Cost Modeling for Sustainable Services

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Goals

- Understanding *costs* in order to plan for and implement *sustainable* preservation services
- Investigating the possibility of *paid-up* pricing in order to address
  - *Boom-or-bust budget cycles*
  - *Fixed-term, grant funded projects*

Source: www.sharedidiz.com/
Accounting for incurred costs is hard

- Existing administrative accounting generally is not aligned with curation services

Projecting anticipated costs is really hard

- “What will I spend someday to do something in response to some kind of situation ...”

Source: Getty Images
Modeling is made tractable through *abstraction* and *assumption*. 
Abstraction and assumption

- **Content Owners**, with stewardship responsibility for digital **Collections**, make use of submission ...
- **Streams** to transfer content to a curation ...
- **System**, composed of Ingest, Data management, and Access services, running on ...
- **Servers** and occupying ...
- **Storage**, to enable discovery and exploitation by content ...
- **Consumers**, with ongoing ...
- **Analysis and planning** and periodic ...
- **Intervention** as necessary to ensure viability and accessibility, all subject to operational ...
- **Administration** and high-level ...
- **Management**
Cost modeling

- Total cost of preservation
  - Nominal units of activity or capacity
  - Fixed vs. incremental costs

\[ TCP = n \cdot O + m \cdot T + A + \ell \cdot R + k \cdot S + j \cdot C + G + i \cdot V + D + M \]

- Pay-as-you-go pricing
  - “Common good” vs. direct costs

\[ X = \frac{A + \ell \cdot R + j \cdot C + i \cdot V + G + D + M}{n} + O + m_O \cdot T + k_O \cdot S \]
Cost recovery

- Various activities/capacities may be cost recovered through various means

- Common good
  - Development: External grants
  - Operations: Campus “tax”
  - Infrastructure: Campus “tax”
  - Interventions: Special subvention?

- Direct
  - CRM: Campus “tax”
  - Storage: Direct billing
Cost modeling

- Paid-up pricing ("endowment")
  - Cost of staff-dependent activities tends to increase over time; mitigated somewhat by productivity increases
  - Cost of technology-dependent components tends to decrease over time (Moore’s “law”, Kryder’s “law”)
  - Surplus endowment funds can be invested

\[
E = X \cdot \frac{\left(1 + r \right)^T - \left(1 - d \right)^T}{\left(1 + r \right)^T \cdot \left(r + d \right)}
\]

- \( r \) Investment rate of return
- \( d \) Discount (or markup) factor
- \( T \) Term in years

http://activeheroes.org/active-heroes-endowment/
## Pricing

### Pay-as-you-go

<table>
<thead>
<tr>
<th>Storage</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100 GB</td>
<td>$39</td>
</tr>
<tr>
<td>1 TB</td>
<td>$390</td>
</tr>
<tr>
<td>10 TB</td>
<td>$3,900</td>
</tr>
</tbody>
</table>

### Paid-up (10 years)

<table>
<thead>
<tr>
<th>Storage</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100 GB</td>
<td>$290</td>
</tr>
<tr>
<td>1 TB</td>
<td>$2,900</td>
</tr>
<tr>
<td>10 TB</td>
<td>$29,000</td>
</tr>
</tbody>
</table>

### Assuming ...

- **Investment**: 2%
- **Staff COLA**: 1.5%
- **merit raise**: 1%
- **productivity**: 3%
- **Server discount**: 8%
- **Storage discount**: 5%
Cost Modeling for Sustainable Services
http://wiki.ucop.edu/display/Curation/Cost+Modeling

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