Why does it cost so much?

Decisions and choices in preservation of digital content

New England Archivists Fall 2008 Meeting
Boston, Massachusetts

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Council on Library and Information Resources
November 15, 2008
Council on Library and Information Resources: Introduction

- Not-for-profit organization that undertakes activities at the intersection of higher education, advanced research, and libraries
- Interests in preservation, digital archiving, and scholarship and the infrastructure, including libraries, that supports and fosters research and education.
- Sponsorship from the Mellon Foundation and individual academic and research libraries and organizations.
This talk will:

- Describe some of what has been learned during the work of the Blue Ribbon Task Force on Sustainable Digital Preservation and Access (BRTF-SPDA)
- Outline several of CLIR’s projects that complement and extend aspects of the work of the Task Force
- Not represent the work or consensus views of the Task Force
- Acknowledgements: Charles Henry, Amy Lucko, Fran Berman, Sayeed Choudhury, Clifford Lynch, Brian Lavoie, Lorraine Eakin
Blue Ribbon Task Force on Sustainable Digital Preservation and Access (BRTF-SDPA)

- Two-year effort engaging 19 experts from economics, computer sciences, library and information science
- Addresses the “data deluge” in science as well as more generally (Gantz 2008)
- Support from NSF, Library of Congress, the Mellon Foundation, CLIR, JISC and others
- Deliverables:
  - Year 1 report that establishes the conceptual framework
  - Year 2 (final) report that describes the model(s)
BRTF-SDPA: Objectives

- General **cost framework**: key cost categories of digital preservation
- Set of **economic models** which provide alternative ways of addressing sustainable digital preservation
  - Pros, cons, costs, trade-offs of each
  - List real world conditions for which each model is best suited.
- **Actionable recommendations**: “If your digital preservation context is X, you should consider using model Y for sustainable digital access and preservation.”

Digital preservation is visible.

- Preservation was once a dimension of technical services in libraries.
- Digital preservation requires active management.
- Preservation v. Curation: Total process of management
  - Acquisition
  - Management of the content
  - Re-purposing and re-use of the material
What are “costs”? 

- Acquisition v. total cost of ownership 
- Operations 
- Maintenance 
- Infrastructure, threshold investment 
- Value proposition 
  - We can quantify some of the costs. 
  - We have trouble quantifying the value of the collections *and services*. 
  - So the cost-benefit analysis is undefined. 
  - Costly relative to what?
Components of Costs in a Nutshell

- Labor, especially metadata creation
- Format
- Scale and heterogeneity
- Granularity
  - Collection or item
  - Resolution
  - Tagging/mark-up
- Environmental factors
  - Heating and cooling
  - Power consumption to operate
  - Regulatory framework
- Time
Prior studies

- What are the assumptions?
- What are they measuring or estimating?
- How does the study map to your context?

Note: This is based on the excellent work by Lorraine Eakin; background paper to be posted to the BRTF-SPDA website in December 2008.
Roquade Project / Dekker et al. (2001): Published literature

- Personnel costs of assigning metadata: approximately 10 euros
- Processing SIP's: approximately 10 euros per information item
- 5,000 items per year added: 6 PC’s with a network card and AV facilities: 1500 euros each + professional server: $5000 euros
- Total hardware costs: approximately 32,000 euros, depreciated over 4 years
- Software and licensing fees: 15,000 euros per year using proprietary software
- Maintenance support costs: 2,000 euros per year
- Technical support: 0.2 FEs = 9,000 euros per year
- Data refresh every 5 years @ 1 euro per MB; if DIPs are kept for 20 years and DIP is about 500 kB, cost - about 2 euros per information item, that is, 10,000 euros per year for all information items
- Total per information item costs: 29 euros per item
Chapman (2003): storage

- Excludes ingest and access
- Based on billable square feet
- $0.08 per 332-page (microfilm) volume per year in the standard vault
- $0.19 per 332-page (microfilm) volume per year in the film vault
- $0.31 per 332-page (book) volume in the standard vault
OCLC/Chapman (2003): cost/GB

- Excludes ingest and access
- Based on GB of data deposited
- $0.01-0.06 per 332-page ASCII text
- $0.47/$1.01/$1.89 per 332-page 600-dpi 1-bit page image (variable rate, based upon total amount of data deposited per account)

- Creation of a batch of 1000 records (assuming 50kb per email, 100 kb per text document, 250 kb per spreadsheet, and 2 Mb per database): 333 euros
- "Repair" of a batch of 1000 records (assuming 50kb per email, 100 kb per text document, 250 kb per spreadsheet, and 2 Mb per database): 10,000 euros
- Acquisition and input of metadata for "normal" email: 1.41 euros
- Acquisition and input of metadata for XML email: 0.06 euros
Riksarkivet/National Archives of Sweden / Palm (2006)

- Looked at:
  - Cost per year per 1 Gb stored;
  - Total costs per year
- 1 Hierarchical Storage Management System (i.e., HSM) (2003 price + 3% interest per year): 449,694 euros over five years
- Storage medium for additional 40 Tb/year: 43648 euros over five years
- Staff
  - Staff operations costs: 132240 euros over five years (0.6 FTE)
  - Staff ongoing data input: 88160 euros over five years (0.4 FTE)
- Total annual input cost: 131808 euros over five years (staff & storage medium included)
- Facilities ("Premises") (100 square meters): 66228 euros over five years
- Service/support: 138300 euros over five years
- Digitization of paper materials (1-bit 600 dpi files in A4 format): 0.10 euro per file, with 5 million images scanned annually
- Scanning of large-format drawings and maps (8-bit grey-scale at 297 dpi, in manually fed scanners): 0.61 euro per file, with 1,321,000 image files created annually
- Production costs for 1 Gb 1-bit digitized information: approximately 17 euros per Gb
- Production costs for 1 Gb 8-bit digitized information: approximately 30 euros per Gb
- Production costs for Audiovisual information: approximately 11 euros per Gb
Academy of Motion Picture Arts and Sciences/AMPAS Science and Technology Council (2007)

- "All film" production generating no digital assets, annual storage costs for archival master: $1059
- A film-captured, digital finished production at 4K, annual storage costs for archival master: $12,514
- Digitally captured, digitally finished production using HDCAM SR videotape as the capture medium at 1920 x 1080, annual storage costs for archival master: $1,830
- Digital captured, digitally finished production using an uncompressed digital data capture system at 2K, annual storage costs for archival master: $1,955
- Digitally captured, digital finished production using an uncompressed digital data capture system at 4K, annual storage costs for archival master: $12,514
Time has several senses.

- Technology changes.
  - Migrate formats
  - Refresh data
  - Respond to changes in hardware and software
  - Learning curves that do not always show up in “the numbers”

- Technology may help – automatic capture of metadata element.

- Preservation/curation has a life cycle.

- Perpetuity means open-ended.
LIFE$^2$: Life Cycle Model

\[ L_T = C + Aq_T + I_T + BP_T + CP_T + Ac_T \]

Lt: Life cycle
C: Creation or purchase
Aqt: Acquisition
It: Ingest
BPT: Bitstream Preservation
CPt: Content Preservation
Act: Access

LIFE\(^2\) Estimates, total cost per year

- Several different projects, yielded ranges
- Year 1: £15.00 - £31.50
- Year 5: £16.50 - £32.00
- Year 10: £16.70 - £32.20
What might minimize costs?

- **Automation**
  - Metadata capture
  - Cataloging

- **Time – Initial processing reduces costs**
  - Standards process
  - Planning
  - Collaboration
Hidden Collections

- Generous grant from the Andrew W. Mellon Foundation to run a competition to catalog unprocessed materials held in the special collections of libraries, archives, museums, and historical societies

- **Two known problems:**
  - *Small, distributed collections of materials of potential value to scholars either individually or in concert with others*
  - *Labor-intensive cataloging of manuscripts*

- First year with renewals for a total of five years
Hidden Collections: Eligibility

- Demonstrated value to scholars
- Web-accessible catalog with records that can be “discoverable” and hence compliant with current protocols and standards
- Long term responsibility for the maintaining the records (sustainability)
- Collections owned or held in the USA (Y1)
- Applicant a not-for-profit organization
- Digitization or format conversion not in scope
Hidden Collections: What will we learn?

- What constitutes an important collection? To whom? And how do individual collections relate to each other? ➔ value proposition
- How do organizations build a shared infrastructure?
- How can description and cataloging be streamlined?
What increases ambiguity?

- **Unknows: risks and liabilities**
- **Risks**
  - Random events
  - Natural disasters
- **Liabilities**
  - Intellectual property
  - Evolving expectations and perceptions
    - What is professionally appropriate?
    - How are research, confidentiality and personal privacy reconciled?

Note: These ideas owe much to Clifford Lynch.
Decisions

- Collection development and management
  - Legacy collections: Do you digitize? Can you digitize?
  - Native digital: Do you want to collect these materials?
- Context:
  - Network of similar institutions
  - Infrastructure
  - Resources – staff, volunteers, training, budget
  - Users: Who are they? How do they work?
- Access
  - Nature of the materials
  - Expectations of users
- Not much that deviates from standard practice in archives, libraries and museums. It’s all about mission.
And Choices

- Predominantly analog collections; digital catalogs and finding aides
- Hybrid collections, based on collecting policies
- Digital collections for purposes of access; is there a tipping point?
- All digital – what do you do with the originals? And what parts of your collections are managed according to which policies?
- Does conversion mean preservation? It depends.
Why does it cost so much?

- Does it cost so much? What is the value proposition?
- Because so much is unknown.
- We can reasonably expect:
  - Technology will become more stable.
  - Technological system solutions will appear, and these will be modular.
  - Costs of energy will rise, affecting heating and cooling as well as operations.
  - Organizational systems will offer alternatives. And will challenge institutional identity.
  - The learning curve will work with us as we simply become more accustomed to the medium and its challenges.
Surrogate for fear?

- Costs are necessarily open ended and hence unknown.
- Preservation is inherently an act of hope.
- Time will reduce some, if not many, sources of ambiguity.
Thank you.
References [1]:

References [2]