Stewardship of the Digital Scholarly Record & of Each Nation’s Published Heritage

Peter Burnhill, University of Edinburgh
Gaëlle Béquet, ISSN International Centre
Alan Darnell, University of Toronto

#cni16f
Digital preservation represents one of the grand challenges facing higher education. Yet... the responsibility for preservation is diffuse and the responsible parties have been slow to identify and invest in the necessary infrastructure... the digital portion of the scholarly record is increasingly at risk and solutions may require unique arrangements within the academy for sharing preservation responsibility.

Adapted from "Urgent Action Needed to Preserve Scholarly Electronic Journals," Don Waters et al, 10/2005

A recent reflection 2015/16

E-Journal Archiving Metes and Bounds: A Survey of the Landscape

by Anne R. Kenney, Richard Entlich, Peter B. Hirtle, Nancy Y. McGovern, and Ellie L. Buckley


Building a Social Compact for Preserving E-Journals

ANNE R. KENNEY
Presenter

KATHRYN WESLEY
Recorder

A hot topic 10+ years ago in the USA & elsewhere too
Libraries boast of ‘e-collections’, but do they only have ‘e-connections’?

Caroline Brazier, British Library
Time to take stock …

1. What do we know?
   • Stating the Task at Hand
   • Stating the Achievements
   • Stating the Challenges

2. What is to be done?

3. What are the priorities for our attention and action?
Stating the Task in Hand

Our shared obligation is to ensure ease and continuing access to online resources needed for scholarship.

- **“ease”**
  - **usability**
  - **licence to use**
    - **Open**
  - **Restricted**

- **access to content & tools**

- **“continuing”**
  - **‘just in case’**
  - **long-term preservation**
Defining Stewardship for the Digital Scholarly Record

Our Scholarly Record has a fuzzy edge
Practical focus: what ISSN identifies as ‘continuing resource’ issued online

ISSN assigned to:
- Government publications ‘issued on web’
- ‘e-journals’
- Conference proceedings
- ‘e-theses’
- ‘data as findings’
- ‘book-length work’
- Updating websites, repositories, databases
- Trade magazines, etc.
- ‘e-newsmedia’

Continuing Resources = ‘SERIALS’ + ‘ONGOING INTEGRATING RESOURCES’

(issued in Parts) (changes over time)

‘The Scholarly Record ....’
Massive increase in e-serials over past 20 years
- measured by ISSNs for ‘online continuing resources’

<table>
<thead>
<tr>
<th>Country</th>
<th>ISSN</th>
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<td>NORWAY</td>
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<td>ARGENTINA</td>
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<td>SWITZERLAND</td>
<td>2,048</td>
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<td>INDONESIA</td>
<td>1,822</td>
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<td>HUNGARY</td>
<td>1,679</td>
</tr>
<tr>
<td>IRAN</td>
<td>1,327</td>
</tr>
</tbody>
</table>

72,337 in 2009
97,563 in 2011
132,806 in 2013
177,631 in 2015
187,445 in 2016

From the ISSN Register
Researchers (& libraries) in any one country depend on content written & published as serials in countries other than their own.

%age of 187,445 ISSN assigned to ‘e’ (1 Dec. 2016)
Stating the Achievements: What we know

1. Growing number of Keepers of archived serial content

① **CLOCKSS & Portico** - web-scale dependent upon earnings from publishers + funds from libraries

② ‘the nationals’ – with government-backed mission statements:
   - British Library
   - Cariniana Network/IBICT (Brazil)
   - KB/Netherlands (e-Depot)
   - Library of Congress
   - National Science Library, Chinese Ac of Sciences
   - Archaeology Data Service (UK)

③ ‘university-based cooperatives’ - self-funded operations:
   - LOCKSS Program [& Private LOCKSS Networks]
   - HathiTrust
   - Scholars Portal
   - Public Knowledge Project/ PLN [OJS]

Breaking News:
Swiss National Library
Not yet BnF, DnB, LAC ...

nor NLM, ...
Many archiving organisations a Good Thing 😊

“Digital information is best preserved by replicating it at multiple archives run by autonomous organizations”

B. Cooper and H. Garcia-Molina (2002)
2. We have means to search across those digital shelves

An established Global Monitor... to discover who is looking after what

Search

Input a search term (e.g. free text, or a title or ISSN(s))

Search

Show search examples

Glossary and definitions

The following organisations are the Keepers of digital content, working on your behalf to ensure long-term access to the scholarly and cultural record. They provide the registry with information on their archival holdings, ordered by most recent update (date of which is shown):

- HathiTrust (03 Dec 2016)
- PKP PLN (02 Dec 2016)
- Library of Congress (01 Dec 2016)
- Archaeology Data Service (24 Nov 2016)
- Global LOCKSS Network (23 Nov 2016)
- CLOCKSS Archive (22 Nov 2016)
- Cariniana Network (21 Nov 2016)
- Scholars Portal (07 Nov 2016)
- British Library (02 Nov 2016)
- Portico (01 Nov 2016)
- National Science Library, Chinese Academy of Sciences (07 Sep 2015)
- e-Depot (24 Apr 2012)

The most up-to-date information may be available on the Keeper’s website.

12 ‘keepers’ (+ Swiss National Library)

Funded by: THE UNIVERSITY of EDINBURGH

Developed & managed by: EDINA

INTERNATIONAL STANDARD SERIAL NUMBER INTERNATIONAL CENTRE
Search for *Origins of Life*

This e-journal is being archived by 5 archiving agencies ... 

... but coverage of volumes is partial & patchy
Registry as ‘Observatory’: providing evidence / data

The Keepers Registry
Supporting long-term access to journal content

Discover who is looking after your e-journals

Search

Input a search term (e.g. free text, or a title or ISSN(s))

Search

The following organisations are the Keepers of digital content, working on your behalf to ensure long-term access to the scholarly and cultural record. They provide the registry with information on their archival holdings, ordered by most recent update (date of which is shown):

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- Cariniana Network (21 Nov 2016)
- Scholars Portal (07 Nov 2016)
- British Library (02 Nov 2016)
- Portico (01 Nov 2016)
- National Science Library, Chinese Academy of Sciences (07 Sep 2015)

Working Together

Find out how publishers, research libraries and national libraries can support archiving initiatives to ensure the future of the digital scholarly record. Read more.

Current Statistics

- Serials with volumes reported as 'ingested and archived' by at least one Keeper: 33711
- Serials with volumes reported as 'ingested and archived' by three or more: 12644

Work on other serials (and volumes) is 'in progress'.

News and Events

- 11 Aug 2016: Ensuring the Future of the Digital Scholarly Record
- 19 Jul 2016: Supporting E-journal
How are we doing? : What do the data from the Keepers Registry tell us?

**Good News 3: # Titles known to be archived is increasing**

The Keepers Registry reports titles ‘ingested & archived’

<table>
<thead>
<tr>
<th></th>
<th>... at least 1</th>
<th>... 3 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 2013</td>
<td>22,196</td>
<td>8,618</td>
</tr>
<tr>
<td>Nov 2014</td>
<td>26,195</td>
<td>9,656</td>
</tr>
<tr>
<td>Dec 2015</td>
<td>29,663</td>
<td>10,710</td>
</tr>
<tr>
<td>Dec 2016</td>
<td>33,711</td>
<td>12,644</td>
</tr>
</tbody>
</table>

Kept Safer

Up by c.50% over past 3 years 😊

more archiving + more archives reporting into Registry!
Looking more closely with two simple Key Performance Indicators

‘Ingest Ratio’ = ingested by 1+ Keeper / total ‘online serials’ of interest

So ‘global’ estimate for
‘Published Heritage’
Titles archived, divided by
all ‘continuing resources’ in ISSN Register

33,711 / 187,445 => 18%

‘KeepSafe Ratio’ = ingested by 3+Keepers / total ‘online serials’ of interest

12,644 / 187,445 => 6.7%
Stating the challenges: focus on ‘scholarly e-journals’

** Amber Alert **

(a) Early evidence that much of a research library’s serials list is at risk

<table>
<thead>
<tr>
<th>University library</th>
<th>% 'Preserved' by 1 or more</th>
<th>% 'Preserved' by 3 or more</th>
<th>% Not known as 'Preserved'</th>
<th>Total having a valid ISSN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columbia</td>
<td>26</td>
<td>12</td>
<td>74</td>
<td>58,882</td>
</tr>
<tr>
<td>Cornell</td>
<td>28</td>
<td>13</td>
<td>72</td>
<td>54,698</td>
</tr>
<tr>
<td>Duke</td>
<td>22</td>
<td>10</td>
<td>78</td>
<td>61,682</td>
</tr>
</tbody>
</table>

*a* When checked against preservation activity of The British Library, CLOCKSS, e-Depot (Netherlands), Global LOCKSS Network, HathiTrust, National Science Library of China and Porto Rico, as reported into The Keepers Registry.

KPI1: ‘Ingest Ratio’ = 22% to 28% only a quarter

=> fate of c.75% unknown

(b) Indication that much of what Users request also at risk

Using usage logs of 4.1m requests via UK OpenURL Router

=> 51,426 online titles requested during 2015

‘Ingest Ratio’ = 41.7% \( (21,461/51,426) \)

‘KeepSafe Ratio’ = 23.6% \( (12,126/51,426) \)

=> Archiving Status of well over half (58%) of online titles requested by UK staff and students in 2015 is unknown & presumed at risk of loss
‘elite’ Journals for some disciplines at risk

From UK University submissions to Research Excellence Framework REF 2014

**Amber Alert**

Arts & Humanities are very much ‘at risk’

### STEM Journals well archived

<table>
<thead>
<tr>
<th>Unit of assessment name</th>
<th>Ingest ratio</th>
<th>KeepSafe Ratio</th>
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</thead>
<tbody>
<tr>
<td>Earth Systems and Environmental Sciences</td>
<td>92.6</td>
<td>74.2</td>
</tr>
<tr>
<td>Civil and Construction Engineering</td>
<td>91.8</td>
<td>74.2</td>
</tr>
<tr>
<td>Chemistry</td>
<td>91.6</td>
<td>73.8</td>
</tr>
<tr>
<td>Law</td>
<td>74.2</td>
<td>73.2</td>
</tr>
<tr>
<td>Classics</td>
<td>74.2</td>
<td>73.8</td>
</tr>
<tr>
<td>Agriculture, Veterinary and Food Science</td>
<td>74.2</td>
<td>73.2</td>
</tr>
<tr>
<td>Sociology</td>
<td>74.2</td>
<td>73.2</td>
</tr>
<tr>
<td>Economics and Econometrics</td>
<td>73.8</td>
<td>73.2</td>
</tr>
<tr>
<td>Earth Systems and Environmental Sciences</td>
<td>74.2</td>
<td>73.2</td>
</tr>
<tr>
<td>Theology and Religious Studies</td>
<td>43.5</td>
<td></td>
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<tr>
<td>History</td>
<td>41.1</td>
<td></td>
</tr>
<tr>
<td>Music, Drama, Dance and Performing Arts</td>
<td>39.1</td>
<td></td>
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<tr>
<td>Modern Languages and Linguistics</td>
<td>38.3</td>
<td></td>
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<tr>
<td>English Language and Literature</td>
<td>39.1</td>
<td></td>
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<tr>
<td>Law</td>
<td>37.2</td>
<td></td>
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<tr>
<td>Classics</td>
<td>17.6</td>
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<tr>
<td>ISSN Count</td>
<td>** Amber Alert **</td>
<td>Ingest Ratio %</td>
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<tr>
<td>------------</td>
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<tr>
<td>187,445</td>
<td>Globally</td>
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<tr>
<td>5295</td>
<td>Elsevier</td>
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<td>1109</td>
<td>Hindawi</td>
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<td>16624</td>
<td>T&amp;F, CUP, OUP, etc</td>
<td>43.5</td>
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<td>33848</td>
<td>Wiley etc</td>
<td>32.9</td>
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<td>8167</td>
<td>Springer</td>
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<td>2048</td>
<td>Karger</td>
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<td>902</td>
<td>Austria</td>
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<td>731</td>
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<td>8054</td>
<td>Brazil</td>
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<td>2895</td>
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<td>6034</td>
<td>India</td>
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*very low KeepSafe Ratios*
### CLOCKSS/Portico do Big Publishers but so do Research Library Co-ops! 2015 data

<table>
<thead>
<tr>
<th>Country</th>
<th>ISSN Count</th>
<th>Ingest Ratio %</th>
<th>CLOCKSS or Portico %</th>
<th>National Institution %</th>
<th>Research Library Coops %</th>
<th>KeepSafe Ratio %</th>
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<tbody>
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<td>54</td>
<td>54</td>
<td><strong>49</strong></td>
<td>1729</td>
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<tr>
<td>Egypt Hindawi</td>
<td>1092</td>
<td>60</td>
<td>59</td>
<td>3</td>
<td>23</td>
<td>4</td>
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<tr>
<td>UK T&amp;F, CUP, OUP, etc</td>
<td>4569</td>
<td>45</td>
<td><strong>34</strong></td>
<td>15</td>
<td>34</td>
<td>20</td>
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<td>USA Wiley etc</td>
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<td>34</td>
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<td>Germany Springer Karger</td>
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<td>4</td>
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<td>10</td>
<td>6</td>
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<td>01</td>
<td>911</td>
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<td>8</td>
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<td>1</td>
<td>2457</td>
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<td>0.2</td>
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<td>1929</td>
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<td>2</td>
<td>2</td>
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<td>4</td>
<td>1002</td>
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<td>4</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>2050</td>
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<td>1</td>
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<td>1</td>
<td>5</td>
<td>1</td>
<td>4846</td>
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</table>
very many ‘at risk’ e-journals from the ‘65% of publishers’; the hardest to reach & work with

** Amber Alert **

BIG publishers act early but incompletely

The “Long Tail”
Time to link arms & focus …

1. What do we know? Some Good News but … **Amber Alerts**

2. What is to be done?

   ‘Stewardship of the Digital Scholarly Record & of Each Nation’s Published Heritage’

   • For our Scholarly Record, that our scholarship produces
   • As part of all Published Heritage, that our scholarship needs

   ① The role of the ‘nationals’ & Legal Deposit
   ② The role of the ‘research library co-ops’
       » Canada as ‘case study’
   ③ How to ensure Open Access means Assured Access
The role of Nationals: value of Legal Deposit for [Digital] Published Heritage

Comprehensive nature of legal deposit lends itself to the acquisition and preservation of the published heritage of a nation

- Covers all types of publishers: Scholarly, Trade, Personal, etc.
  - Reflected in the scope of acquisition for print
  - Reflected in the scope of acquisition for digital

- Gives recognition to the value of publications outside the scholarly record
Caveats on Legal Deposit for [Digital] Published Heritage

Natural tendency to gather the low-hanging fruit – which generally means collecting from the large scholarly publishers

<table>
<thead>
<tr>
<th>Title</th>
<th>ISSN</th>
<th>Product Type</th>
<th>Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordic Tax Journal</td>
<td>2246-1809</td>
<td>Journals/Yearbooks</td>
<td>Online</td>
</tr>
<tr>
<td>European Polygraph</td>
<td>1898-6238</td>
<td>Journals/Yearbooks</td>
<td>Online</td>
</tr>
<tr>
<td>Financial Law Review</td>
<td>2299-6834</td>
<td>Journals/Yearbooks</td>
<td>Online</td>
</tr>
<tr>
<td>Wroclaw Review of Law, Administration &amp; Economics</td>
<td>2084-1284</td>
<td>Journals/Yearbooks</td>
<td>Online</td>
</tr>
</tbody>
</table>

NB: Legal Deposit has scope that extends to foreign material distributed in that country
Challenges to Legal Deposit for [Digital] Published Heritage

Legal
• Macro: Laws vary nation by nation
• Micro: High-profile, delicate negotiation in each instance

Technical
• Let a thousand flowers bloom
  – Large number of individual publishers
• Libraries have a lot of flower picking to do
  – Less technical aptitude/resources on the part of small publishers
Impact of Legal Deposit on [Digital] Published Heritage

Difficult to tell the impact – current or potential

• Not all National Libraries have digital Legal Deposit
  – Even when they do, it is often a slow business to build up
• Few are Keepers, who recognize benefit of sharing knowledge openly

There is real value in Legal Deposit, as shown in its use in collecting print and, increasingly, electronic works

Legal Deposit is an important tool for preservation of digital published heritage – but it is not the entire toolbox
The Role of the Research Library Cooperatives

A Case Study of a ‘regional library coop’: Preservation of the Scholarly Record in Canada via Scholars Portal

Carleton
Ottawa
Queen’s
RMC
UOIT
Ryerson
Toronto
OCADU
Brock
McMaster

Nipissing
Laurentian
Algoma
Lakehead
Trent
York
Guelph
Waterloo
Wilfrid Laurier
Western
Windsor

OCUL
Local Loading & Preservation

A. OCUL Model License: Local Load & Preservation Agreement
   • Legal framework for preservation defined in subscription licenses
   Three rights:
   1. To load content locally and serve it to authorized users
   2. To continue to serve content after subscription period expires
   3. To be able to transform that content to support long-term use

B. Scholars Portal: a TDR [Audited by CRL, certified in 2012]
   • Library-based governance
   • Preserve what our members collect
   • Open or bright archive model
   • Seamless post-cancellation access

journals.scholarsportal.info
- STEM focus
- Big publishers / big deals
- High cost journals
- Reasonable coverage
- Challenges
  - Negotiating rights
  - Quality assurance
  - Scaling

- Arts and Humanities focus
  - Low cost but high value
  - Important regional differences
  - Small number of journals
  - Large number of publishers
  - High rate of cessation

- Switch to all electronic publishing
- Failure of depository programs
- Focus on current publications

- Strong support for OA publishing (PKP & Érudit)
- Low cost barrier to publication
- Many new journals
  - Focus on publication rather than preservation
STEM versus SSH

• Heavy emphasis in Canadian scholarly publishing upon Social Sciences and Humanities (SSH) + ‘applied/practitioner’ literature

• STEM scholars [in Canada, as elsewhere] work within context of larger North American & International scholarly societies
  • Journals in STEM rarely get established or succeed in Canada

• Language duality means a strong and independent publishing culture in Quebec
  • French is one of two official languages
Diversity & Fragility

- Many players involved
  - Scholarly Societies; University Presses; Research Councils
  - A small number of commercial publishers
- Highly dependent on support from granting agencies
  - e.g. SSHRC Aid to Journals Program

- Many more smaller journals
  - A few large journals,

- A high rate of cessation
What can we learn from this case study?

Although scholarly publishing has a strong international element, things will be different from nation to nation, and so understanding preservation issues requires a focus on the local as well as the international
### How to ensure Open Access means Assured Access

**ROAD, Directory of Open Access scholarly Resources**

- **Amber Alert**

<table>
<thead>
<tr>
<th>ISSN is assigned to resources:</th>
<th>total</th>
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<td>12.3</td>
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<td>2.9</td>
<td>1.7</td>
<td>0.5</td>
<td>1.3</td>
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</table>

| ‘Scholarly OA titles’ N=      | 16965 | 13152 | 2086 | 629 | 498 | 281 | 90  | 224 | 5   |

⇒ Known Archiving Status of $\frac{3}{4}$ of OA resources is presumed at risk of loss

http://road.issn.org/
How to ensure Open Access means Assured Access

• Strong library culture supporting Open Access
  • in Canada & elsewhere

• Library publishing support services becoming common

• Role of DOAJ
  • Seal of Approval: ISSN; deposit with a Keeper

• Role of PKP
  • OJS used by over 8,600 journals world-wide
  • Potential for direct archiving
Good News: Need to ensure OA is Assured Access

** DOAJ Requirements **

1. Web-scale not-for-profit archiving agencies:
   - CLOCKSS
   - PORTICO
   - PKP

2. National institutions …
   - Library of Congress
   - British Library
   - Koninklijke Bibliotheek
   - National Science Library, Chinese Academy of Sciences

3. Research libraries: consortia & specialist centres …
   - LOCKSS
   - Scholars Portal
   - HathiTrust
   - Rede Cariniana
Building a Social Compact for Preserving E-Journals

ANNE R. KENNEY
Presenter

KATHRYN WESLEY
Recorder

Conclusions

✓ All of the scholarly record must be preserved
✓ Coverage is uneven and insufficiently documented
✓ Much content is at risk
✓ No party can do this alone
✓ Preservation will require a social compact of all parties
✓ Viable preservation options are available and need support
✓ Programs need greater transparency and coordination
✓ Access should be reassessed
✓ Standard means for recording access rights for preserved titles
✓ Legislation needed to cover legal deposit
✓ License terms inadequate
✓ Moving wall vs trigger

“that really great thing called the Keepers Registry.”
Statement from The Keepers Network

**Working Together to Ensure the Future of the Digital Scholarly Record**

This outlines the actions now required to tackle the evolving challenges of preserving and ensuring the long term accessibility of digital scholarship.

Addressing publishers, research libraries and national libraries, the statement sets out a series of recommended activities that they can undertake to support archiving and preservation initiatives.

[http://thekeepers.blogs.edina.ac.uk/keepers-extra/ensuringthefuture/](http://thekeepers.blogs.edina.ac.uk/keepers-extra/ensuringthefuture/)
1. Endorsements for the Keepers Statement

- Europe: King’s College London, UK
- Australasia: Pacific and Regional Archive for Digital Sources in Endangered Cultures (PARADISEC)
- Canada: Council of Prairie & Pacific University Libraries (COPPUL)
- USA: The Ivy Plus Libraries Collections Group.
- South America: Rede Cariniana Network (IBICT), Brazil

2. Looking to engagement with & support from:

a) International Alliance of Research Library Associations
   IARLA: ARL + CARL + LIBER + RLUK + AUL

b) IFLA / Conference of Directors of National Libraries (CDNL)
Recommendations from The Keepers Network

At the national level:

For National Libraries (＆ National Institutions)

1. Provide leadership in setting preservation priorities for your country’s serial publications
   • Work with university-based research libraries & their associations

2. Use national collecting mandate to ensure the preservation of content produced by small, local and regional publishers
   • These are at significantly greater risk of loss

3. Forge partnerships with other archiving agencies
   • Explore ways of working together to maximise coverage and find economies of effort.

4. Promote awareness & understanding of importance of archiving to stakeholder groups within your country.
   • Advocate dedicated resources & support from government / funders.
Recommendations from The Keepers Network

At the local level:

For Research libraries

1. Actively support at least one archiving organisation
   • preferably more than one Keeper

2. Designate responsibility for long-term access to e-journals
   • library staff can then be active in the Keepers community

3. List your priority titles & make these known to the Keepers

4. Make long-term access issues part of the licensing process
   • ask publishers for a digital preservation plan
   • explain why archiving is important to libraries in your region/subject

5. Increase awareness & understanding of the issues with your faculty staff and senior management.
No Time Like the Present - To Take Action

1. What do we know?
2. What is to be done?

3. What are the priorities for our attention and action?
   • Time for some contribution from the floor?
   • Can we set ourselves some strategic objectives, targets and agree upon some division of labour/labor?
   • Support Web Archiving initiatives
     – e.g. to preserve gov’t publications
What Can NASIG Do?

- Raise awareness of the issue
- Endorse power of collective action
- Consider set of principles *and* actions
- Foment international cooperation
- Identify other parties, e.g., role for funding bodies in research, development and requirements
Targets: By next CNI Fall Meeting …

• More of the ‘long tail’ will have been archived
  – 20+ academic libraries have provided the Keepers with priority titles of e-publications
  – Each Keeper will have acquired content from 20+ journals published by small publishers

• Significant increase in the KeepSafe Ratio
  – A ‘Keepers Badge’ awarded to publishers who invest their content with at least three Keepers

• Increase support of Keepers & Keepers Registry
  – Double the number of research libraries active in one or more archiving service
Proposition that underpins Keepers Registry

1. Assign an identifier at the ‘point of issue’ for a stream of digital content
2. Ensure that content is archived routinely and, preferably, have others/peers do that for you too
3. Say what you are doing (\& how) and what you hold
4. Publish the terms of access for the archived content (now and when triggered as orphaned).

http://thekeepers.org
@keepersregistry
http://thekeepers.blogs.edina.ac.uk/
### Members Area: Title List Comparison [Try this yourself]

<table>
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<tr>
<th></th>
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</table>

1. Upload a file of **ISSN** + any extra as CSV file

2. Download file with **ISSN-L** + Number of Agencies + Archiving Agencies + link to KR record
About the Keepers Extra Statistics tool

Here we provide links to the data and statistics that are being generated and making available as open data. We welcome feedback and offers of finance.

This data is geared for use by the world’s scholarly community and by all those making evidence-based help decision making. Our goal is to provide data that is provoking actions that ensure that in a world of interdependence each can:

Among the key statistics of interest are the count of titles (identified by ISSN), at least one archiving agency – a 'keeper' - and of titles being kept safe by the number of ISSN assigned to continuing resources (both those issued in a
country of ISSN assignment). The latter provides information is best preserved by replicating it at multiple archives run by
garcia-molina (2002)).

This tool is an output of the Jisc-supported Keepers project.

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<th>3+</th>
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