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This study was to analyze three representative linked open data (LOD) services in Korea - KERIS (Korea Education and Research Information Service), NLK (National Library of Korea) and KISTI (Korea Institute of Science and Technology Information) - in an aspect of ontology, and to suggest three LOD to transform their local ontology to BIBFRAME as a measure for interoperability of LOD. They have been publishing LOD from bibliographic records and authority data with linking the external LOD such as VIAF, LDS, BNB, ISNI, WorldCat, and so on. We analyzed the characteristics of three LOD according to the following categories: (1) subject domain, (2) volumes of bibliographic, authority, and subject data, (3) ontology, (4) local ontology, and (5) linking external LODs. In the aspect of ontology, FOAF, SKOS, DC, and BIBO were used in common, and however, MODS, DCTERMS, BIBFRAME, PRISM, and Bibtex were also used in three LOD. Also, three LOD devised their own ontology - properties and classes - due to lack of classes and properties in describing LOD. These local properties and classes were different with inconsistency that would bring out conflicts in data sharing and interoperability. Therefore, this study suggested transforming the local ontology of three LOD to BIBFRAME for interoperability and crosswalking.

## LOD publishing in Korea

KERIS has been publishing KERIS LOD of bibliographic records in late 2013. It has used the properties and the classes from DC, BIBO, MODS, FOAF, SKOS, and KERIS devised local ontology. OCLC WorldCat, LCSH, BNB, GeoNames, DBpedia, Flickr are most consumed for linking vocabularies of external LOD.

NLK has been publishing NLK LOD of bibliographic records, Name authority data, and Subject headings in early 2014 with linking external LOD. It has used properties and classes from lots of ontology such as DC, DCTERMS, BIBO, BIBFRAME, FOAF, SKOS, and NLK defined local ontology. Name authority data were converted to LOD according to SKOS. ISNI, LDS, and VIAF have been consumed for linking vocabularies of external LOD.

KISTI has been publishing KISTI LOD of bibliographic records for scientific academic information in late 2013. It has used properties and classes from PRISM, DC, Bibtex, FOAF and KISTI devised local ontology. DBpedia, Open Library, Sudo c, BibBase are most consumed for linking vocabularies of external LOD as shown in Table 1.

TABLE 1: Comparison of 3 LOD services

|                                 | KERIS   | NLK   | KISTI   |
|---------------------------------|---|---|---|
| URI                             | <a href="http://data.riss.kr/serviceHome.do">http://data.riss.kr/serviceHome.do</a> | <a href="http://lod.nl.go.kr">http://lod.nl.go.kr</a> | <a href="http://lod.ndsl.kr">http://lod.ndsl.kr</a> |
| Domain                          | General   | General   | Scientific academic information                     |
| Volume of Bibliographic data    | 1,981,255   | 19,775,931  | 1,794,088   |
| Volume of Authority data        | 8,143   | 346,888   | 467,574   |
| Volume of Subject               | -   | 542,661   | -   |
| Ontology for Bibliographic Data | DC, BIBO<br>MODS  | DC, DCTERMS, BIBO<br>BIBFRAME                         | DC<br>PRISM, Bibtex                                 |
| Ontology for Agent              | FOAF  | FOAF  | FOAF  |
| Ontology for Subject            | SKOS  | SKOS  |   |
| Local ontology                  | Keris properties  | nlon properties                                       | ndsl properties and classes                         |
| Interlinking External LOD       | OCLC WorldCat, LCSH, BNB, GeoNames, DBpedia, Flickr                                 | VIAF, LC LDS, ISNI                                    | DBpedia, Open Library, Sudo c, BibBase              |
| Starting Year                   | late 2013   | early 2014  | late 2013   |

This table was based on NIA(2014)

## Ontology

Each has used ontology differently. FOAF for agent, and SKOS for subject were used respectively. However, ontology for bibliographic data was various such as DC, BIBO, MODS, DCTERMS, BIBFRAME, PRISM, and Bibtex. KERIS used MODS as well as DC and BIBO, NLK selected BIBFRAME with DC, DCTERMS and BIBO, and KISTI used DC, PRISM, and Bibtex. NLK adopted BIBFRAME ontology in need of specific properties in transforming bibliographic data to LOD.

In addition to above universal ontology, three LOD developed their own ontology because of lacks of classes and properties of standard ontology. KERIS designed its properties for holding information such as keris:institution, keris:library, keris:university, and keris:author as shown in Figure 1. NLK has its properties for local data such as nlon:audienceNote, nlon:supplementNote, nlon:localHolding, nlon:awardsNote and so on as shown in Figure 2. KISTI invented its classes such as ndsl:Article and ndsl:Journal, and its properties such as ndsl:keyword, ndsl:conferenceVenue, and ndsl:yearOfAffiliation as shown in Figure 3.

Three LOD have no choice but to develop their own ontology to transform and publish their legacy data to LOD. However, these local properties and classes would lead to some problems in LOD sharing.

## Suggestion for LOD in Korea

These local properties and classes were different with inconsistency that would bring out conflicts in data sharing, crosswalking, mapping and interoperability. Among ontological modeling, BIBFRAME is more applicable for library because BIBFRAME reflected FRBR model and accommodated MARC field and subfield to replace MARC. Therefore, for LOD interoperability and crosswalking, this study suggested transforming locally devised ontology of three LOD to BIBFRAME which has been developed as library specific ontology in future.

## References

- NIA. (2014). Linked Open Data : Korea case. Seoul: NIA.
- KERIS Home Page. Retrieved, January 15, 2018, from <http://data.riss.kr/LODintro.do>.
- KISTI Home Page. Retrieved, January 15, 2018, from <http://lod.ndsl.kr/home/intro/ontology.jsp>.
- NLK Home Page. Retrieved, January 15, 2018, from <http://lod.nl.go.kr>.

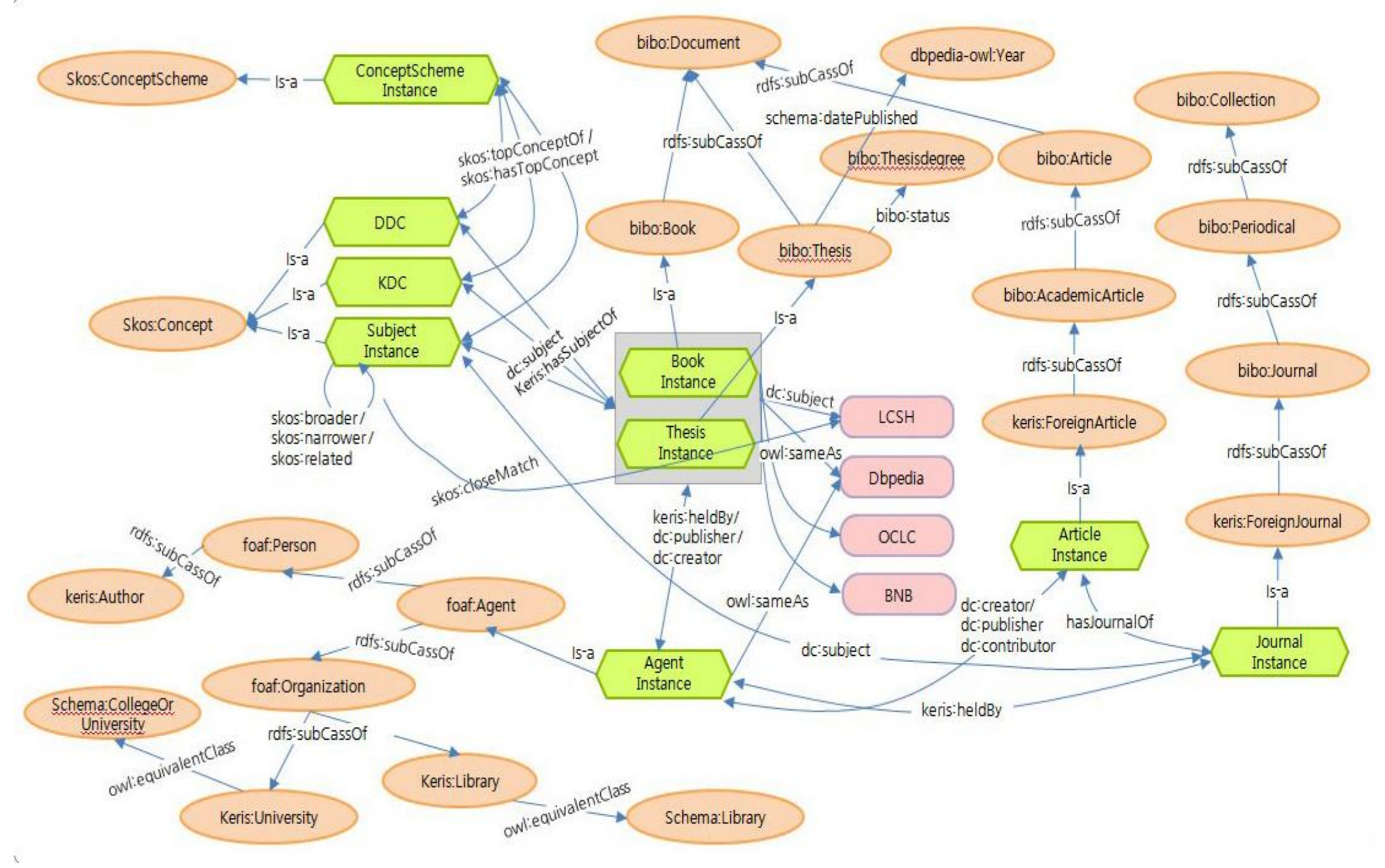


FIG. 1. KERIS ontology  
Source: KERIS Home Page

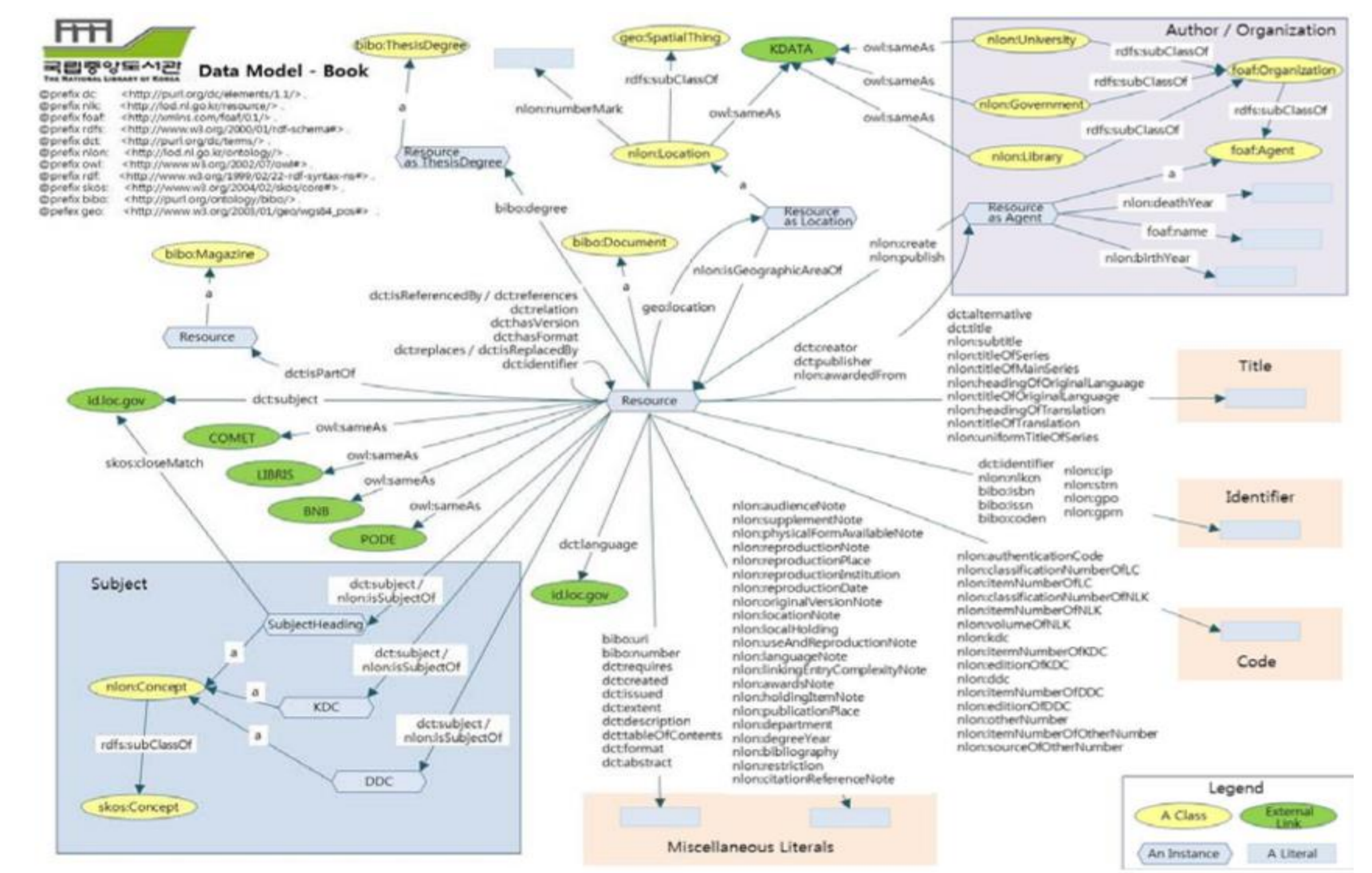


FIG. 2. NLK ontology  
Source: NLK Home Page

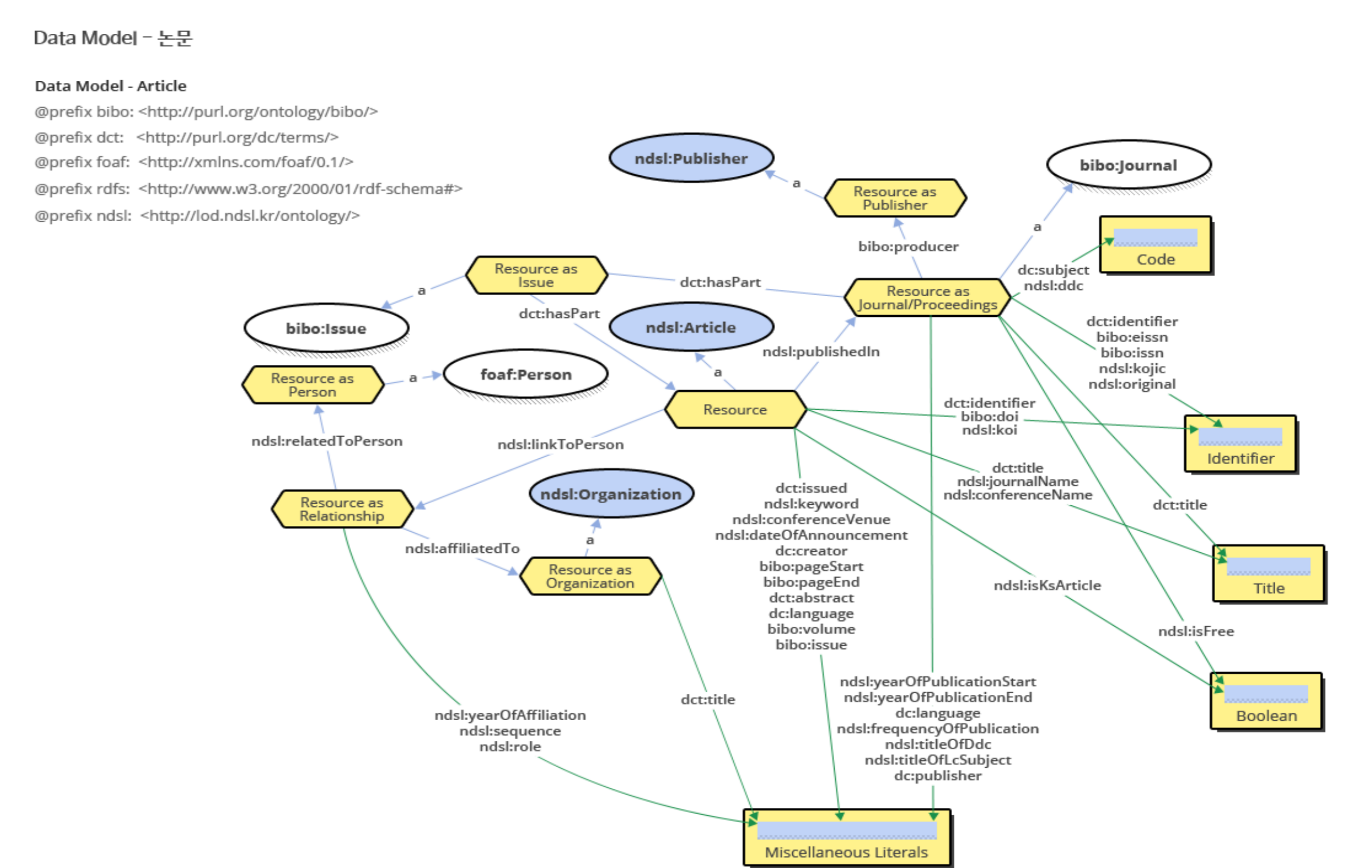


FIG. 3. NDSL ontology (Article resource)  
Source: KISTI Home Page