

Cost-Benefit Analysis of a Shared Digital Long-Term Preservation (LTP) System

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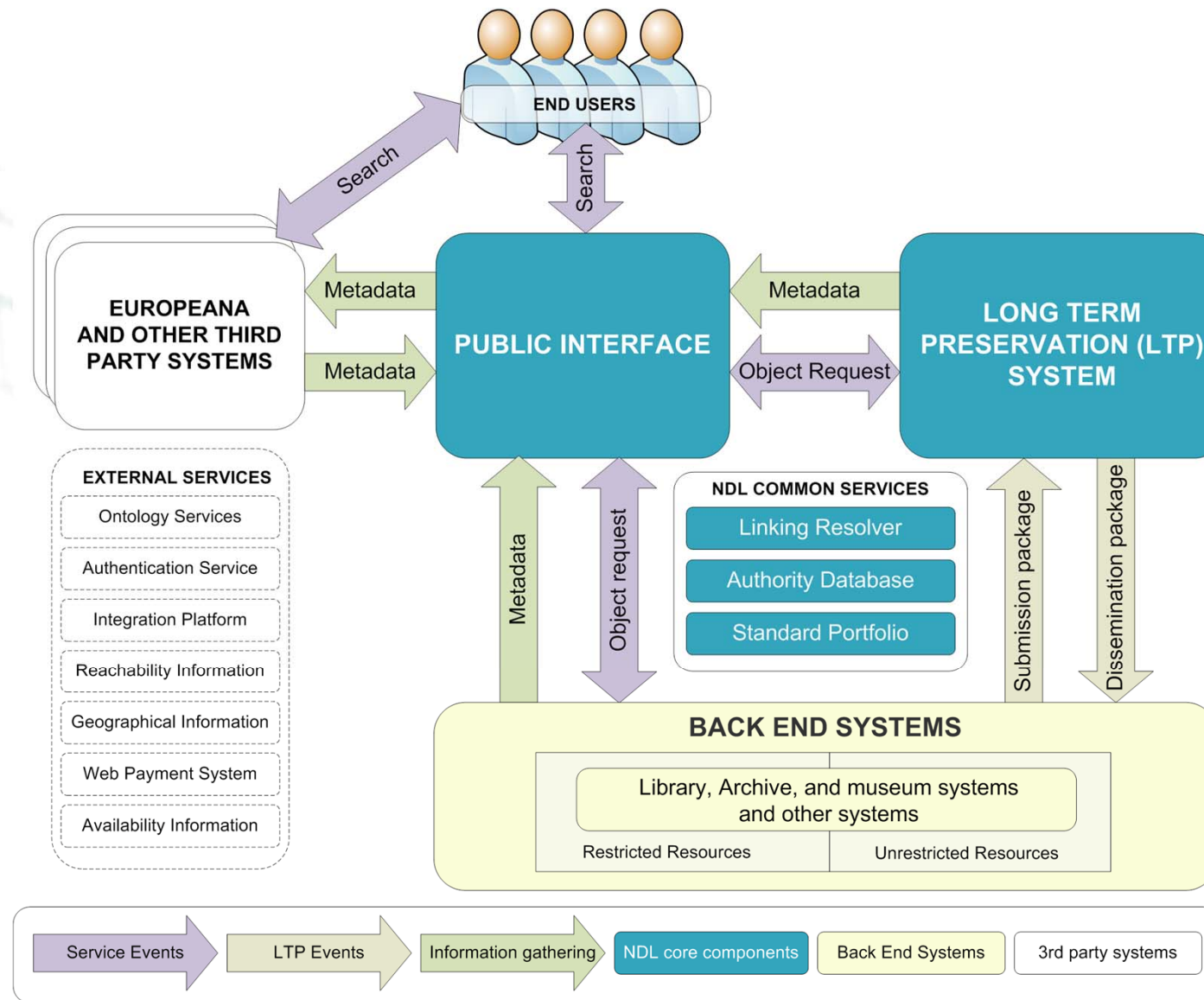
Outline

- Context: the National Digital Library Initiative
- Tools and basic assumptions
- Results
- Lessons learned

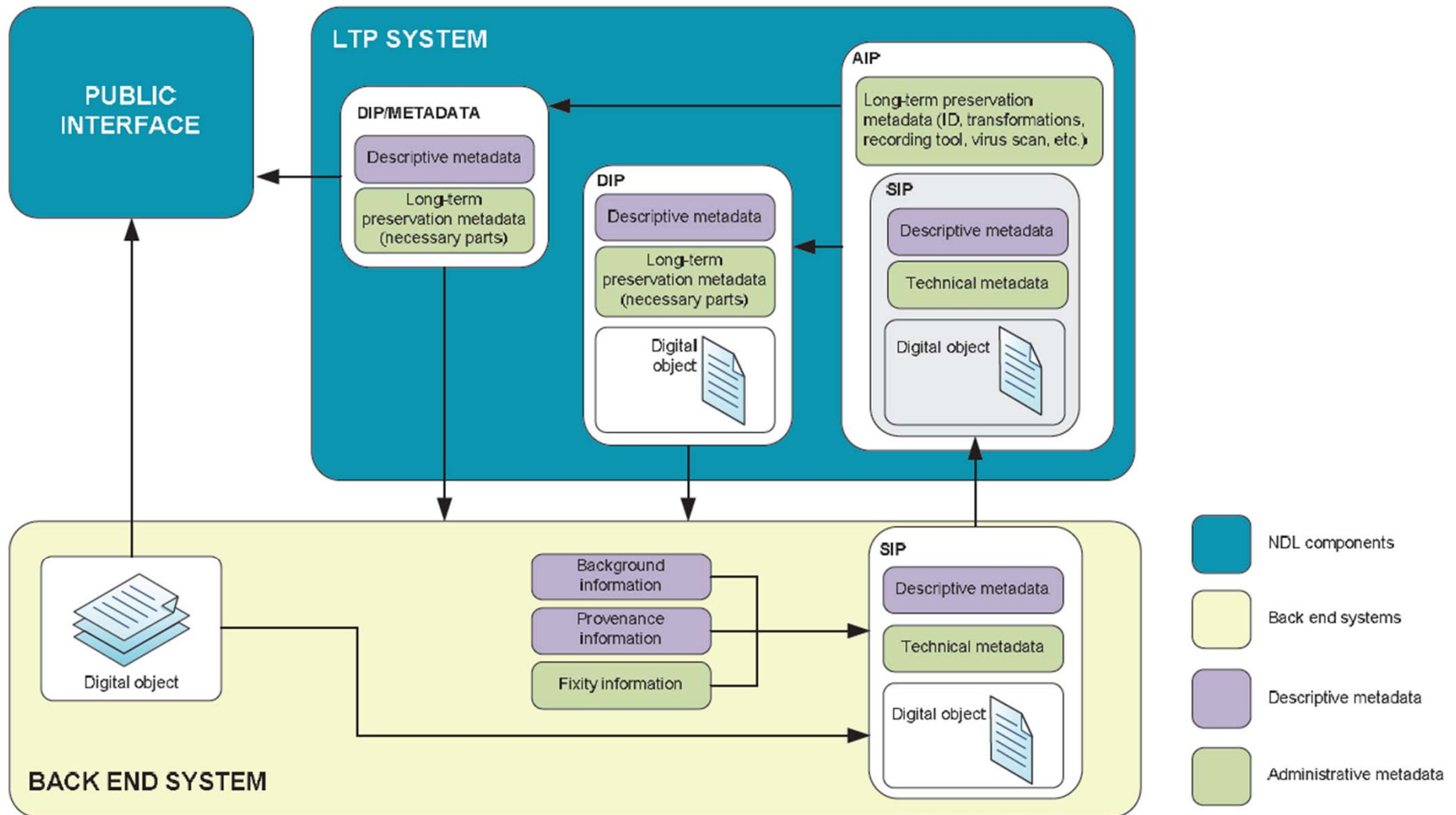
National Digital Library

- Improving availability, usability, and preservation of digital materials in libraries, archives, and museums.
 - Common user interface infrastructure
 - Europeana aggregation
 - Digitization of cultural heritage materials
 - Centralized long-term preservation service
- Part of the development of national electronic services and infrastructures. (Ubiquitous Information Society action plan; Government Resolution on the Objectives of the National Information Society Policy)
- <http://www.kdk.fi/en>

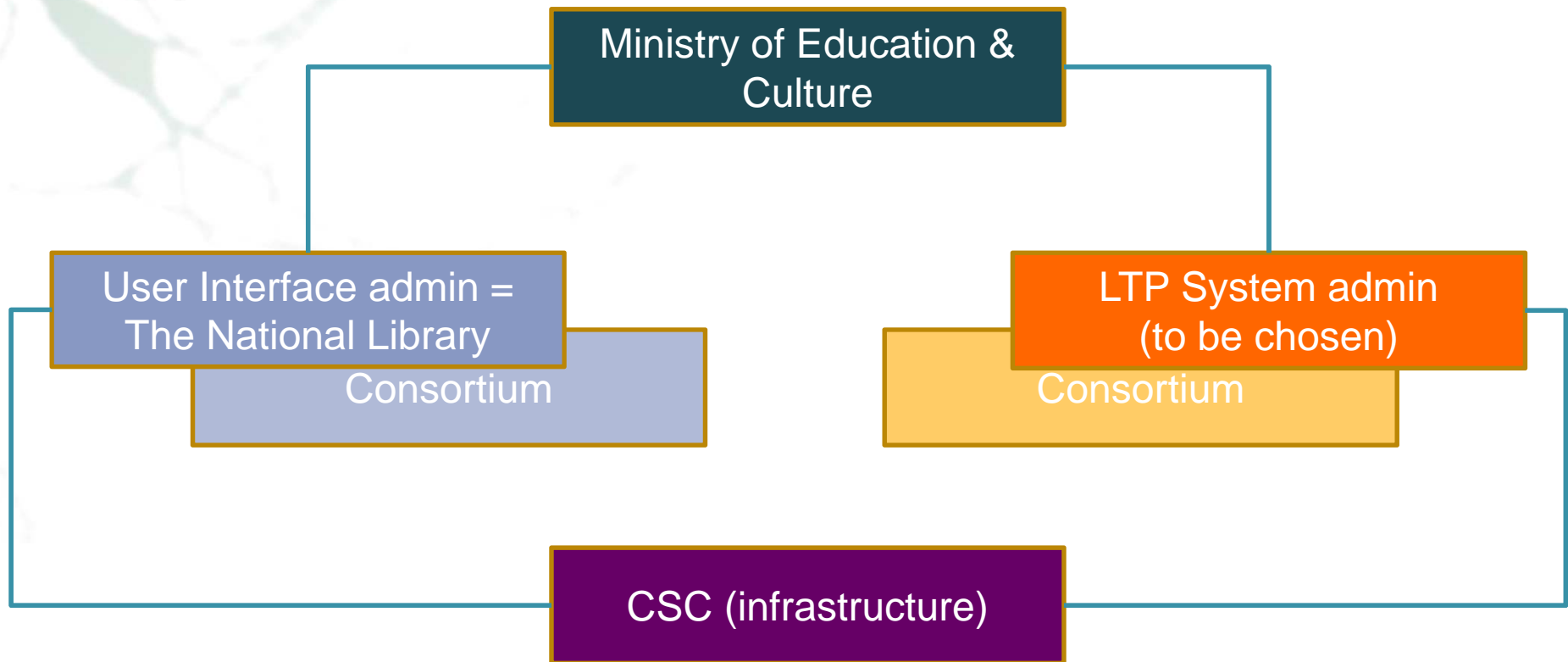
The National Digital Library



NDL: Long-Term Preservation System

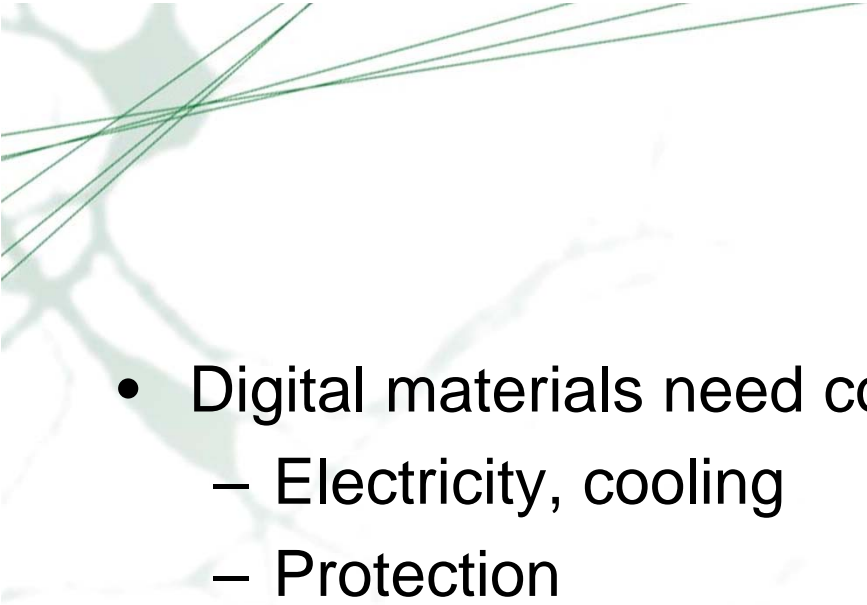


Future Governance of the NDL



NDL givens for the Future LTP System

- [LTP Section Final Report](#)
- [NDL Enterprise Architecture; with the Standards Portfolio](#)
- NDL System of Governance
- Strong push towards participation
- General acceptance of the concept of the LTP system

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- Digital materials need constant care
 - Electricity, cooling
 - Protection
 - Digital materials need risk analysis and preservation procedures
 - Monitoring
 - Migration, emulation, etc.
 - The

Cost Analysis

- LTP is about building a system of funding and governance that can ensure usability of materials.
- The path is chosen by balancing costs and benefits in the long run.
- Good understanding of Life Cycle Costs is a must.
 - Set criteria, assumptions, limitations
 - Identify cost factors; estimate costs; rank alternatives.
 - Building costs, running costs, maintenance costs

Tools Used in Analysis

- Lifecycle Information for E-Literature (LIFE)
 - Designed for digital materials
- Standard Cost Model (SCM)
- Life Cycle Costs (LCC)
- Cost – Benefit Analysis (CBA)

Figure 4 - The LIFE Model v2

Lifecycle Stage	Creation or Purchase ⁸	Acquisition	Ingest	Bit-stream Preservation	Content Preservation	Access
Lifecycle Elements	Selection	Quality Assurance	Repository Administration	Preservation Watch	Access Provision
	Submission Agreement	Metadata	Storage Provision	Preservation Planning	Access Control
	IPR & Licensing	Deposit	Refreshment	Preservation Action	User Support
	Ordering & Invoicing	Holdings Update	Backup	Re-ingest	
	Obtaining	Reference Linking	Inspection	Disposal	
	Check-in				

Kuva 4: LIFE-projektin laa tima sähköisen aineiston elinkaarimalli, versio 2

Preliminary Surveys

- Preservation and Use of Digital Materials. Memorandum of the Working Group on Long-Term Preservation and Usability of Digital Materials. Ministry of Education: Reports 2008:2.
- "Identifying Benefits of the LTP Project and Increasing Organizations' Preparedness", December 2009. Jaakko Asplund (Salivirta & Partners)
- Digital Materials in Archives, Libraries, and Museums. December 2009. Juhani Koivunen (Netum Konsultointi)

Assumptions: Amount of Data

Type	Amount of data (Terabytes)			
	2008	2009	2010	2011
Text documents	64	164	190	216
Still images	6	10	17	25
Moving image	11	25	31	37
Audio	17	23	28	33
Reference records	<10	<10	<10	<10
Web Archive	8	17	26	35
Radio and TV Archive	2	57	112	167
Total	108	296	404	513

Table 1. Materials in the NDL, estimated in 2008

Assumptions: Scale and Growth Rate

Year	Organs:s	Systems	Materials, Tb
1			
2			
3	5	5	300
4	20	10	700
5	80	20	1,000
6	140	30	1,400
7 - 12	209	40	4,000

Amount of data underestimated

- Surveys were not comprehensive
- Especially research data badly represented
- Participants have revised their estimations up

Assumptions: Level of Services

- Different organizations, different materials
- Organizations are responsible to prepare materials for preservation
 - Standards compliance
 - Metadata minimum requirements met
 - METS packaging
 - LTP System may provide additional consultancy and services, e.g. METS packaging software service
- Level of involvement in LTP decision-making and operation may vary
- Advanced dissemination up to the organizations

Assumptions on Technology

- Several copies – on different media – in separate locations
- E.g. One copy on disk (S-ATA), two on tapes (backup copy, archival copy)
- Two full-service locations + one internal archive location
- Materials accessible "in a few seconds"
- Fall of prices will match increase of volume

Cycles of hardware and software replacement

Increase of disk space	1 year
Disk arrays	3 years
Servers	3–5 years
Tape robot	5–8 years
Tape drives	3–5 years
Network	3–5 years
System administration and control software	3–8 years
LTP software	5–10 years
Format-dependent software (for accessing preserved materials)	3–5 years

Assumptions: Costs of Human Resources

- Average salaries for specialists, management, administrative support
- Estimation of annual increases
- Employer's costs (30 % of salary)
- Costs of premises (750 € / month / person)
- 10 specialists require 1 manager and 0.5 assistant
- 10 % of the sum of salaries used in outsourced training, consultancy, auditing, etc.

Cost Factors: Human Resources

Creation	Acquisition, selection, cataloguing	Ingest	Bit level preservation	Content preservation	Access
Digitization	Selection	Enrich metadata	Systems maintenance	Monitoring	Dissemination
R&D	Acquisition	QA	New media	Operations	Access ctrl
	Cataloguing	Transfer	Backups	Error mgmt	Statistics
	Management	Systems integration	Monitoring	R&D	Services
	Systems maintenance	R&D	Security		R&D
	DRM		R&D		
	Contracts				
	R&D				

Cost Factors: Investmens

Creation	Acquisition, selection, cataloguing	Ingest	Bit level preservation	Content oreservation	Access
Creation systems' - HW - SW - Building phase	Backgoroun d systems' - SW - HW - Building phase		LTP system's - HW - SW - Building phase	SW	User interface's - HW - SW - Building phase

Cost Factors: Fixed & Variable Costs

Creation	Acquisition, selection, cataloguing	Ingest	Bit level preservation	Content preservation	Access
- Insurance			As in Creation		As in Creation
- Rents					
- Basic fees for energy, broadband					
- Licences		Outsourced services	As in Creation	Outsourced services	As in Creation
- Media					
- Leasing					
- Energy					
- Broadband					
- Outsourced services					

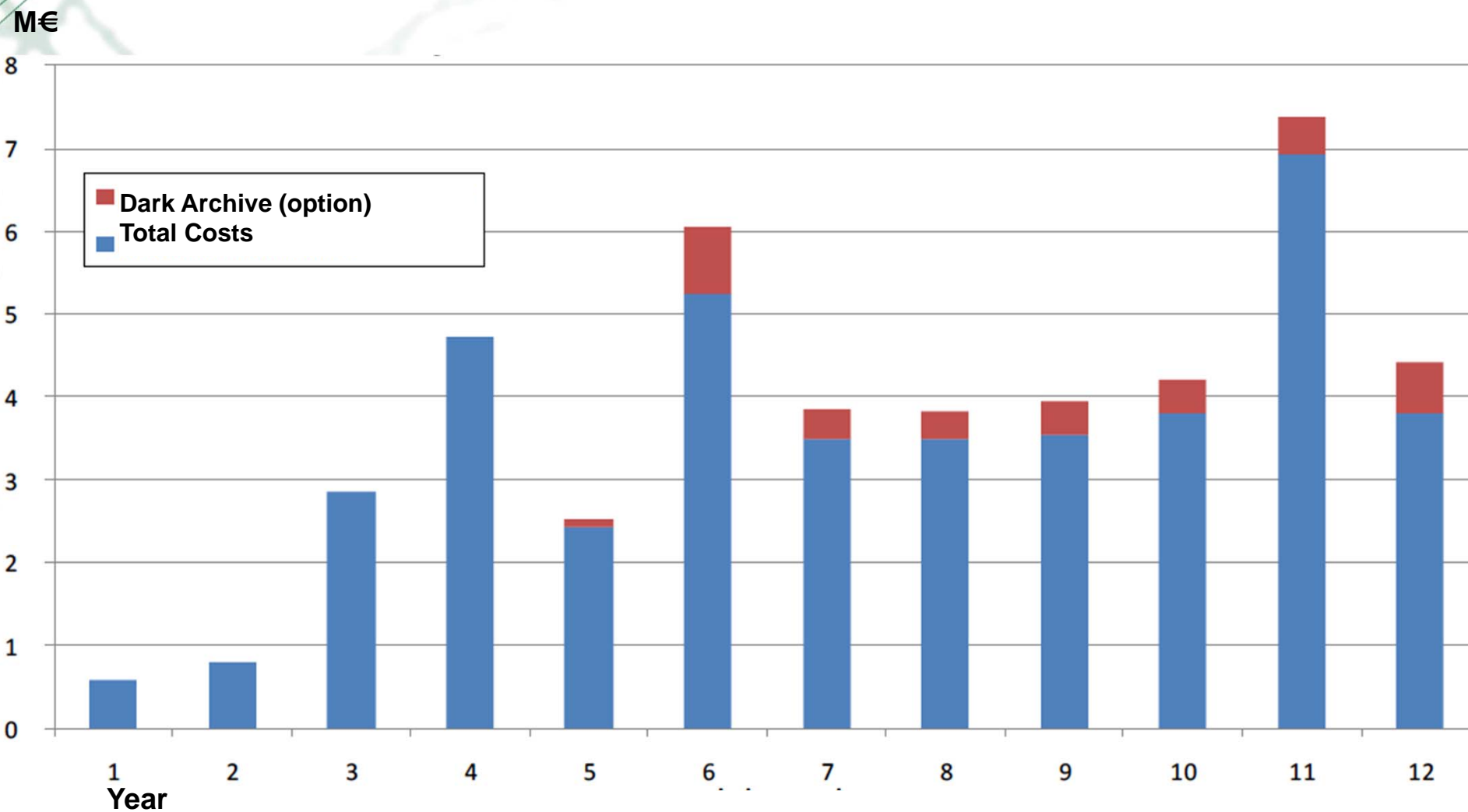
Characteristics of the hypothetical LTP System

- 200 institutions participate (many very small).
- Starts with 700 Terabytes, increases to 4,000 Tb in 7 years.
- Planning and implementation phased over six years.
- Two geographically separate mirror sites with all services available; plus a "dark archive".
- Stores materials in several copies, in several locations, on several types of media.
- Conducts risk management and preservation operations
- 10 % of contents migrated annually
- Materials are owned, and ultimately controlled by the participating organizations
- Different levels of service to different organizations

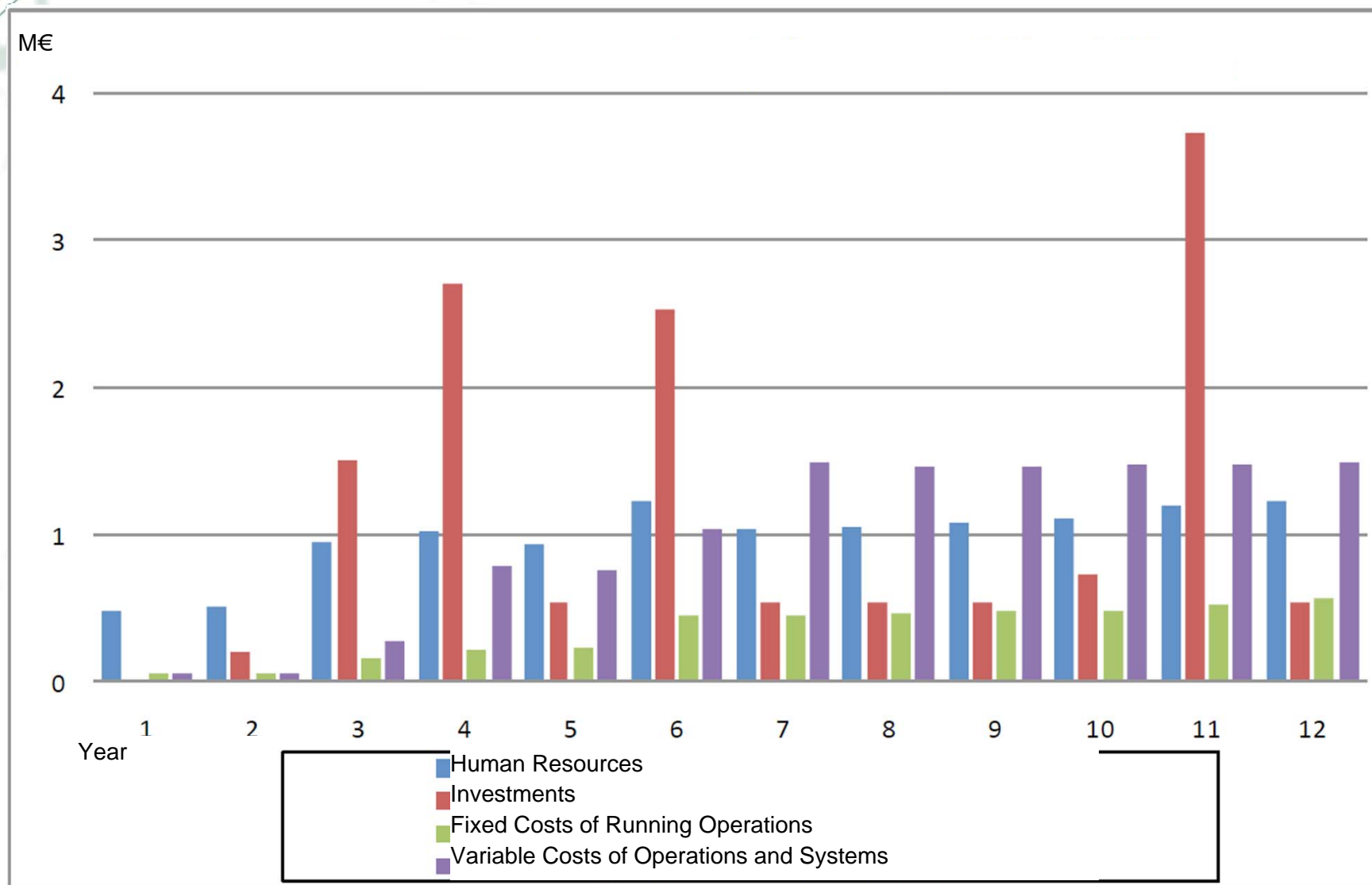
Estimated Costs

- 42 M€ for years 1-12 (planning and implementation stages)
- Plus 3,4 M€ for a "dark archive"
- After year 12, running costs stable 4 M€ per annum

Costs of a Shared LTP System



Main Division of Costs



Qualitative Benefits of a Shared LTP System

Benefit	Benefit Index (/100)
Organizations can fulfil their legal obligations.	81
Organizations can focus on core functions.	81
Reduces overlaps.	63
Creates a centre of excellence.	63
Reduces risks of failure in digital preservation.	63
Creates better processes and services.	63
Digital materials are preserved for future use.	63
Better cooperation and share of resources.	38

Quantitative Benefits

- Translation of qualitative benefits into money values
- Types of savings:
 - Savings in performance (goods produced)
 - Comparative savings (against alternative scenarios)
 - Increased return
 - Other savings
- Major savings by
 1. Lower costs of LTP systems
 2. Cheaper management of materials
 3. Better preservation results

Lower Costs of LTP Systems

- Implementation stage: 30 million € over
- Production stage: 8 million € per annum
- Against 5 separate LTP systems
- Savings in human resources and investments

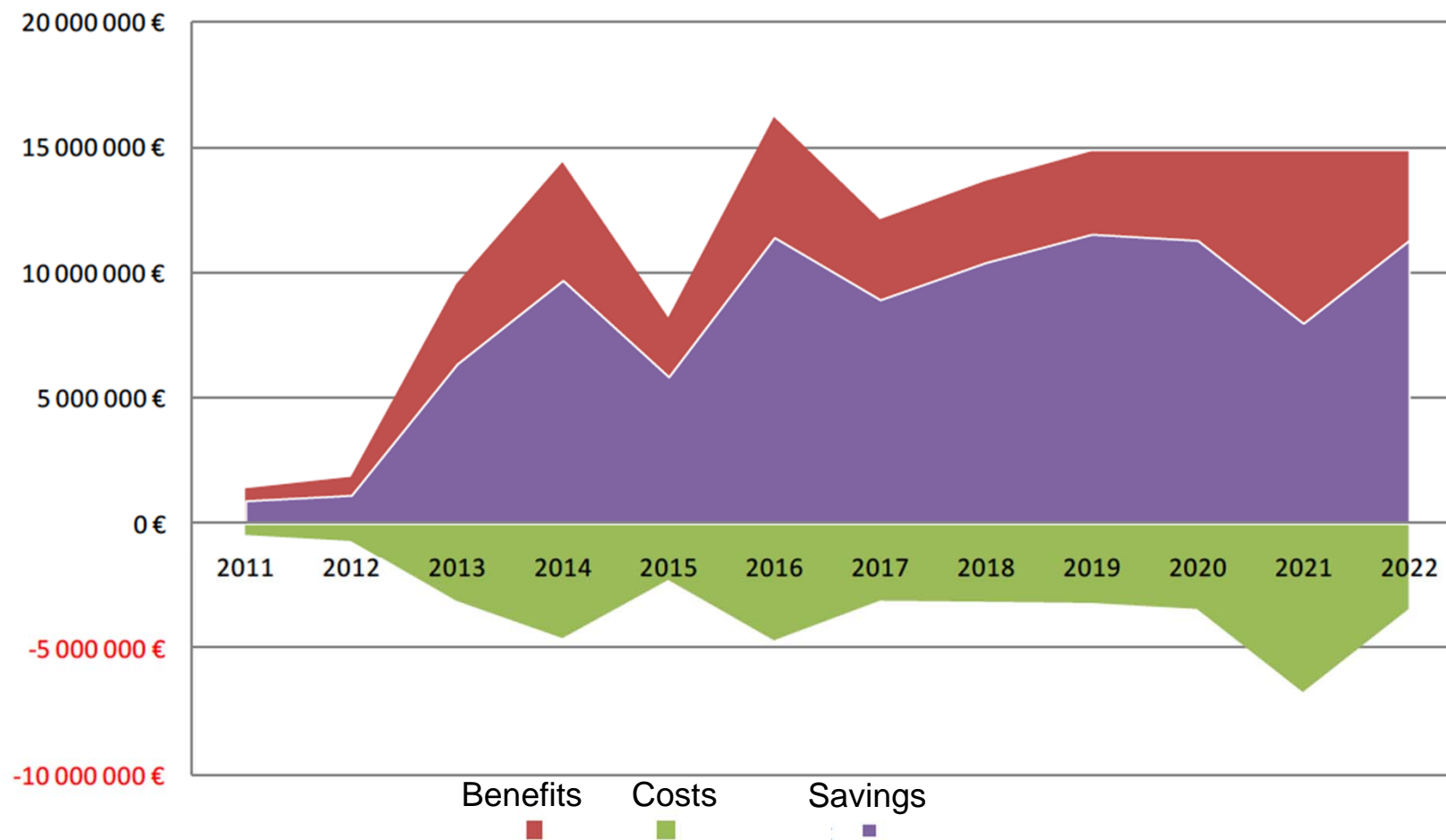
Cheaper Management of Materials

- In production, 2.5 million € per annum
- Compared to administration, quality assurance, and dissemination done in the organizations

Better Preservation Results

- Digitized materials:
 - 0.5 million € per annum
 - Compared to
 - 2 % of digitized materials being damaged in lack of LTP
 - Digitization cost: 1.3 € per an object
- Born-digital materials:
 - "Several million euros per annum"

Balance of Benefits of a Shared LTP System



Summary of Costs and Benefits

- Costs:
 - 42 M€ for years 1-12 (planning and implementation stages)
 - Plus 3,4 M€ for a "dark archive"
 - After year 12, running costs **stable** 4 M€ per annum
- Savings of a shared LTP system
 - 30 M€ during years 1-12
 - 10 M€ per annum after that
- Cumulative benefit during first 12 years: 100 M€

Lessons Learned about Costs and Benefit

- Increase of costs over time is tolerable
- Costs are manageable in the scenario used
- Digital preservation has benefits
- Shared system is a feasible option

Lessons Learned about the Process

- There are methods that lend themselves to analysing costs and benefits of LTP
- Inexact figures are better than no figures at all
- All values can and must be expressed in money

Thank you!

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centia. aut ad morte' deferentia. Que ducit ad sanitate'
bone' crisi' ee' dicitur. Que ad morte' male. h' au' i' acuta egri
dine s' s'lidanda. a' mutacio paulatim i' longo tpe p' h'nt.
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morte' ducit. Que fit cu' i'firmu' minorat'. i' morbi augm'ntat'.
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tio. atq' finitio. Quinta mut' subita ad bonu'. que
paulati' minoratur usq' ad morte' sanitate'. Sexta si
mut' ad malu'. e' i' t' defic' usq' ad p' dendu'. h' duo s' po
sita crisi' dicitur. Bona crisi' i' statu acure equidivul' cu'
h' u'el' subtile'. i' natura ad dissoluendum bonu' a
malo mouet'. i' i' expellend' malu' s'fortat'. ut a' epe
eiciat'. Mala crisi' similit' e' i' statu e' nate' p'ualeat mor
bi. Et q' h'c dicit'. G. crisi' mut' uelox s'ruent' morbo
p' duricie' accidentiu'. i' i'firmu' reluctantiu'. ducet'

