services of V-Must.net in the community.
- Active business development resulting in projects with community members already in project-phase.

Success factors in sustaining V-MusT.net:

- Providing excellence and competence by working with the best partners in Europe, providing quality based upon a predefined methodology.

- Members are in a win-win situation to work through the V-MusT Competence Centre: they can focus on their specialisation, working together with other highly qualified partners, coordinated by skilled and trained project coordinators.

- The focus on implementations that have a long life cycle, that can be exchanged and updated easily, yields a high cost-effectiveness and differentiates us from other competitors.

Challenges:

- Maintaining a large base of members.
- Keeping the knowledge base up to date.
- Surpassing potential competitors.

2.10   PrestoCentre

PrestoCentre is a foundation for the audiovisual digitisation and digital preservation which brings together experts, researchers, and businesses, collecting their best practices, tools, and relevant information and promoting cooperation.

Background: PrestoCentre is a main outcome of the PrestoPRIME project (FP7, 2009-2012) and was set up to enhance collaboration between audiovisual content holders; facilitate coordinated action in the areas of digitisation, digital preservation of and long-term access to audiovisual archival content; and serve an international community of stakeholders in audiovisual digitisation and digital preservation through online and offline services, publications, and training.

Vision: providing free tools and simple strategies that will save the customer money and time, whilst improving long-term access to their digital audiovisual collections. PrestoCentre does this by helping their users share their experiences and learn from best practices.

Mission: the PrestoCentre Foundation brings together a global community of stakeholders in audiovisual digitisation and digital preservation to share, work, and learn. PrestoCentre works with experts, researchers, advocates, businesses, public services, educational organisations, and professional associations to enhance the audiovisual sector's ability to provide long-term access to cultural heritage.

Legal entity: non-profit organisation.

Office: Hilversum, NL.

Governance: Board of Directors.

Management: Managing Director.

Business Model: membership.

Customers: smaller archives (services to connect, share experiences, and learn from early adopting organisations); larger archives (structured ways to collaborate and share knowledge more effectively); research and commercial organisations (market and technology watch, evaluation and transfer of new R&D and commercial output).

Revenues: membership fees varying from 500 to 1,450 euro.

Facts & Figures: members include 118 organisations and 271 individuals.

2.11   APARSEN Virtual Centre of Excellence

APARSEN is a Network of Excellence in digital preservation bringing together 31 organisations covering a wide spectrum of roles and expertise in the field. The participants include national libraries and holders of scientific data; commercial companies active in the field; and research organisations with expertise in key areas. The project started in January 2011 and has a duration of four years. Its activities are organised in four streams characterised as Trust, Sustainability, Usability, and Access. The information on APARSEN is not as extensive as the information on the other centres because APARSEN is still being established as a centre of competence.

Background: one of the main objectives of APARSEN is the creation of a Virtual Centre of Excellence. This is a final result of the project and at this stage the options are being examined. Steps taken so far include a first version of a common research agenda, which is another of the outputs of APARSEN and considered fundamental so as to give researchers in digital preservation a common understanding of the digital preservation landscape, a common set of testing procedures and test data, and a common repository of tools.

A number of questions arise in the setting up of the VCoE:

- Inside/outside, who benefits from the activities of the VCoE?
- Sustainability and lifetime.
- Scope and activities, paid vs. free offerings.
- Relationship to existing coalitions/networks, in particular the Alliance for Permanent Access to the Records of Science, a membership organisation to which some of the APARSEN partners belong.

Vision: the VCoE is seen as one of the success indicators of APARSEN. The success of the project will be seen in the subsequent coherence and general direction of travel of research in digital preservation, with an agreed

way of evaluating it and the existence of an internationally recognised Virtual Centre of Excellence.

A Virtual Centre of Excellence is a fairly new organisational concept. Its aim is to bring the capabilities, knowledge and expertise together from diverse teams across geographical and organisational boundaries to create something exemplary and distinguishable within its domain. The key to a successful VCoE is the vision which is shared by all members, including the know-how and "know-why" of digital preservation. This know-how includes knowing who to ask about particular areas.

As mentioned above, the creation of the VCoE is a task stretched over the entire duration of APARSEN. A first report was produced after one year to explain some of the issues and options. In particular, two views emerged about how the VCoE can be brought into existence. These might be characterised as a 'network of networks' approach or a 'service provider' approach, and represent two different operational models to achieve the strategic goal, rather than a fundamental disagreement about it. An operational 'Service Provider to Networks' model offering the best of both approaches could be envisaged. This would strengthen the existing networks rather than risk further fragmentation, while retaining a convincing business proposition of services and products to ensure sustainability.

3 The future of the Centres of Competence: three possible scenarios

This section presents three possible scenarios (although not necessarily exclusive) for the future development of the centres of competence in digitisation and digital preservation. The first one stresses the role of cooperation to optimise their impact while minimising risks; the second one defines a possible scheme, based on variable funding, to promote excellence and maximal performance in the services provided by the centres; and finally, for completeness, a stand-alone perspective is considered.

3.1 A cooperation scheme

The overview presented in section 1.2 shows that each centre of competence covers one or more types of content (printed, audiovisual, three dimensional) and several segments of the digitisation workflow, which involves complementary activities like the creation of digital content, the long-term preservation of this content, and the deployment of services for its dissemination and exploitation. Since none of the existing centres covers all aspects, it can be argued that a closer cooperation between the centres of competence could provide the
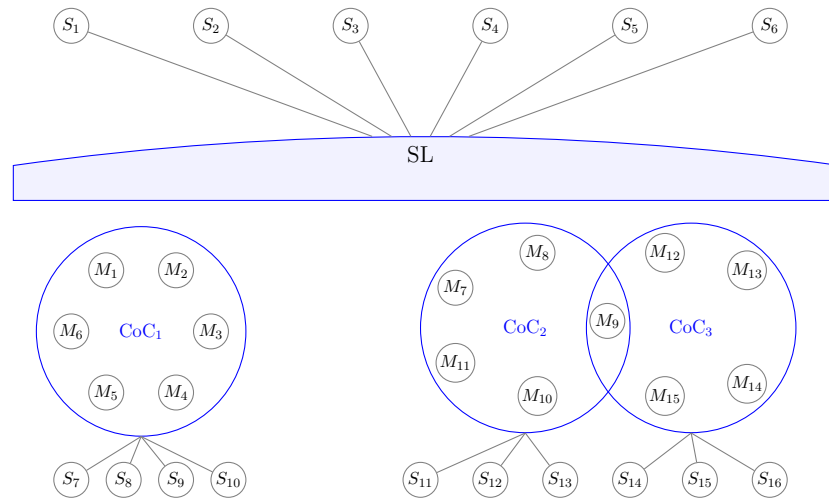
Figure 4: Centres of Competence (CoC) may overlap in expertise and members (M). A shared layer (SL) can help in the coordination of the activities of the centres, and facilitate the communication with external stakeholders (S).

stakeholders with a more comprehensive picture of the technologies for digitisation and preservation and achieve a more effective impact on the community. Remarkably, each centre already gathers its own group of stakeholders (with some non-empty intersections), and those stakeholders have their own specific needs and requests, which are best answered by one of the centres.

These observations lead to a scenario that incorporates this dualism: closer cooperation between the centres in certain areas can help the centres, on the one hand, to better serve the community of stakeholders and, on the other hand, to optimise the efficiency in the application of the available resources and, indirectly, to mitigate some of the challenges and risks which all the centres face. However, since the development of most centres is still in an initial stage, and the channels for formal collaboration are still being established, it seems advisable that the centres remain autonomous, in order to preserve their role as knowledge hubs for specific communities with distinct lines of activity, and to facilitate the engagement of new institutions.

This dual strategy can be implemented with a scheme as the one schematically represented in figure 4: a shared layer (SL) of activities and services fostering the communication between the individual centres of competence (CoC) and facilitating the interaction with external stakeholders (S). Every centre is integrated by a core of member institutions (M, which in some cases, as discussed at the end of section 1.2, belong to more than one centre) while keeping active links with their own communities.

This shared layer can implement at least five services, which will be discussed below:

1. A person (or a minimal central office) coordinating the shared activities and the organisation of specialised sub-networks.

2. An interoperable technical platform for integrated online services.

3. A common help-desk for legal issues.

4. Integrated consultancy and certification services.

5. A comprehensive network providing professional training.

The main tasks of the coordinator are the following:

- Facilitate the communication between the individual centres of competence in order to detect duplication of efforts and propose measures to resolve such duplications, for example, by coordinating some of the dissemination activities.

- Enhance the *one stop shop* concept for digitisation stakeholders through the channelling of membership requests (implementing, for example, multi-centre and collective memberships) and the handling of complex requests for assistance or consultancy which may call for the expertise of members in different centres.

- Assist in the creation of sub-networks (for example, natural classes like one made of centres providing services for libraries and archives, another one specialised in museums, etc) which mitigate the risk of competition for identical targets between the centres. This organisation will help the centres to present themselves as a strong network of mutually complementary infrastructures.

- Combine and coordinate actions to reach a wider spectrum of stakeholders and potential members with a focus on the internationalisation of the consortia beyond their current geographic scope (for example, the United States of America, BRIC countries, etc.).

- Provide administrative assistance in the preparation of contracts.

- Collect practical issues and challenges arising in the entire field of digitisation and preservation, and promote its translation into the research agenda at a European level.

The interoperable technical platform will allow the centres to showcase and provide online services in a more usable way, since it will provide a more complete display of tools and resources covering all steps in the digitisation workflow and a wider spectrum of formats and media. Similarly, the integrated consultancy and certification services will allow the competence centres to

provide comprehensive solutions encompassing all the steps in the digitisation workflow.

A common help-desk for legal issues will assist in the consolidation of the legal bodies of the centres, a question which has still not been satisfactorily resolved in all cases. It could also provide assistance with contracting, as well as with IPR-related issues such as the licensing conditions of tools and resources.

The network for training will involve experts and academic institutions in providing top quality training and certification. The coordinator will promote the agreements with academic institutions, the creation of learning curricula and the implementation of online courses (including massive open online courses, popularly known as MOOCs) and other open educational resources.

Clearly, the implementation of such a cooperative model requires staff with complementary profiles: commercial, technical (for the platform and consultancy services), legal and academic. Sharing the personnel required to implement these functions, performed otherwise separately at every competence centre, reduces the implementation costs. Although this centralised facility does not necessarily require a physical office, some initial funding can help the implementation of this layer of shared activities. Establishing a network of existing centres along the lines suggested above is, for example, promoted by the European Commission for High Performance Computing (HPC) competence centres in the draft of the Horizon 2020 Research Infrastructures Work Programme 2014-2015.

3.2 Promoting excellence through variable funding and competition

The cooperative approach described above presupposes a willingness within the existing centres to cooperate in a network-like structure held together by a shared layer of facilities. The experience so far, especially in preparing this document, has shown that this vision is not shared at this stage by all centres. Clearly, some factors restrict this approach. First, some of the centres of competence are still in an early developmental stage and not fully operational yet. Second, there is a considerable difference in some cases between the features of target groups and sectors, and the associated business models. For example, while libraries are ready for relatively high subscription fees, museums expect free or very low membership fees.

If intensive cooperation between all centres across the entire field is not viable, an alternative model, basically competitive in nature, can be explored. In such a scenario, each centre of competence tries to secure its own funding, and thereby its future sustainability, on the basis of a mixed income. This mixture of income is inspired by financial models of large national research organisations, for example, the Fraunhofer Society (a member of the Succeed consortium). The Fraunhofer organisation is the largest applied re-

search organisation in Europe with the mission to transfer new technology into real-world applications. The Fraunhofer Society earns about 70% of its income through contracts with industry or specific government projects with public partners. The other 30% of the budget is sourced in the proportion 9:1 from federal and state government grants. This part, which is used to support preparatory research and to sustain the basic research facility and infrastructure, is made dependent on the other sources of funding.

A similar model, based on a mixture of income, can be conceived for the European centres of competence in digitisation and digital preservation. They can be funded, for instance, according to a three-way split:

- 1/3 obtained from research projects (with public or industrial partners).

- 1/3 coming from membership fees (for which members receive a number of basic services).

- 1/3 is core funding for sustaining the infrastructure and management.

For best results, the core funding will consist of both fixed and variable components and the variable component of the budget is linked to the performance measures. For example, if the centre is successful in raising the income from research projects and membership fees, then it is rewarded additional basic funding. This approach provides additional motivation to acquire a significant amount of industrial projects, and furthers public-private partnerships. Although this model brings competition as a variable into the equation, it does not exclude the option for some centres to cooperate or build alliances if it makes them more competitive. Such sub-networks might be feasible for centres that operate in the same or a similar sector, for instance libraries and archives, since they form a natural cluster for stakeholders. In addition, centres that have a successful running operation could offer their services to other centres in membership administration, dissemination, maintenance, etc, all that the so called shared layer does in the cooperation scheme.

In this scenario, the European Commission (EC) can be still actively involved in the further development of the centres, if the EC is willing to provide the centres with core funding.

3.3 Stand-alone perspective

It is also possible that no specific action is taken to support the further development of the centres of competence in the digitisation and digital preservation domain. The experience in the creation of this document shows that the probability that the centres will then evolve independently of each other is high. According to the risk analysis performed in section 1.3, it is likely that memberships will decline, and only some centres of competence will be able to survive in a period of weak economic climate. If this natural selection happens

at an early stage, while most of the centres are still in their starting-up period, the funds already invested in the creation of expertise and the implementation of these infrastructures for the dissemination of knowledge will be lost, since it will happen before the centres have the opportunity to fully develop a suitable and sustainable model.

In this scenario, the EC is no longer in control of the further development of the centres. There is a risk of no return on investment, because some developing centres will never make a successful transition into adulthood.

4 Recommendations

Both the centres of competence themselves and the European Commission can contribute to the future sustainability of these key infrastructures by addressing some pending issues, and by initiating a number of key measures. These key measures relate to the good practices discussed above and the scenarios outlined in section 3. By securing a sustainable future for the centres, the Commission and the centres themselves contribute to the advance of the state-of-the-art in digitisation and digital preservation, and enhance Europe's competitiveness in this area. Proposed actions are listed below:

1. The centres of competence should discuss whether there are any incentives for more intensive cooperation —for instance on the basis of the three scenarios outlined in this document—, and if so, what the possible forms of cooperation are. The number of possible scenarios sketched in this document is by no means exhaustive. Also, the scenarios are not mutually exclusive. Aspects of various scenarios can be combined.

2. The centres should address together the issue of identifying the most suitable business model, for instance, whether the independent, three-way funding model is most appropriate, or an approach with shared facilities lead to a closer cooperation scenario.

3. The existing centres should start pilot experiences for collaboration. These pilots can be incremental in that another centre can join the cooperation pilot if possible or advisable.

4. The centres of competence should explore joint actions oriented towards the involvement of communities outside of Europe (like US and BRIC).

5. The EC should explore and discuss the various scenarios with the centres of competence, including the role of the EC in the different scenarios. This meeting may be held in the frame of a major event, i.e. the Digitisation Days organised by Succeed and the IMPACT Centre of Competence in Madrid in May 2014.

6. Europe should promote the creation of interoperable technical platforms, based on open standards, which allow the provision and integration of services for all steps in the digitisation workflow.

7. The EC should invest in finding a transnational solution for the legal status of the centres of competence.

8. Europe should stimulate the development of a process for certification of procedures and standards in which the centres of competence reach the status of certification institutes.

9. Europe should encourage the launch of international and multidisciplinary networks implementing professional training programmes in digitisation and digital preservation applications, which may also extend beyond Europe.

These recommendations are expected to generate precise outcomes and benefits for the European community, in particular:

1. Advanced support for the take up of integrated technologies covering all the steps of the digitisation process, from the creation of digital content to its dissemination and preservation

2. Affordable technologies for a more efficient distribution of digital content with interoperable features and easy integration with the production environment.

3. Improved technologies for the creation and exploitation of complex, aggregated objects.

4. Pan-european schemes for the legal bodies of international organisations.

5. Interoperable platforms for the dissemination and awareness raising of research results.

6. Pan-european networks for high-quality professional training and certification in digitisation technologies.