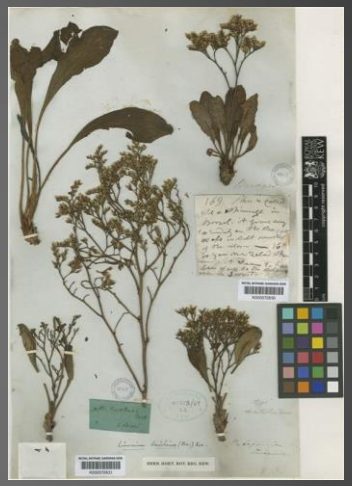
Using Complementarity to Improve Plant Specimen Digitization

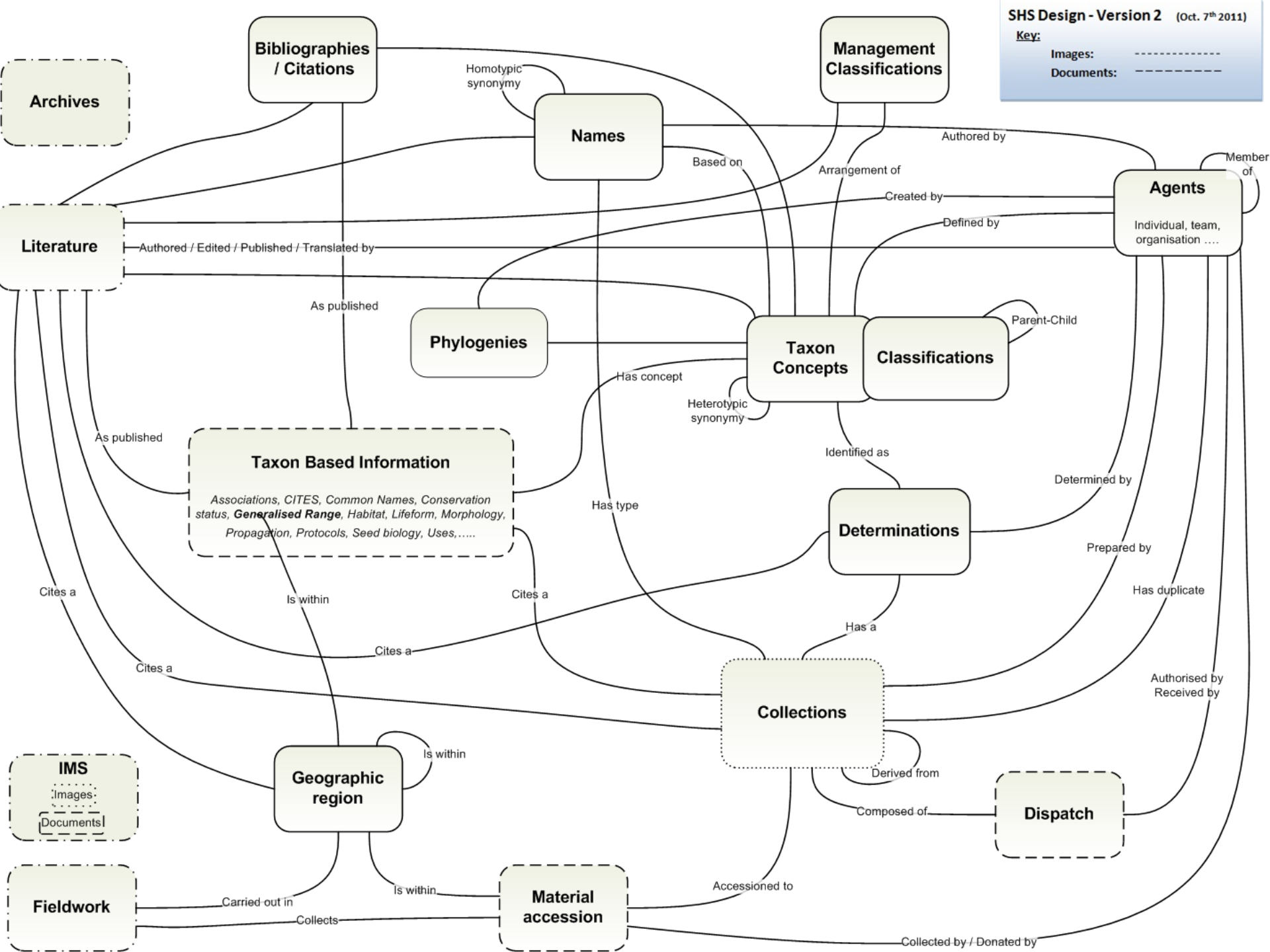
Elspeth Haston
Royal Botanic Gardens-Edinburgh

Rusty Russell
Smithsonian Institution



Nicola Nicolson
Royal Botanic Gardens-Kew

SPNHC 2014
Cardiff, Wales, U.K.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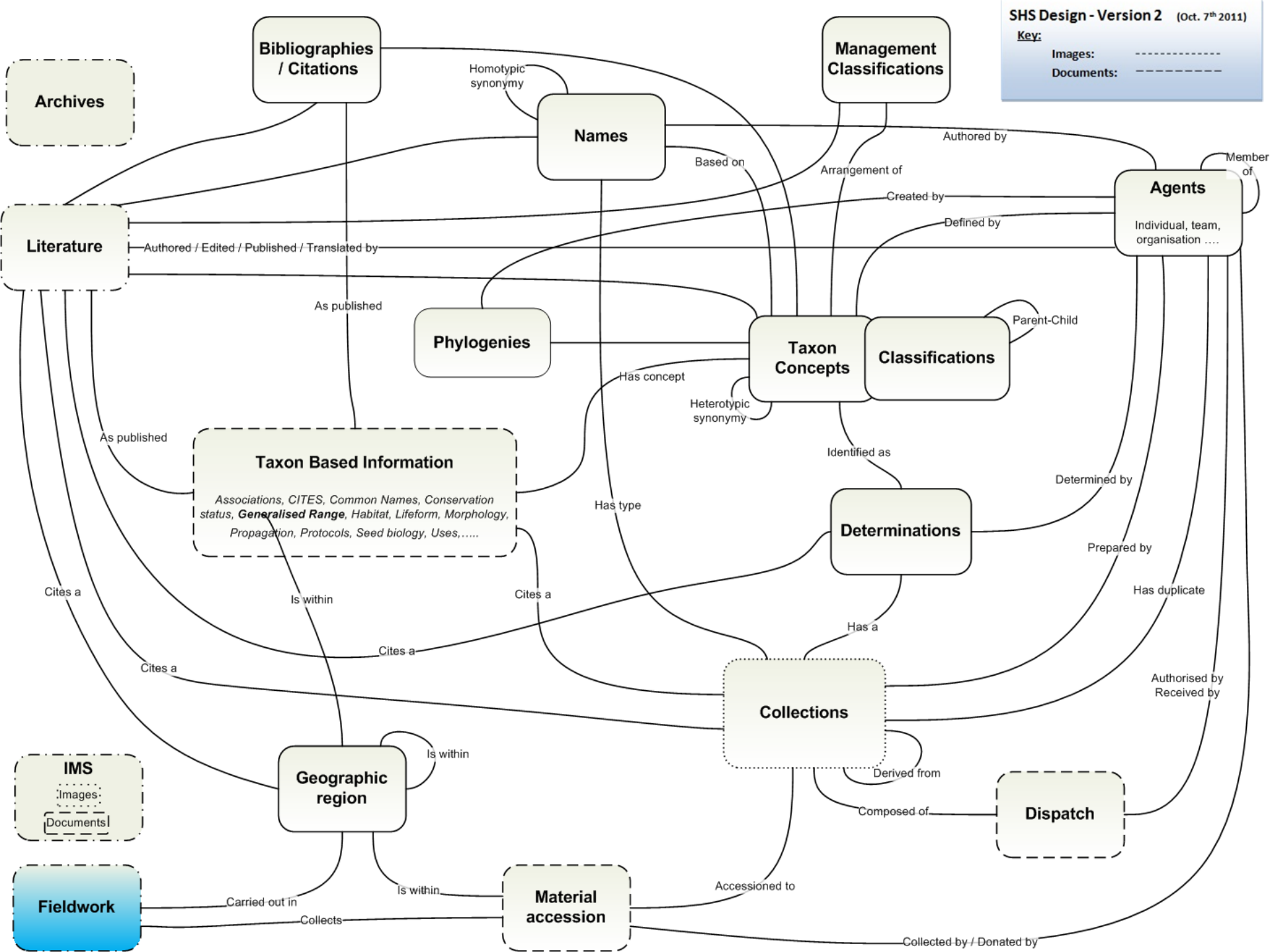
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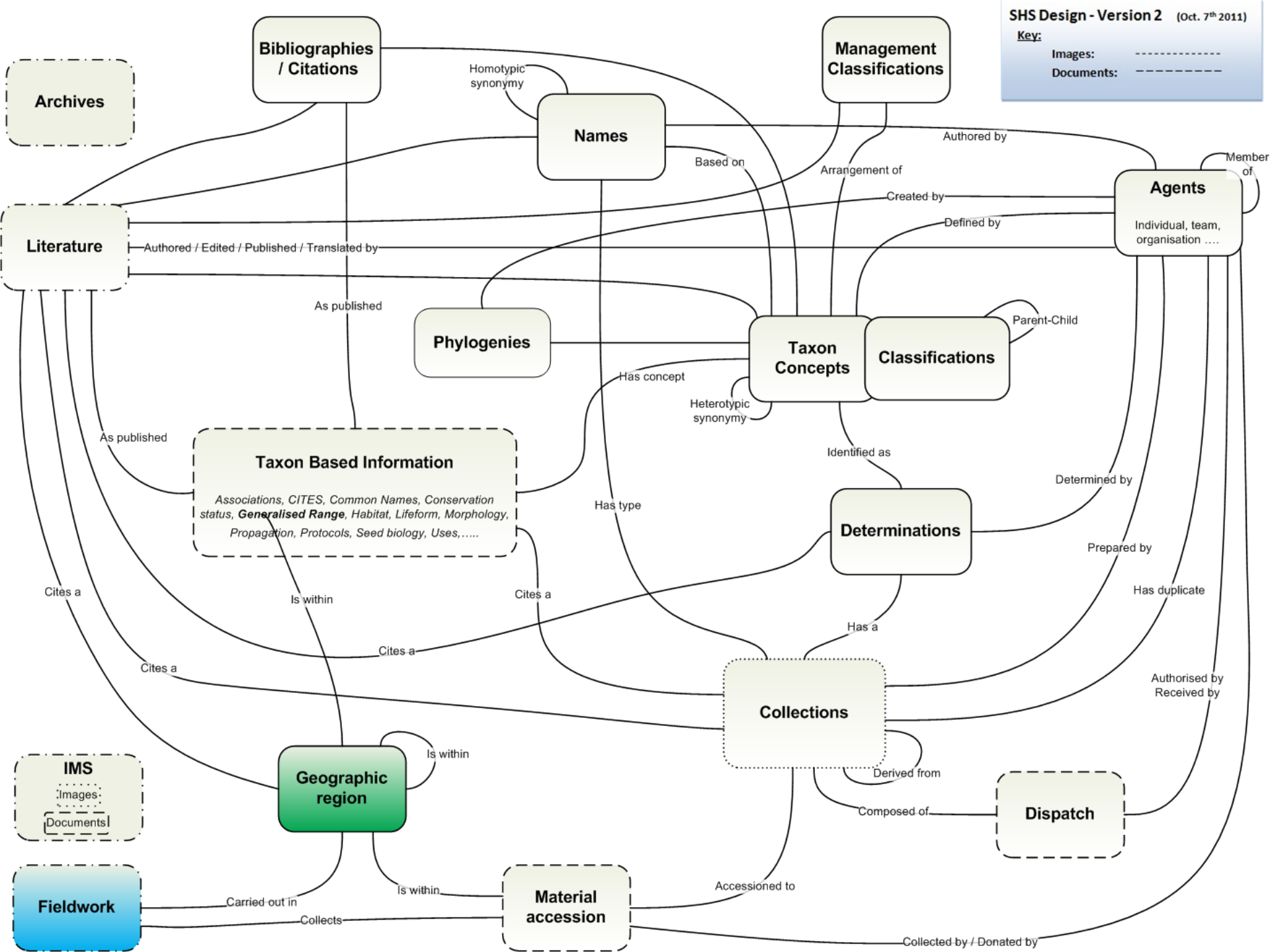
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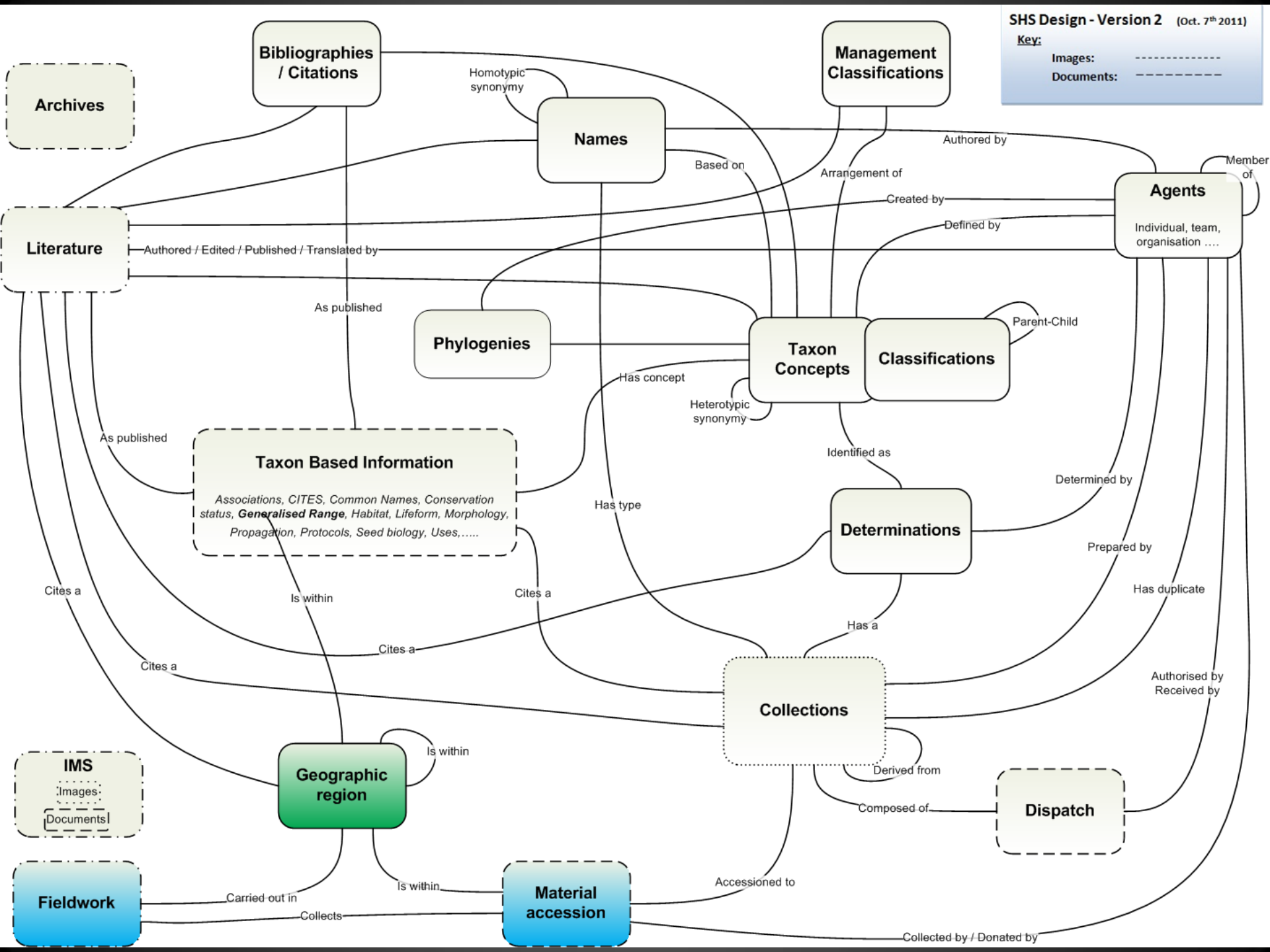
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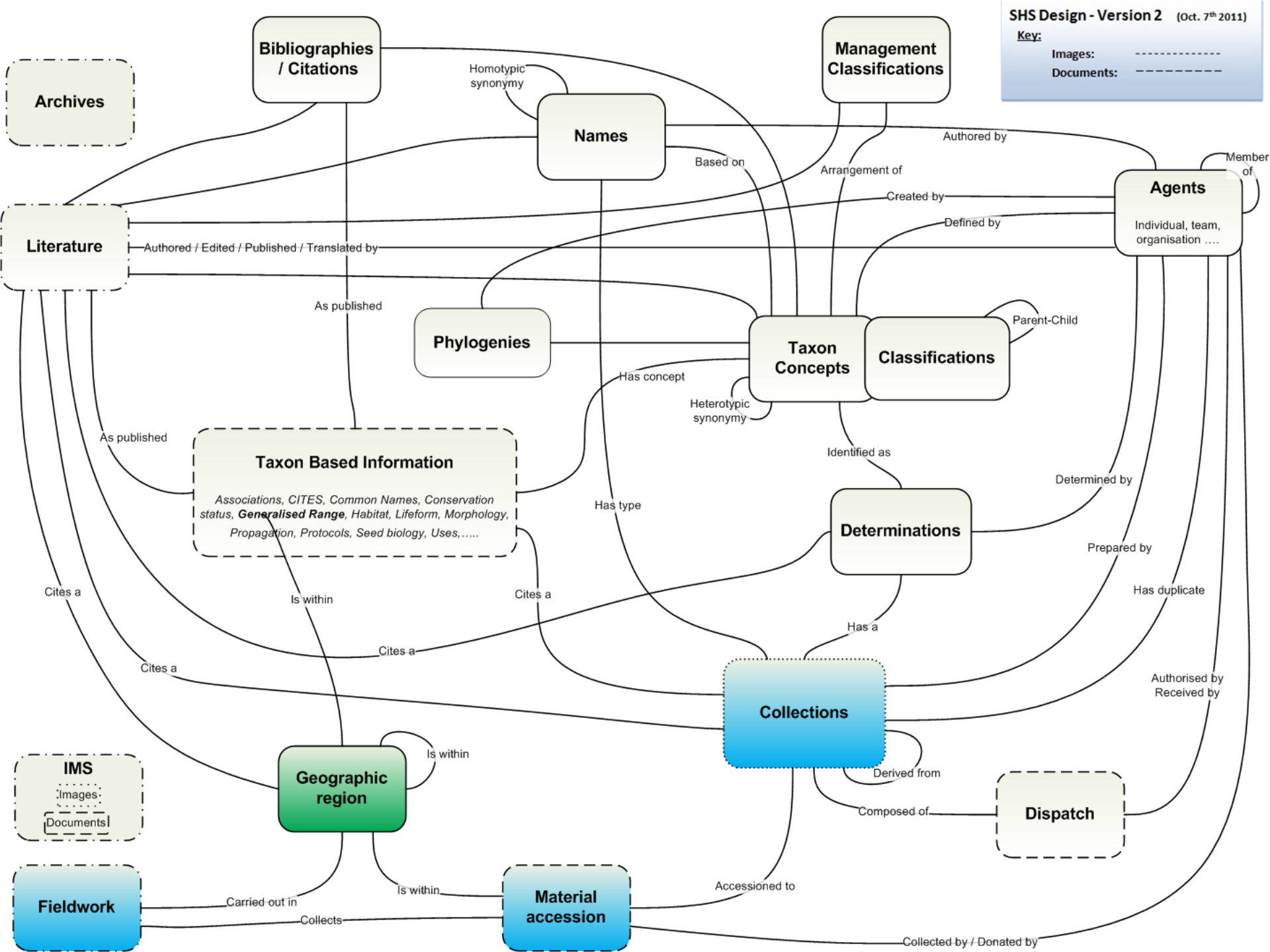
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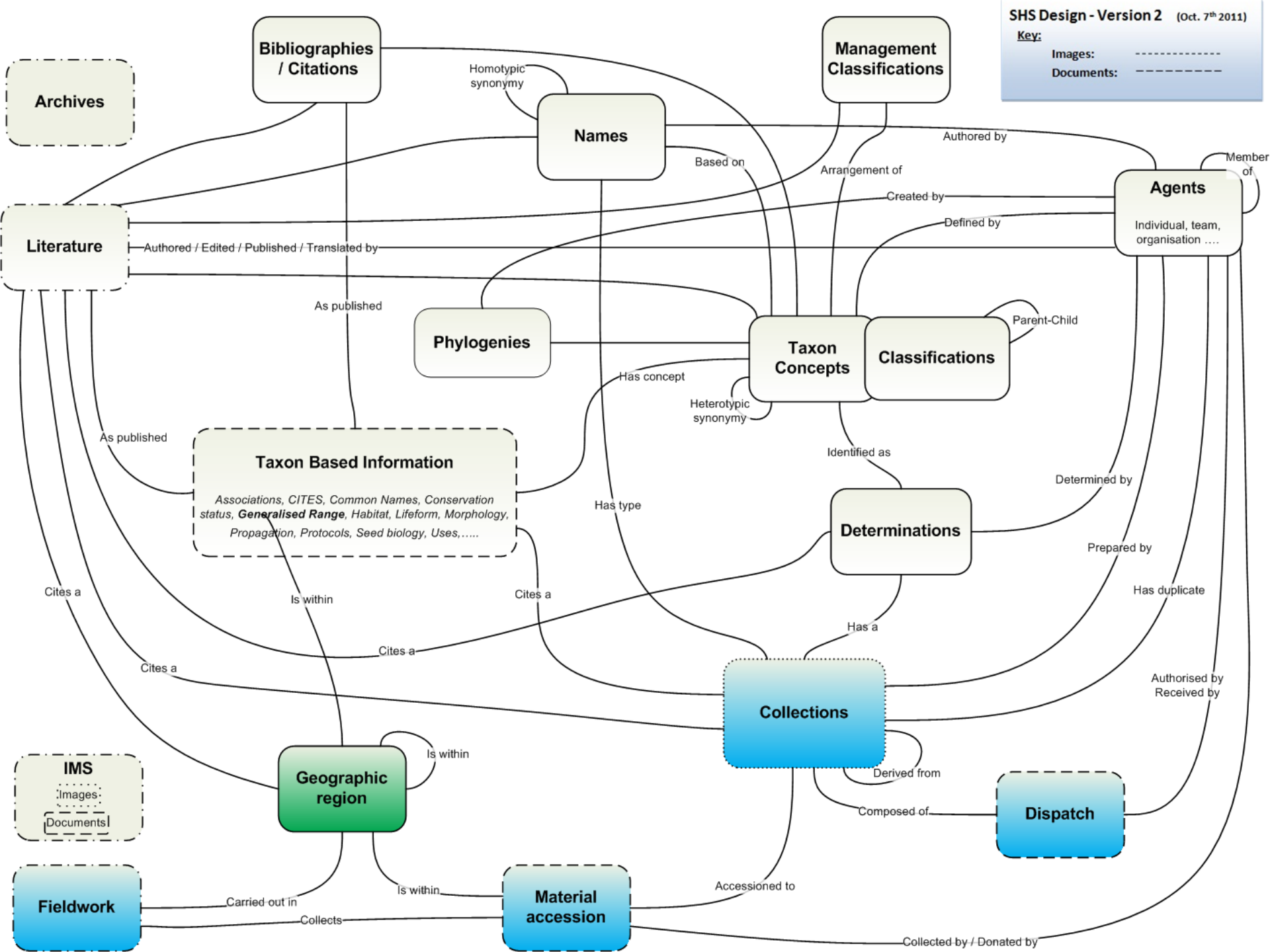
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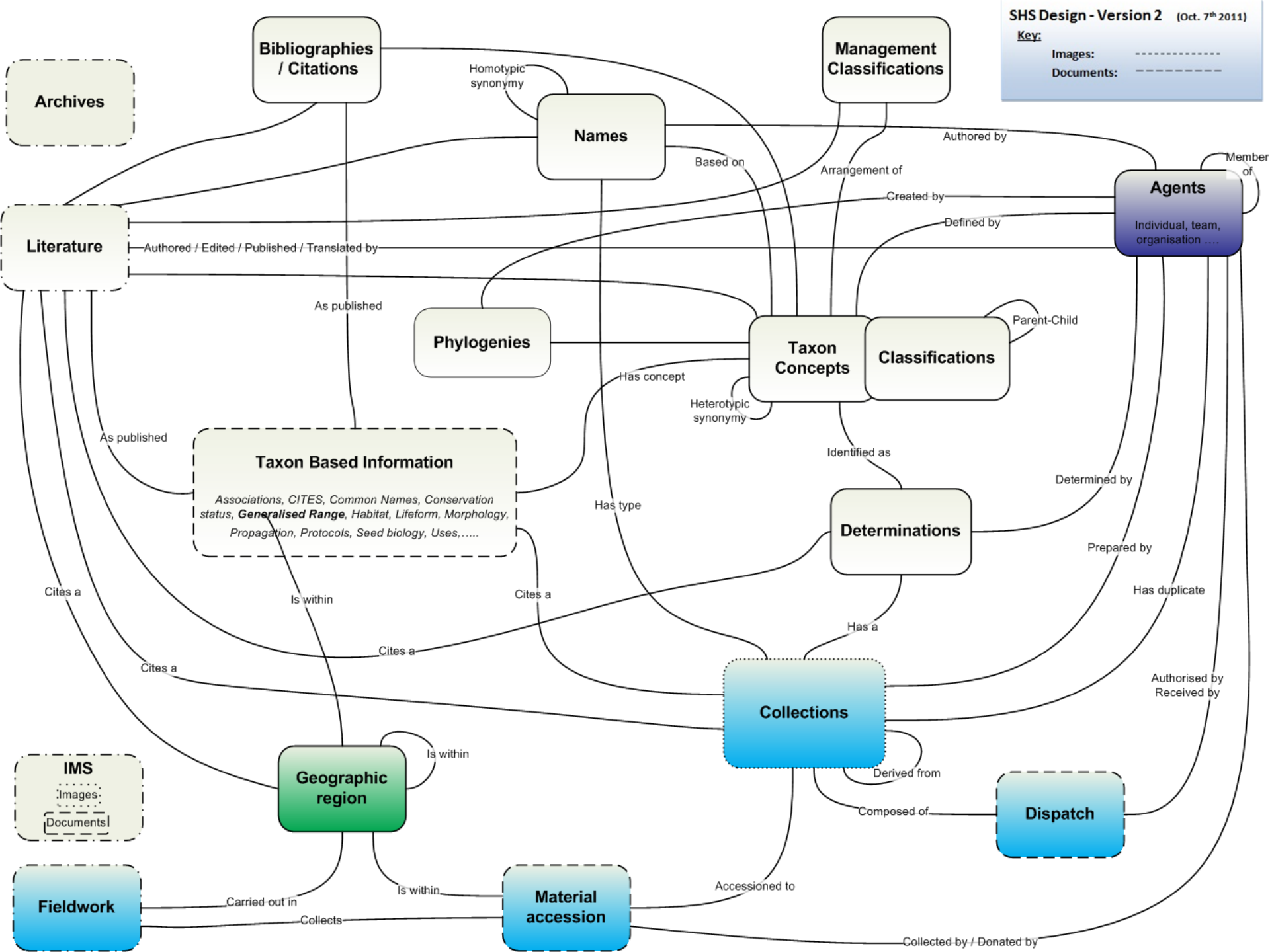
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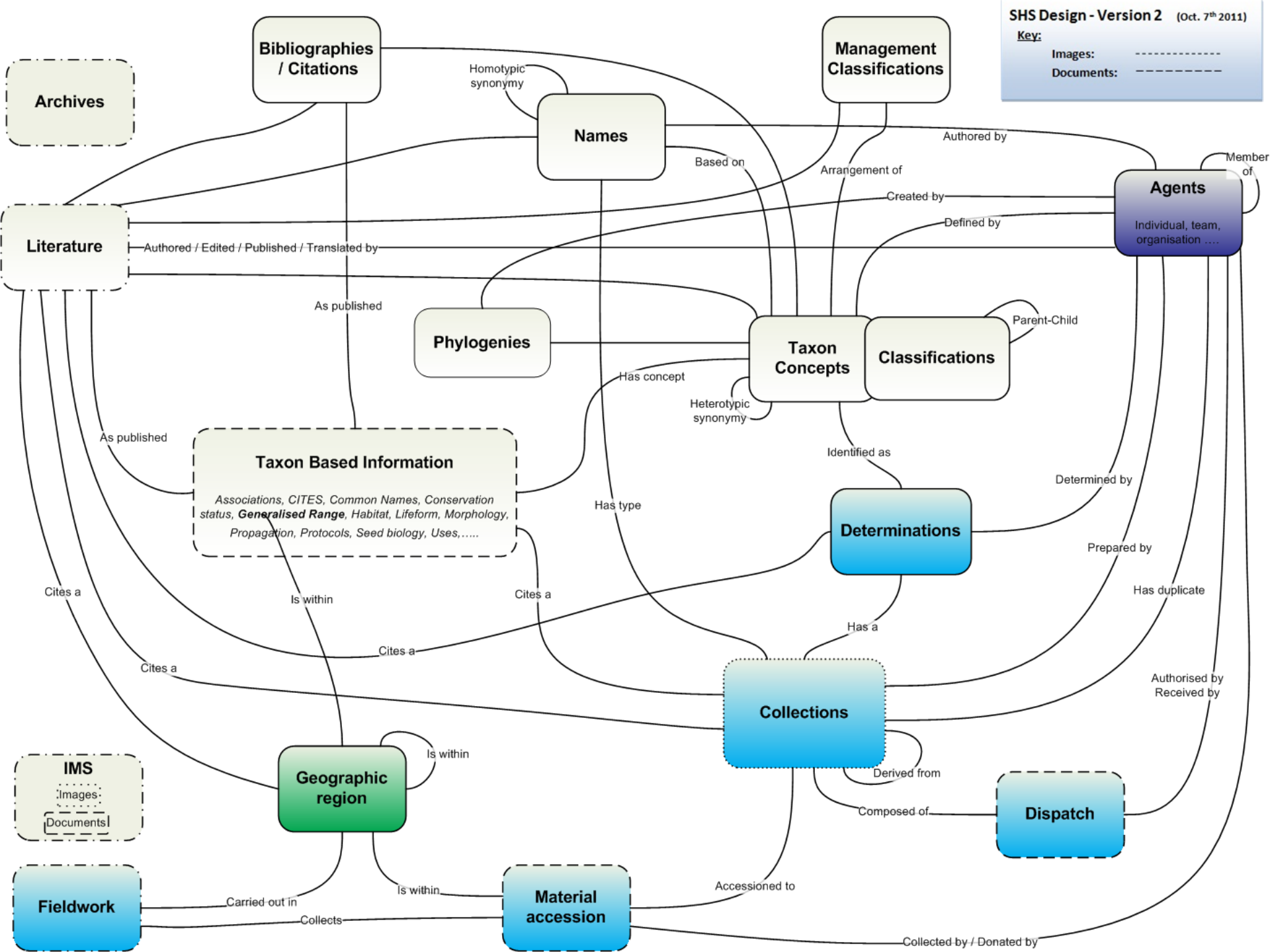
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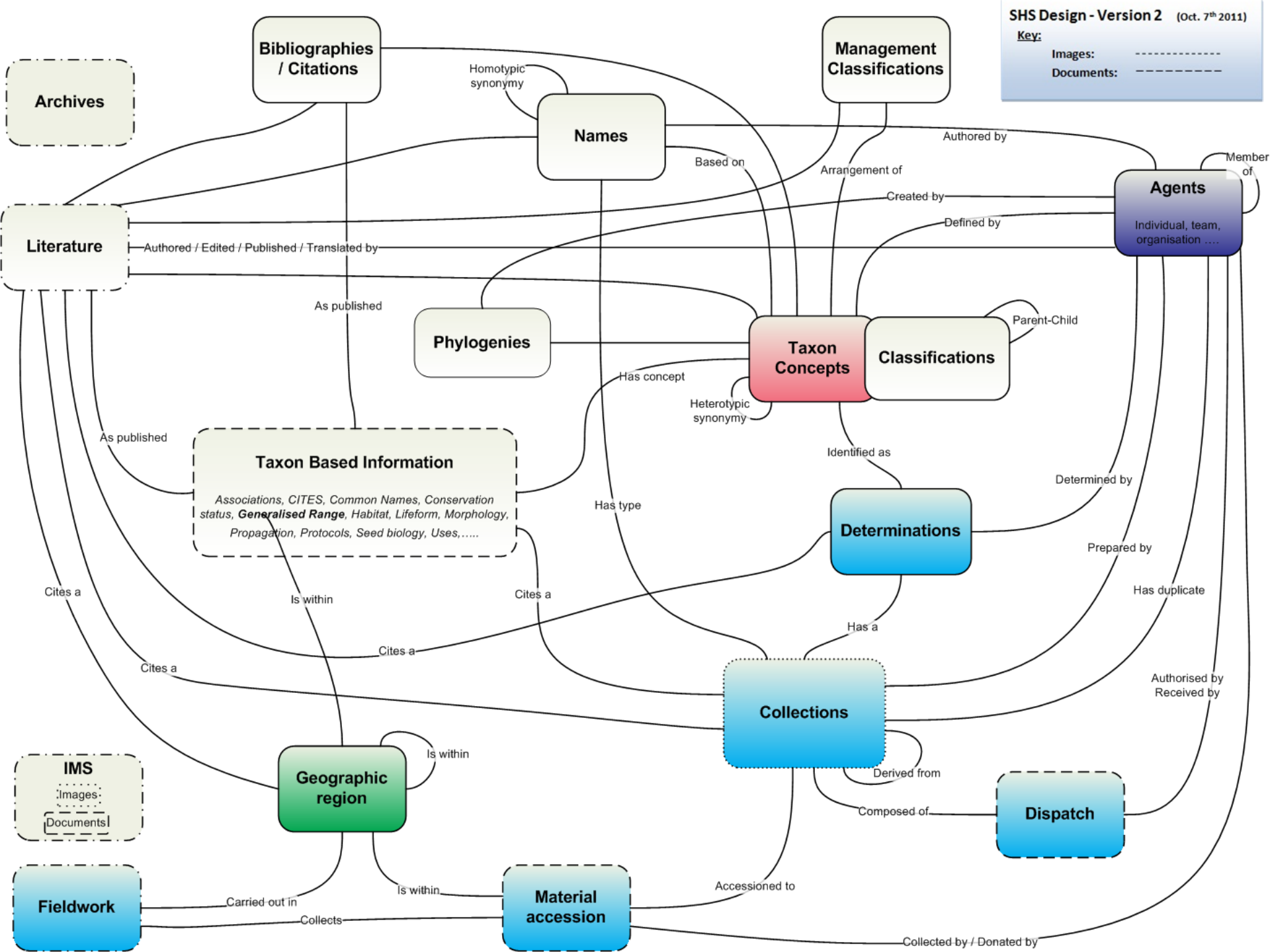
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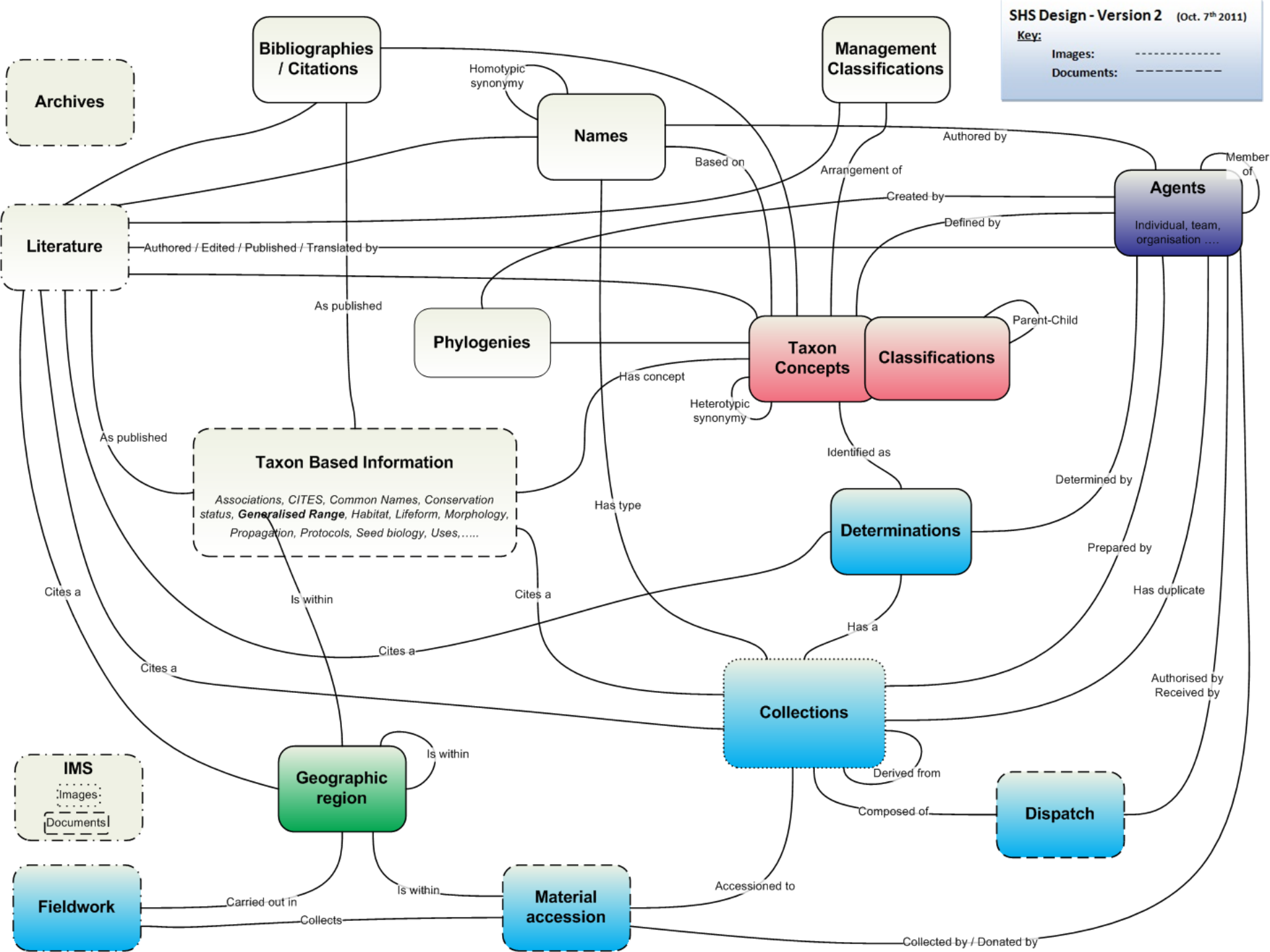
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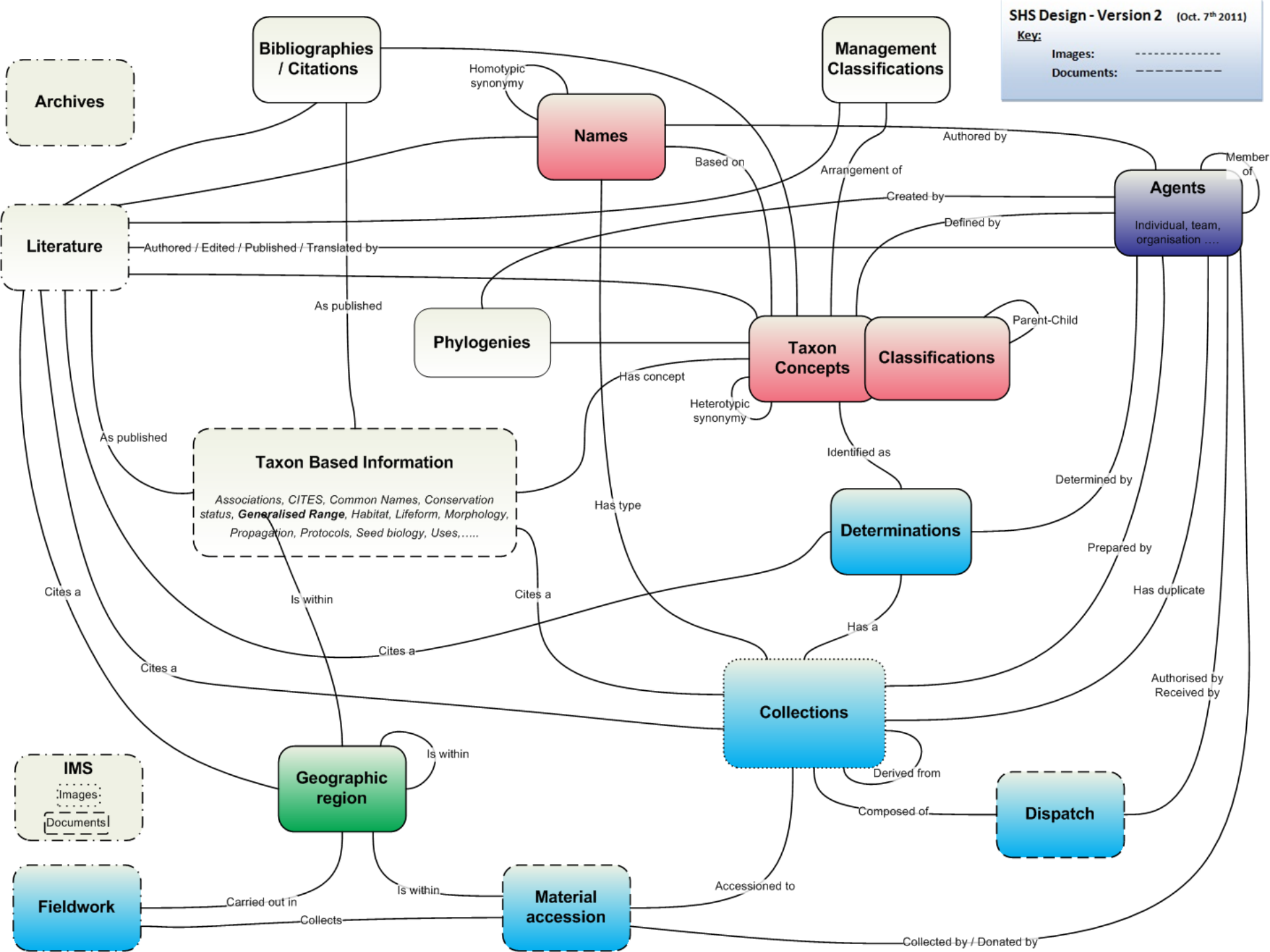
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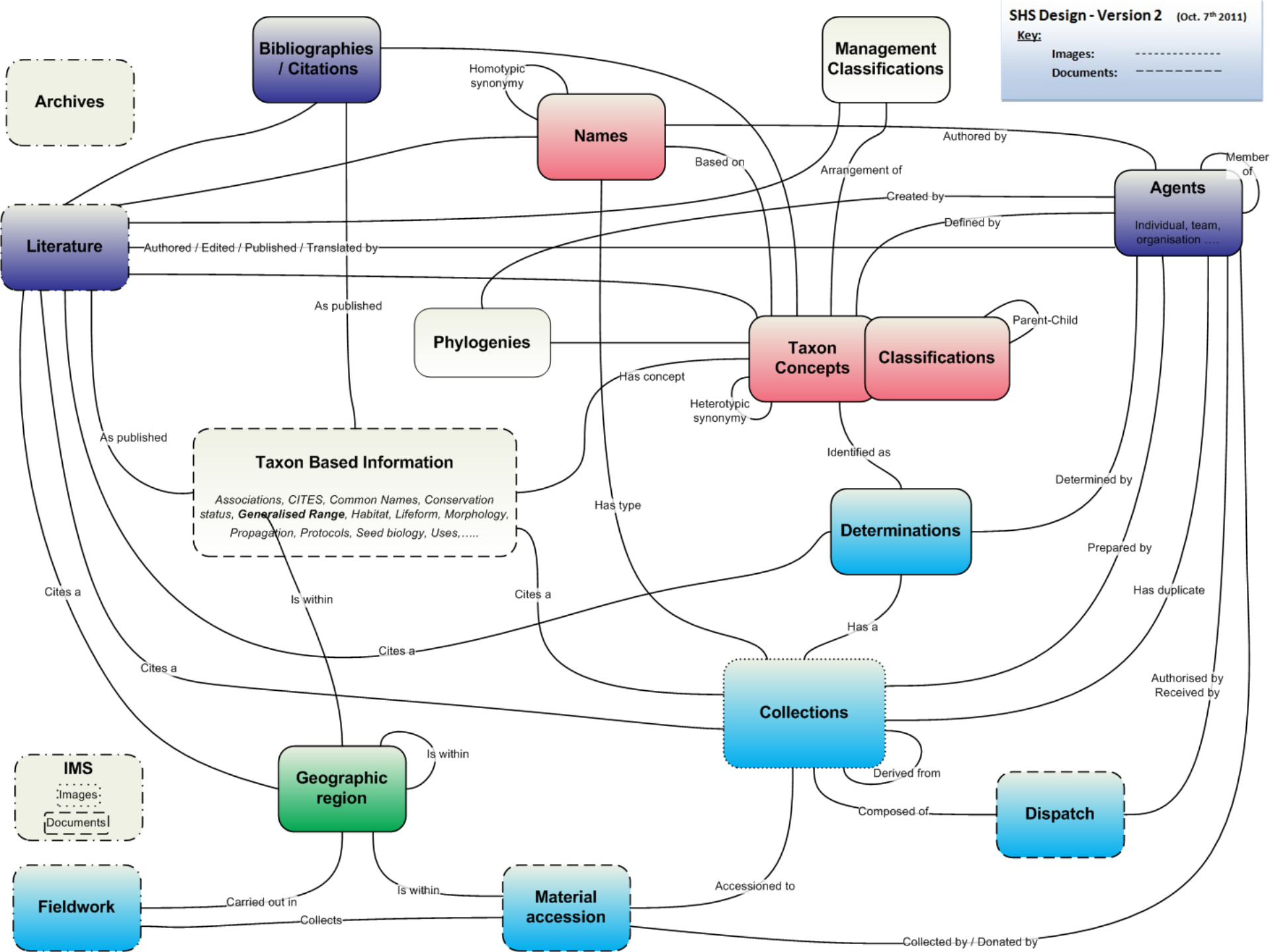
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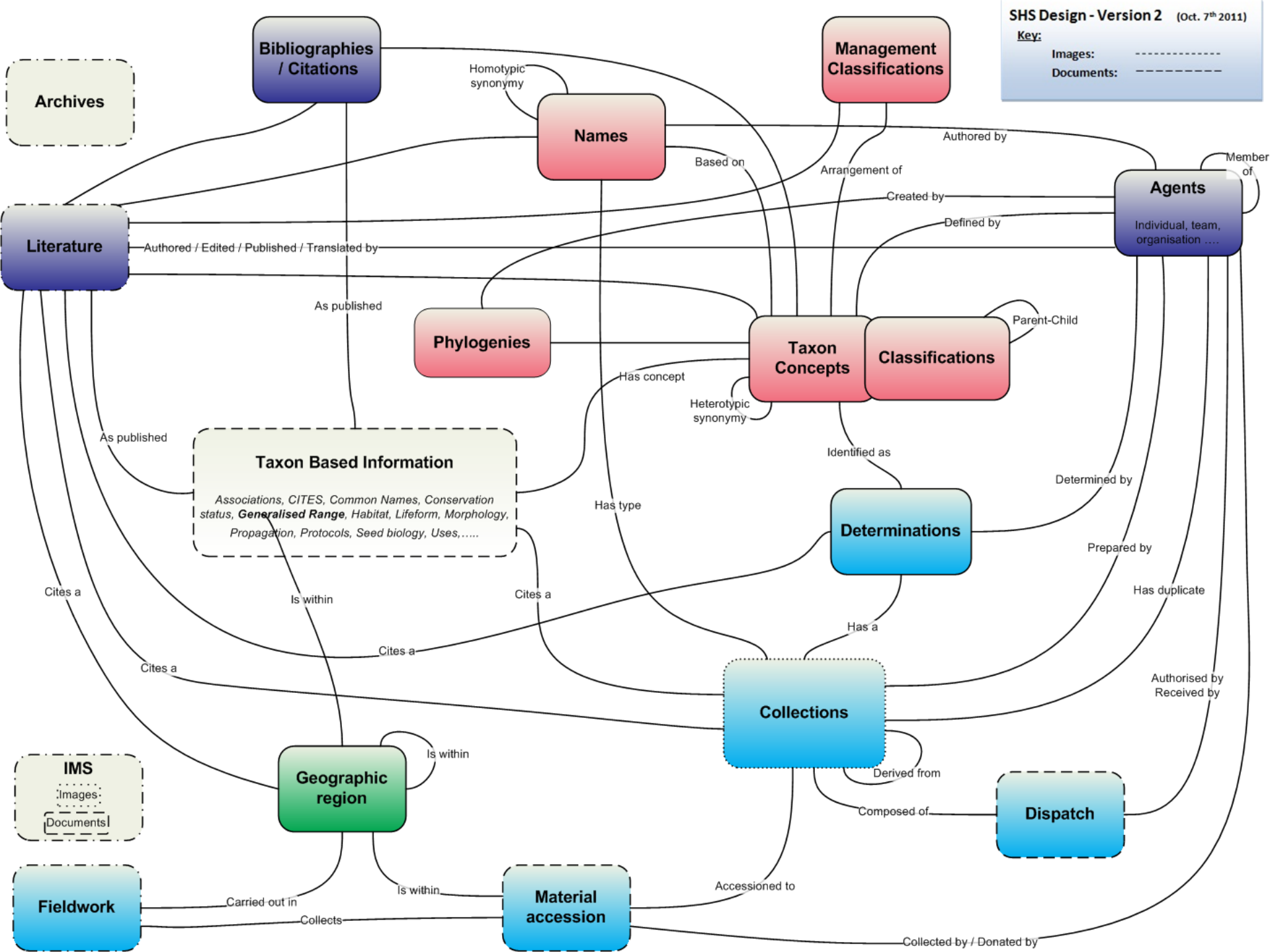
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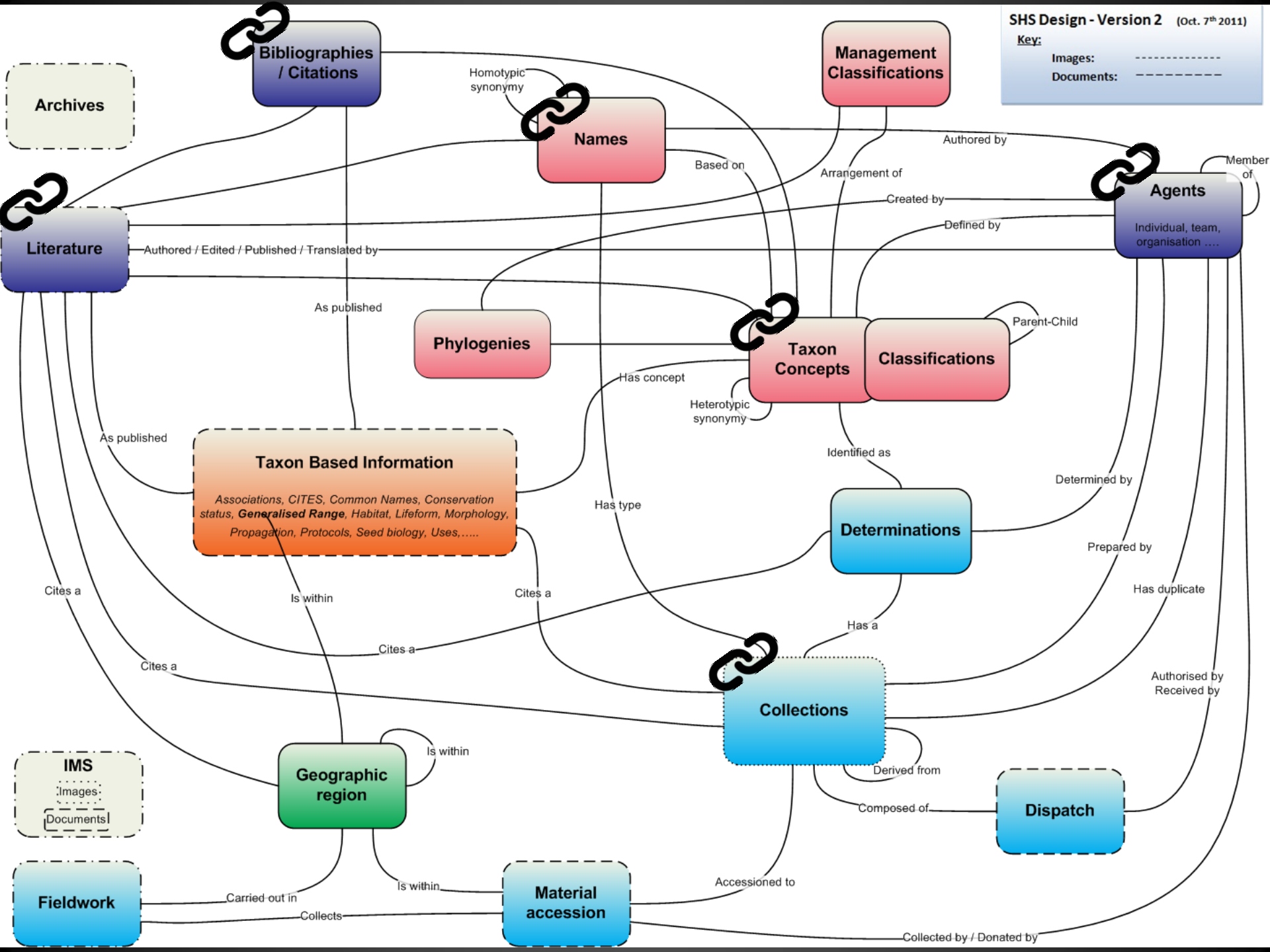
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Likelihood of Duplication

Rate of Data Acquisition

Complementarity

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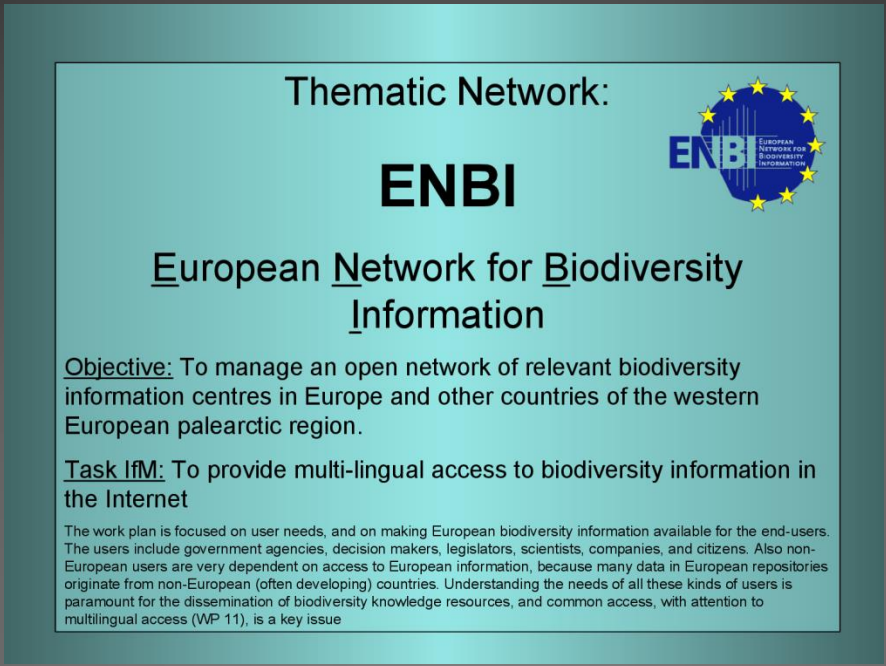
Rate of Data Acquisition

Complementarity



Funded by the European Commission under its Fifth Framework Programme

To develop and implement technical standards or rules of best practice for specimen databases, particularly with regard to digital imaging.

Chania, Crete in January 2005

How can the incidence of duplicate collections in herbaria be leveraged to improve the rate of data acquisition?

Cathy Furlong 2006.
Master's thesis on likelihood of specific instances of duplication of plant specimens between herbaria.
American University, Washington, DC, USA

Cathy Furlong 2006.
Master's thesis on **likelihood** of specific instances of duplication of plant specimens between herbaria.
American University, Washington, DC, USA

Question:

If significant resources were applied to completely digitizing ten selected major herbaria, what would be the incidence of duplication with any other herbarium.

What factor or factors can be used to predict the degree of overlap in collectors across herbaria.

- List of collectors in ten major herbaria
- List of collectors in all herbaria
- Size
- Geographic Specialties
- Collections Scope
  - Local
  - Regional
  - National
  - International
  - International over 1.5 M specimens

- List of **collectors** in ten major herbaria
- List of **collectors** in all herbaria
- Size
- Geographic Specialties
- Collections Scope
  - Local
  - Regional
  - National
  - International
  - International over 1.5 M specimens

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- List of **collectors** in all herbaria
- Size
- Geographic Specialties
- **Collections Scope**
  - Local
  - Regional
  - National
  - International
  - International over 1.5 M specimens

Likelihood of Duplication

Rate of Data Acquisition

Complementarity

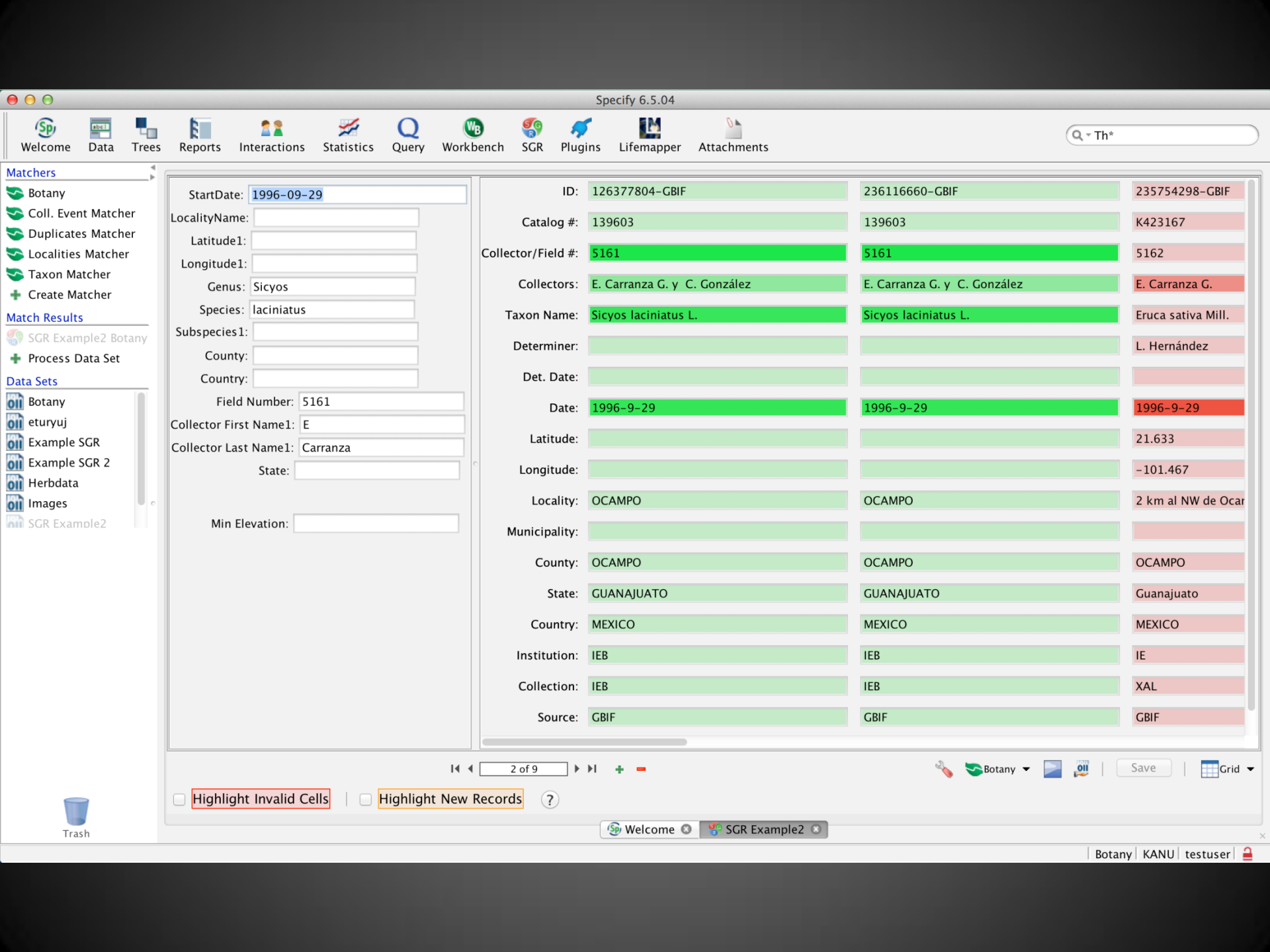
SGR - Scatter Gather Reconcile

discovers and facilitates the re-use of computerized information from duplicate specimens. SGR completes the circle of enterprise-level integration by enabling write-back from GBIF to Specify databases.

Download data from GBIF for comparison

Create comparison dataset of minimal records containing collector name, collector number, taxon, date, locality

Run SGR Analysis and receive suggested matches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Matchers
Botany
Coll. Event Matcher
Duplicates Matcher
Localities Matcher
Taxon Matcher
Create Matcher
Match Results
SGR Example2 Botany
Process Data Set
Data Sets
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eturyuj
Example SGR
Example SGR 2
Herbdata
Images
SGR Example2
Trash
StartDate: 1996-09-29
LocalityName:
Latitude1:
Longitude1:
Genus: Sicyos
Species: laciniatus
Subspecies1:
County:
Country:
Field Number: 5161
Collector First Name1: E
Collector Last Name1: Carranza
State:
Min Elevation:
ID: 126377804-GBIF | 236116660-GBIF | 235754298-GBIF
Catalog #: 139603 | 139603 | K423167
Collector/Field #: 5161 | 5161 | 5162
Collectors: E. Carranza G. y C. González | E. Carranza G. y C. González | E. Carranza G.
Taxon Name: Sicyos laciniatus L. | Sicyos laciniatus L. | Eruca sativa Mill.
Determiner: | | L. Hernández
Det. Date: | |
Date: 1996-9-29 | 1996-9-29 | 1996-9-29
Latitude: | | 21.633
Longitude: | | -101.467
Locality: OCAMPO | OCAMPO | 2 km al NW de Ocar
Municipality: | |
County: OCAMPO | OCAMPO | OCAMPO
State: GUANAJUATO | GUANAJUATO | Guanajuato
Country: MEXICO | MEXICO | MEXICO
Institution: IEB | IEB | IE
Collection: IEB | IEB | XAL
Source: GBIF | GBIF | GBIF
2 of 9
Botany
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Grid
Highlight Invalid Cells
Highlight New Records
Welcome
SGR Example2
Botany | KANU | testuser

Benefits:

Validation

Augmentation

Considerations:

Time to process SGR vs. direct data entry

Accuracy of suggestions and unmatched data

Likelihood of Duplication

Rate of Data Acquisition

Complementarity

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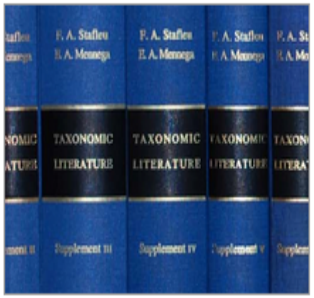
.: Taxonomic Literature II (TL-2)

Taxonomic Literature: A selective guide to botanical publications and collections with dates, commentaries and types **(Stafleu et al.).**

TL-2 is the premier publication of the International Association for Plant Taxonomy (IAPT) and this online version was made possible by the generous cooperation of the IAPT.

In its print form, TL-2 is a 15 volume guide to the literature of systematic botany published between 1753 and 1940. It is organized by author and includes numbered entries for the author's publications. Suggested abbreviations for use in taxonomic publications are provided: abbreviations for the author's name, short titles and abbreviations of the short titles for publications. TL-2 is the standard by which authors' names and titles should be abbreviated.

TL-2 at the Smithsonian Institution Libraries



Currently, we offer a basic database searchable by keyword, author name, title number, author name abbreviation, or title abbreviation. We display the search results with the scanned page and the parallel OCRed and corrected text in a "page turning" application.

The next round of planned improvements, to be done in conjunction with the redesign of the Smithsonian Libraries' website, is to implement Linked Open Data for the entire TL-2 dataset. This computer-friendly format will give each authors and publications a permanent, authoritative URI on the web. These URIs will contain information in both human-readable form (via HTML) and computer-readable form (via RDF/XML.) A SPARQL endpoint will also be provided for querying the linked data.

Further in the future, we wish to perform additional parsing of the data to, for example, extract the Herbaria that contain specimens collected by the authors, link authors and publications to other sources on the web such as the Virtual International Authority File, the Biodiversity Heritage Library,

Elspeth Haston @emhaston · Mar 4
@rdmpage Common. Plant collectors often collect 5-10 duplicates, 1+ stays in country, 1 to collector's institute, rest to other herbaria
Details Reply Retweet Favorite More

nicky nicolson
@nickynicolson

Follow

@emhaston @rdmpage we've tools to assess and link duplicates, will be demo-ing (and destruction testing) at upcoming Leiden data hack

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1

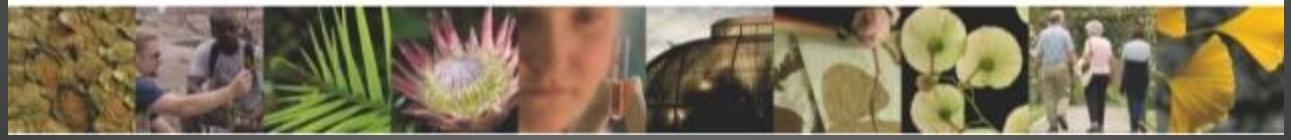
1:45 AM - 4 Mar 2014

Kew at pro-iBiosphere data hackathon

Nicky Nicolson, Matt Blissett

RBG Kew Biodiversity Informatics team

PRO-iBIOSPHERE
WWW.PRO-iBIOSPHERE.EU



Leiden Data-Hack

- Background on the problem (it's one we all share)
- Pre-existing toolkit
- Activities in the data-hack week
- (Aside – links that already exist in data)
- Conclusion & where next

Shared problem

- We (collections-based systematic research organisations) recognise the same entities
- (Especially in botany and mycology) we have:
  - Lots of data digitally available
  - Culture of referencing authoritative sources (e.g. IPNI / IF)
  - Culture of sharing physical collection objects (specimen duplicates)

Tackling the problem

- To make the most of these resources we need to make links between them.
- Ambitious data integration projects like “World Flora Online”

Data linking tool

- Technology: Java, Spring framework, Lucene
- Rules based
- Armed with a tabular dataset, you:
  - Define zero or more transformers for each field
  - Define how fields must match
  - This is a match configuration.

Examples of transformers

- *Epithet*
  mediterraneum → mediterranea
- *NormaliseDiacrits*
  Déségl. → Desegl.
- *CleanedPubAuthors*
  (L.) A.Gray in Hook.f. → A.Gray
- *SurnameExtracter*
  (A.Gray) A.Heller → (Gray) Heller
- *PageExtractor*
  37(4): 412 (1977) → 412

Examples of matchers

- *Exact*

  “Poa” = “Poa”

- *CommonTokens – how many tokens shared btw the two inputs*

  e.g. CapitalLetters

  in Beitr. Aethiop. → B A

  Beitr. Fl. Aethiop. → B F A = 0.67 ratio

- *Number: 1 = 1*

- *Levenshtein edit distance:*

  Plectranthus → Piectanthus (LD1)

Using the matcher

- A configured match can run against any tabular dataset.

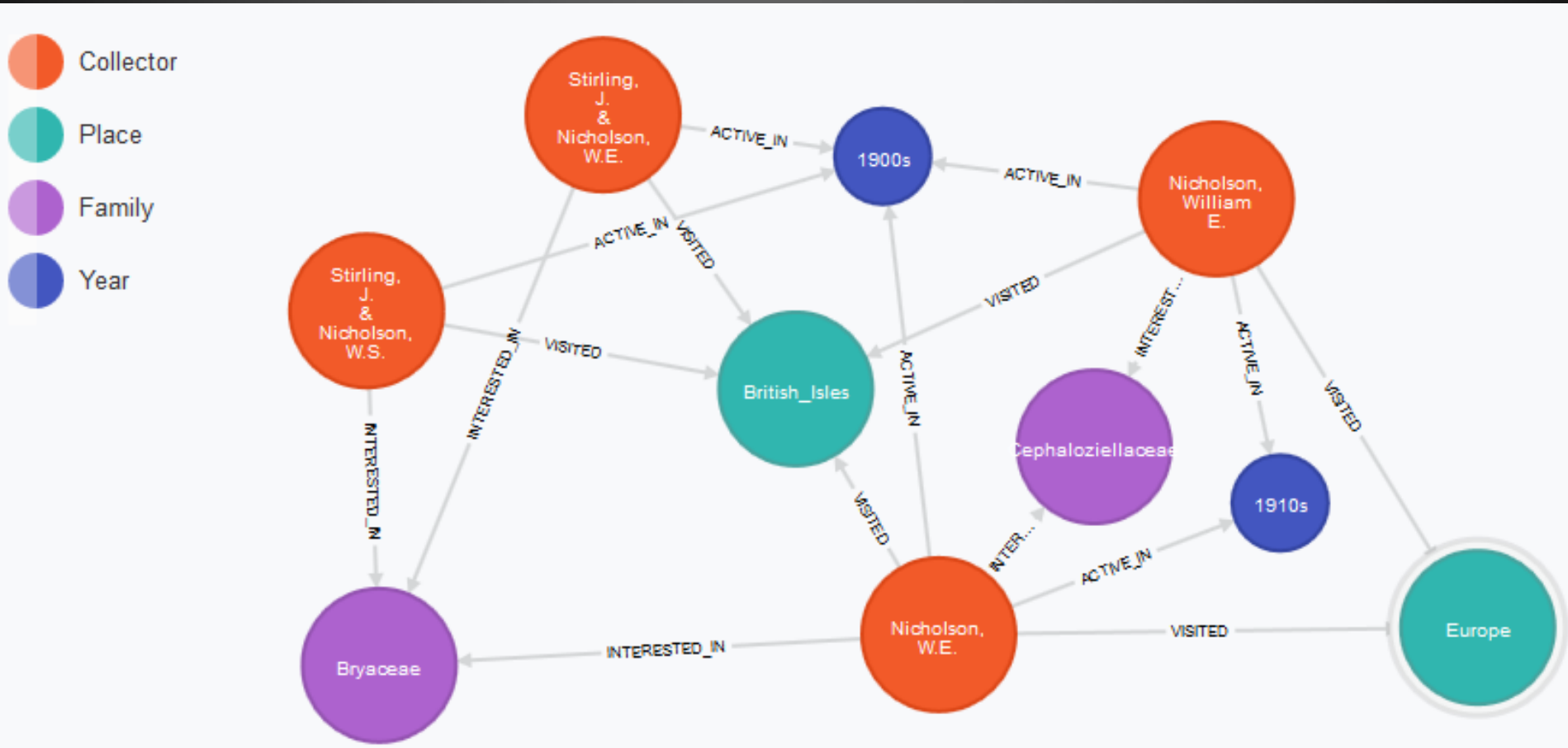
- Accessible as:
- JSON web service
- Google Refine reconciliation service (work in progress)

- Transformers can be dropped into Google Refine

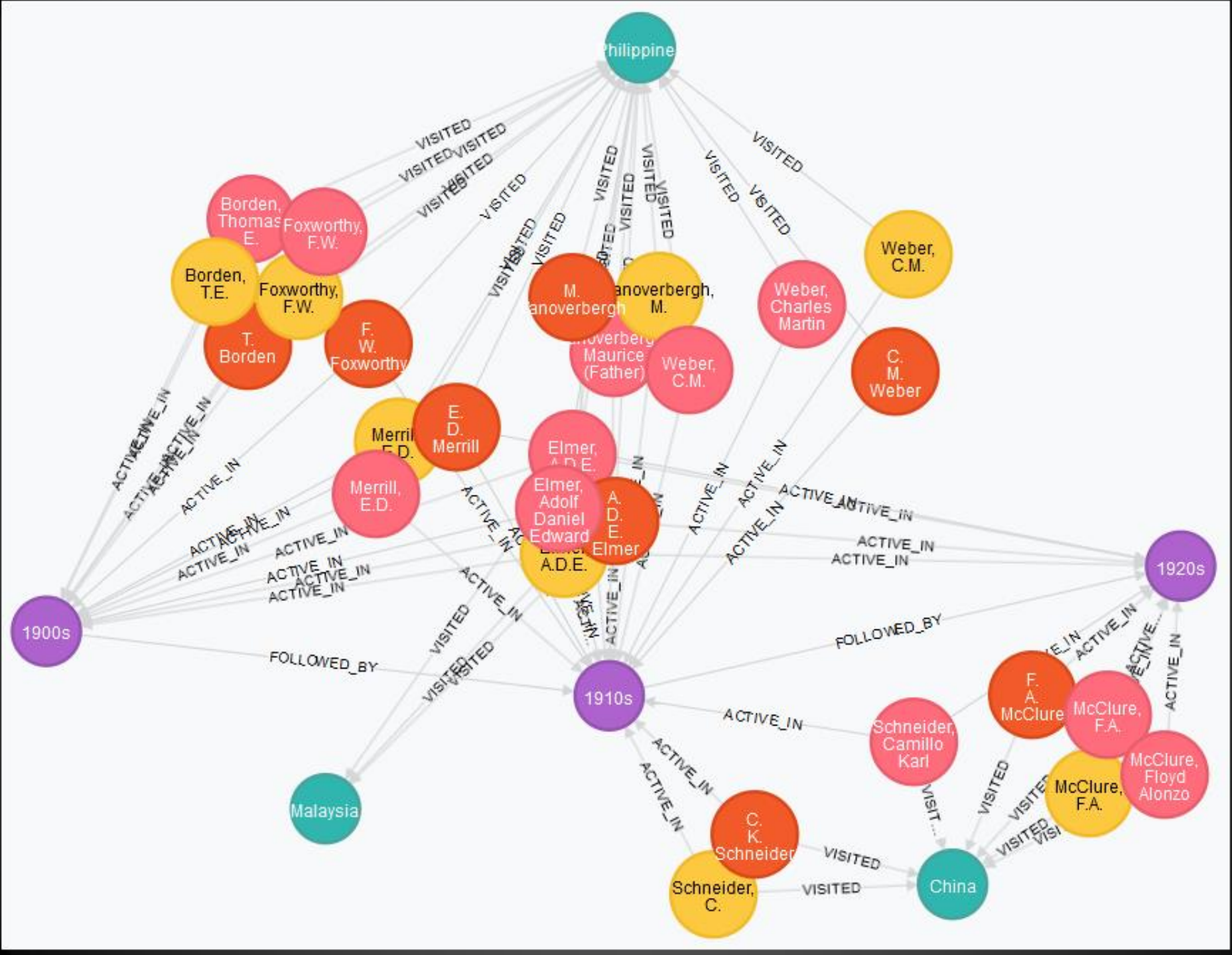
In the data-hack week…

- Worked with the pre-existing toolkit
- Assessed herbaria for duplicates
- Assessed specimens cited in Pensoft journals to link them into digital specimens from herbarium catalogues.

- The work made it obvious that the toolkit would be of use



✔ Displaying 10 nodes, 17 relationships


Philippine
Borden, Thomas E.
Foxworthy, F.W.
Borden, T.E.
Foxworthy, F.W.
T. Borden
F. W. Foxworthy
M. anoverbergh
anoverbergh, M.
Maurice (Father)
Weber, C.M.
Weber, Charles Martin
Weber, C.M.
C. M. Weber
E. D. Merrill
Merrill, E.D.
Elmer, Adolf Daniel Edward
A. D. E. Elmer
A.D.E.
1900s
1910s
1920s
Malaysia
Schneider, Camillo Karl
C. K. Schneider
Schneider, C.
F. A. McClure
McClure, F.A.
McClure, F.A.
McClure, Floyd Alonzo
China
VISITED
ACTIVE_IN
FOLLOWED_BY

Since the data-hack week…

- Further used the toolkit in the assembly of a proof of concept “World Flora Online”
- We plan to open-source it to allow data custodians to “self serve” in linking their data.

- Longer term we could connect a lot of content, and share digitisation / standardisation effort as a result of this linking.

Plants 2020

A GSPC toolkit

The Global Partnership for Plant Conservation

World Flora Online Project

Memorandum of Understanding

Consortium members

WFO Council meetings

The World Flora Online Project

Target 1 of the GSPC calls for "A widely accessible working list of known plant species as a step towards a complete world flora"

The World Flora Online Project has been established in response to Target 1 of the GSPC.

The terms and technical rationale for Target 1 suggest that the Flora should include accepted names and a comprehensive synonymy, building on the results of the previous objectives for Target 1 (dated 2002 - 2010), aimed to develop "a widely accessible working list of known plant species as a step towards a complete world flora." New knowledge should also be incorporated as it becomes available. Target 1 of the first phase of the GSPC was achieved at the end of 2010, through The Plant List (www.theplantlist.org).

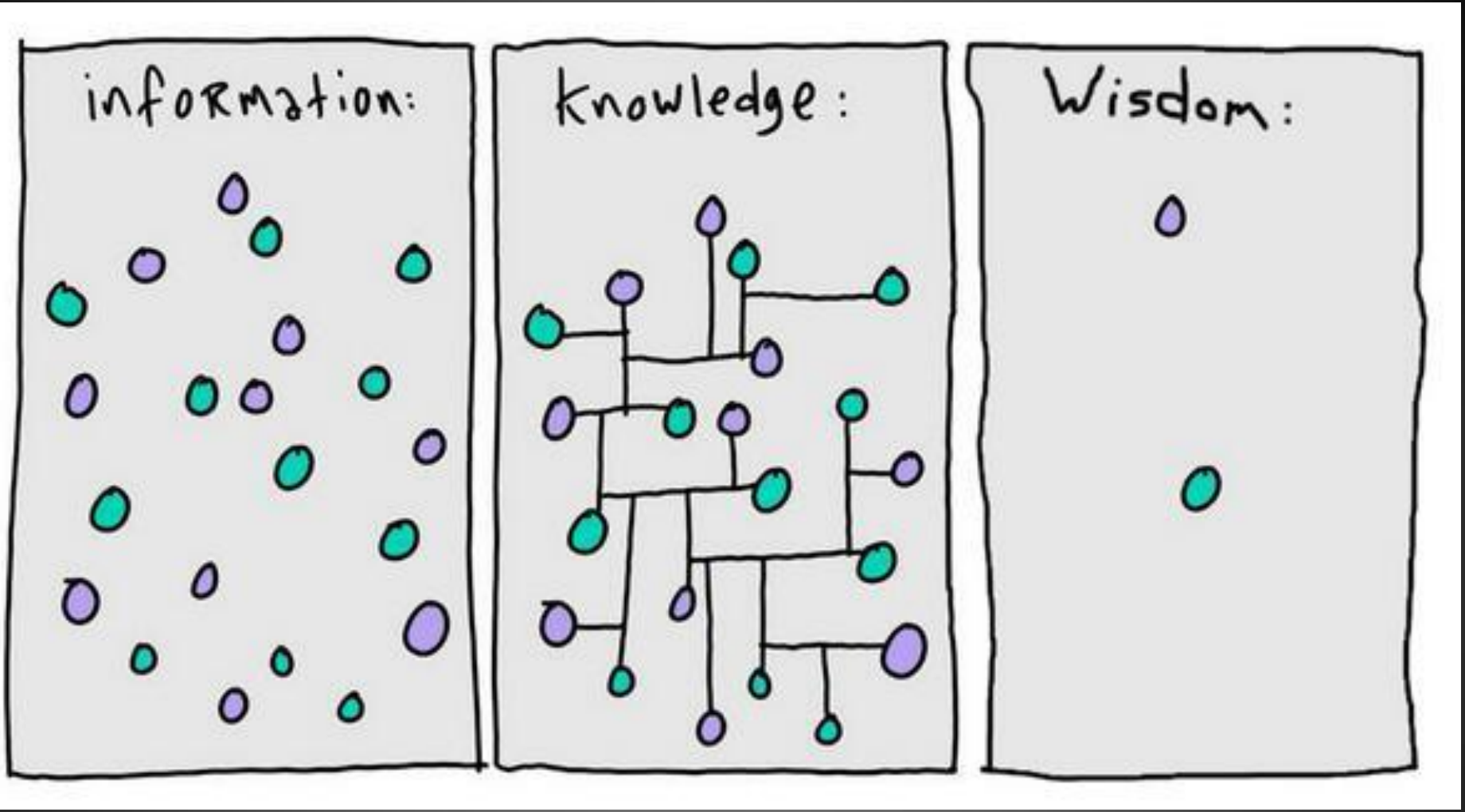
Establishment of the World Flora Online project

- An initial MOU between Missouri Botanical Garden, Royal Botanic Gardens, Kew, Royal Botanic Garden Edinburgh and New York Botanical Garden was signed February 29, 2012.
- The World Flora Online was launched in India, at an event held during the 11th Conference of the Parties to the Convention on Biological Diversity in October, 2012
- In July 2012 the first World Flora Online Meeting was held at Missouri Botanical garden, USA

BGCI

Plants for the Planet

2011-2020



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