metajelo: A metadata package for journals to support external linked objects

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Reproducibility and replicability of scientific findings has been given great scrutiny in recent years (Camerer et al. 2016; Collaboration 2015; Fanelli 2018; Klein et al. 2014).

Historically, it has been difficult to find the materials required to conduct reproducibility or replication exercises (Dewald, Thursby, and Anderson 1986; McCullough, McGeary, and Harrison 2006; McCullough and Vinod 2003).
Journals are supporting the endeavor with “Data [and Code] Availability Policies” [DAP] with variable success rates (Höfler 2017a; Stodden, Guo, and Ma 2013; Stodden, Seiler, and Ma 2018; Stodden et al. 2016).

Not a panacea

Despite DAPs, researchers often find that studies do not reproduce (Chang and Li 2017, 2015; Höfler 2017b; Stodden, Seiler, and Ma 2018).
Replication rates

Our own study

Moderate replication success

- 25% total success rate
- 33% confidential data
- 43% successful conditional on available data
- 42% partial conditional on available data

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Restricted-access Data

Confidential Government Data

- U.S. Census Bureau
- Statistisk sentralbyrå (Statistics Norway)
- many others

Confidential sub-national data

Just in the US:

- North Carolina Education Data
- Ohio Earnings and Education Statistics
- Oregon Health Data
- etc.
Requirements for Reproducibility

What do we need?

- Description of the analysis (possibly as code)
- Access to the data
Is restricted-access data compatible with reproducibility?

Answer: yes

- Theoretical access to confidential data:
  - More than 1000 users (not just Germans from Germany) have been granted access to German confidential labor market data (Müller and Möller 2019)
  - More than 1500 users currently have access to confidential French data (https://casd.edu)
  - More than 700 researchers were active at the end of 2017 in the US Federal Statistical Research Data Centers (U.S. Census Bureau, 2018)
Is restricted-access data compatible with reproducibility?

Answer: yes

- Replications actually do occur with restricted-access data
  For instance, see exchange between Olivier (2016) and Chemin and Wasmer (2017) regarding Chemin and Wasmer (2009), using French (Réseau Quetelet) data
Access Conditions

Is access easy?
▶ No

Is access fast?
▶ No

Can others access the data?
▶ Yes!

Is there a process for granting access?
▶ Yes!
No data, OK - surely we have metadata on all those things?
No.
There is a pervasive lack of consistent, reliable metadata on the materials provided to journals, and in particular those provided through third-party locations.
Early Childhood Education by Television: Lessons from Sesame Street

Melissa S. Kearney
Phillip B. Levine

AMERICAN ECONOMIC JOURNAL: APPLIED ECONOMICS
VOL. 11, NO. 1, JANUARY 2019
(pp. 318-50)

Download Full Text PDF (Complimentary)
Example 1: AEA journal

Additional Materials

Data Set (565.50 MB)

Author Disclosure Statement(s) (88.84 KB)

JEL Classification
<ul id='additionalMaterials'>
  <li>
    <a href="/doi/10.1257/app.20170300.data">Data Set (565.50 MB)</a>
  </li>
</ul>
Example 1: AEA journal

AEJ: Applied Economics

- **Supplementary data** as ZIP file
- **Accessibility method**: download (obvious)
- **Accessibility conditions** or **license**: none stated (but in fact, Copyright with “all rights reserved”!)
- **Persistence**: assumed to be “permanent” because on journal website
Example 2: Nature journal

War increases religiosity

Joseph Henrich, Michal Bauer, Alessandra Cassar, Julie Chytilová & Benjamin Grant Purzycki

Nature Human Behaviour (2019)  

Abstract

Does the experience of war increase people’s religiosity? Much evidence supports the idea that particular religious beliefs and ritual
Example 2: Nature journal

War increases religiosity

Code availability

All code files for a complete reproduction of the analyses herein are available at: https://github.com/bgpurzycki/Religion-and-Violence.

Data availability

All data and analytical scripts are available at:
https://github.com/bgpurzycki/Religion-and-Violence.
<section aria-labelledby="data-availability">
  <div class="..." id="data-availability-section">
    <h2 class="..." id="data-availability">Data availability</h2>
    <div class="..." id="data-availability-content">
      <p>All data and analytical scripts are available at:
        <a href="https://github.com/bgpurzycki/Religion-and-Violence"
            >https://github.com/bgpurzycki/Religion-and-Viole</a>
      </p>
    </div>
  </div>
</section>
Example 2: Nature journal

Nature Human Behavior

- **Supplementary data** as (manually!) linked Github archive
- **Accessibility method**: unknown, but download presumed
- **Accessibility conditions or license**: none stated on journal website, and in fact, none stated on Github site. Therefore: *Copyright with “all rights reserved”!*
- **Persistence**: none stated, but use of Github is troublesome, as deletion is nearly instantaneous (at whim of author) and permanent
For *easily* accessible data

- Unstructured
- Opaque
- Leads to imperfect, unreliable, failing replications
Current Metadata is Problematic

For **difficult to access** data

- Highly unstructured (*prose*) or inexistant
- Opaque
- Leads to imperfect, unreliable, failing replications
Mission of journals: Better transparency
**metajelo**

**metadata (package) for journals** to support external linked objects
Publication-oriented
Provide journals with the metadata needed to assess the robustness and reliability of supporting materials.

Minimal information
Requests no more information than (in theory) is currently being requested from authors.

- Name
- Location
- Accessibility (conditions, license)
- Persistence
Extensive re-use
Leverage existing metadata *schemas* and *infrastructure* as much as possible

- Re-use of *DataCite* and *re3data* metadata elements
- Overlapping elements map into Dublin Core, CrossRef, DDI
Each package is a linkage record

▶ conceptually models a linkage between a publication and its supplementary materials

▶ A record has an **identity** (Digital Object Identifier (DOI)), a **date created**, a **last modified date**, and the **identity** (DOI) of the **research objects** (papers) that are associated with the supplementary products

▶ Then an unlimited number of **supplementary products**
Structure of metajelo

Each supplementaryProducts has

- an identifier,
- a description of its type,
- linkages to full metadata available elsewhere that fully describes the product.
- an associated location block (institutional archive)
- the set of possible policies (access, license, preservation), with a boolean designation flagging the relevant policy for the particular object
- Each policy instance structured to allow for verbatim answers if necessary
Full annotated schema
github.com/labordynamicsinstitute/metajelo
About that *infrastructure* . . .
Shortcoming of existing metadata

Why not directly collect the information from *infrastructure*
Much information lacking from current infrastructure

Paper goes into detail about the **failures of the current infrastructure** to provide information even when the objects are registered by knowledgeable institutions, and despite the ability to do so **within existing metadata schemas**.
How to generate a \texttt{metajelo} package?

Enable authors
Develop an application to allow users to generate a \texttt{metajelo} package
  ▶ Leveraging infrastructure where possible
  ▶ Querying the user where necessary

Portability
Once created, a \texttt{metajelo} package should be of use at multiple journals: saved locally
Encourage data providers

All information can be provided by data providers in a static format

▶ Generate once, deposit on website
▶ (optional) leverage to display suggested data citations
This is where YOU come in
Mapping DDI to metajelo

| metajelo 0.7 | DDI 2.5 |
|--------------|----------|
| /codeBook/docDscr[1]/citation[1]/resourceMetadataSource[1] @relationType=“HasMetadata” |

All metajelo under /record/supplementaryProducts[1]/supplementaryProduct[1]/
## Mapping DDI to metajelo: basicMetadata

| metajelo 0.7 | DDI 2.5 |
|--------------|---------|
| basicMetadata[1]/Title[1] | titlStmt[1]/titl[1] |
| basicMetadata[1]/Creator[1] | prodStmt[1]/producer[1] |
| basicMetadata[1]/PublicationYear[1] | distStmt[1]/distDate[1] |
| location[1]/institutionName[1] | rspStmt[1]/AuthEnty[1..n] |

All metajelo under /record/supplementaryProducts[1]/supplementaryProduct[1]/
### Mapping DDI to metajelo: Institution and product

| metajelo 0.7 | DDI 2.5 |
|--------------|---------|
| `/codeBook/stdyDscr[1]/dataAccs[1]/institutionPolicies/institutionPolicy[1..n]` @policyType="Access" | `useStmt/confDec` `useStmt/restrctn` `useStmt/specPerm` `useStmt/conditions` |

All metajelo under `/record/supplementaryProducts[1]/supplementaryProduct[1]/location[1]/`
### Mapping DDI to metajelo: Institution and product

| metajelo 0.7                                                                 | DDI 2.5                                                                 |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| institutionPolicies/institutionPolicy[1..n] @policyType="Usage"               | /codeBook/stdyDscr[1]/dataAccs[1]/useStmt/restrctn                      |
| institutionContact@institutionContactType="dataCustodian"                    | useStmt/specPerm                                                        |
|                                                                                 | useStmt/conditions                                                       |
|                                                                                 | useStmt/deposReq                                                         |
|                                                                                 | useStmt/contact                                                          |

All metajelo under /record/supplementaryProducts[1]/supplementaryProduct[1]/ location[1]/
Mapping DDI to metajelo: Missing?

| metajelo 0.7 | DDI 2.5 |
|-------------|---------|
| institutionPolicies/institutionPolicy[1..n] @policyType="Preservation" | ?? |
| institutionSustainability/missionStatementURL | ?? |

All metajelo under /record/supplementaryProducts[1]/supplementaryProduct[1]/ location[1]/
Enable journals

The information should be leverable with minimal modifications to current journal infrastructure

- Simplest: attach `metajelo` package, leverage CSS and JS to display contents
- More robust: ingest in journal management system

Short-term implementation can be made, without preventing future robust implementation
Sketch of a user-facing app

metajelo user app

I want to enter manually

Manual entry

Entered DOI

Paste Bib

Initial page

Enter DOI

or

Paste citation

Choose which most closely matches

Access Cond.

Access URL

Access Cond. Verb

License URL

License Freeform

Look Ahead - MetaJelo DB
- [User Policies]
- License DB

Parse URL (Scheme, etc.)

Persistency

Suggestion:

Need: Every CC license may have a click-through acknowledging "Download" vs. "Download w/ click: "Application Process"

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https://www.evernote.com/Home.action#n=42f5ae07-d278-4949-9ff5-f7a1c0142be6&s=s415&ses=1&sh=5&sds=5&x=metajelo&
Sketch of a website

Supplementary materials

- Code and Data

  Besley, Timothy, and Hannes Mueller. 2018. "Replication data for: Predation, Protection, and Productivity: A Firm-Level Perspective." American Economic Journal: Macroeconomics, 10 (2): 184-221. DOI: 10.1257/mac.20160120.data

  cite!

  - Data is freely accessible at 10.1257/mac.20160120.data under CC BY-NC 4.0.
  - Code verified under AEA guidelines 2.0

- Data

  Statistics Norway. 2015. "Firm-level statistics 1975-2013 [dataset]" Norwegian Data Archive [curator], v2. DOI: 10.7654/nda::7643A::34

  cite!

  - Data restricted-access (has residency requirement, has citizenship requirement), accessible at Norwegian Data Archive in Oslo, Norway, under Norwegian Data Access license.
  - Code could not be verified due to access restrictions.
Sketch of a website

- Code and Data
  
  Besley, Timothy, and Hannes Mueller. 2018. "Replication data for: Predation, Protection, and Perspective." American Economic Journal: Macroeconomics, 10 (2): 184-221. DOI: 10.1257/maco.102.2.184
  
  - Data is freely accessible at 10.1257/maco.20160120.data under CC BY-NC 4.0.
Next steps

We want to hear from a broad community
Carl Lagoze and Lars Vilhuber. 2019. *metajelo: A metadata package for journals to support external linked objects.* Document 52. Labor Dynamics Institute.
http://digitalcommons.ilr.cornell.edu/ldi/52/

Development of apps
We have started development of both user-facing apps and journal-oriented toolkit, see
github.com/labordynamicsinstitute/metajelo

Implementation
This is part of a broader strategy to improve transparency and reproducibility at the American Economic Association and in economics in general
Merci
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