SKOS Core: A language to describe simple knowledge structures for the web

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Abstract

We describe the Core of the Simple Knowledge Organisation System (SKOS Core), an RDF vocabulary for representing and sharing simple knowledge structure on the Web.

1 Introduction

The Semantic Web is a framework for creating, managing, publishing and searching semantically rich information about web resources. Creating this type of information requires that those who generate it are able to refer to shared repositories of meaning: vocabularies of concepts that are common to a community, and describe its domain of interest.

This type of effort is common in the digital library community, where groups of experts will interact with user communities to create thesauri for specific domains (e.g. the Art & Architecture Thesaurus[1]) or overarching classification schemes (e.g. the Dewey Decimal Classification). A similar type of activity is being undertaken more recently in a less centralised manner by web communities, producing for example the DMOZ open web directory[2], or the Topic Exchange for blog topics[3]. These communities develop thesauri, classification schemes, subject heading lists, taxonomies, terminologies, glossaries and other types of Knowledge Organisation Systems (KOS) to organise their resources and share concepts.

The goal of the SKOS Core is to provide a simple machine-understandable representation framework for Knowledge Organisation Systems (KOS), that has the flexibility and extensibility to cope with the variation found in KOS idioms, and that is fully capable of supporting the publication and use of KOS within a decentralised, distributed information environment such as the (semantic) web. SKOS de-

fines an RDF vocabulary, which is flexible, interoperable and extensible.

The role of SKOS can be illustrated by Figure 1. SKOS sits in the intersection between three worlds. It leverages the extensive practical experience of the library community in classification and indexing of resources, using traditional KOS to give a rigorously defined conceptual framework, together with the "scruffy Semantic Web" community who have popularised blogs, RSS news feeds, FOAF, web directories and other community based developments on the web, because of their need to both flexibly and rapidly define shared terminologies.
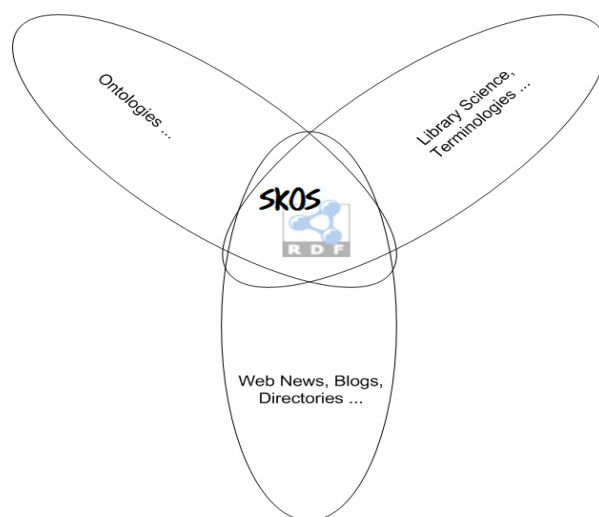

Figure 1: SKOS World View

SKOS also provides a gateway into the richer, but more complex, world of ontologies expressed in OWL. The precise modelling required to construct useful web ontologies is demanding in terms of expertise, effort, and therefore cost. In many cases this may be superfluous or unsuited to requirements. Therefore there is a need to express vocabularies of concepts for use in semantically rich metadata, which are powerful enough to support semantically en-

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[1] http://www.getty.edu/research/conducting_research/vocabularies/aat/
[2] http://dmoz.org/
[3] http://topicexchange.com/

hanced search, but simple enough to be undemanding in terms of the cost and expertise required to use them. The extensible nature of the Semantic Web means that SKOS can be used in combination with OWL constructs to maximise the trade-off between the benefit of explicit semantics and the cost of creation/maintenance. Further, SKOS potentially provides a migration path bringing the legacy of existing KOS to bear on the Semantic Web.

2 SKOS Core Features

SKOS Core is designed to represent some common KOS idioms such as glossaries, thesauri and taxonomies, and the extension of SKOS Core for non-standard KOS idioms. It is oriented towards the description of 'conceptual resources' or 'concepts', which are currently defined as 'an abstract idea or notion; a unit of thought'. This capability provides a basis for creating and publishing re-usable semantic mappings between different KOS, by linking the identified units of meaning from each KOS, as well as addressing multiple natural language vocabularies.

Term: **Economic cooperation**
Used For: Economic co-operation
Broader terms: Economic policy
Narrower terms: Economic integration, European economic
        cooperation, European industrial cooperation, Industrial
        cooperation
Related terms: Interdependence
Scope Note: Includes cooperative measures in banking, trade,
        industry etc., between and among countries.

Figure 2: Sample Thesaurus entry

SKOS Core has a model for expressing the structure and content of concept schemes The model is both flexible and extensible, allowing for the representation of a variety of KOS idioms, but still capturing the common underlying features. This capability is a step towards semantic interoperability between different KOS types.
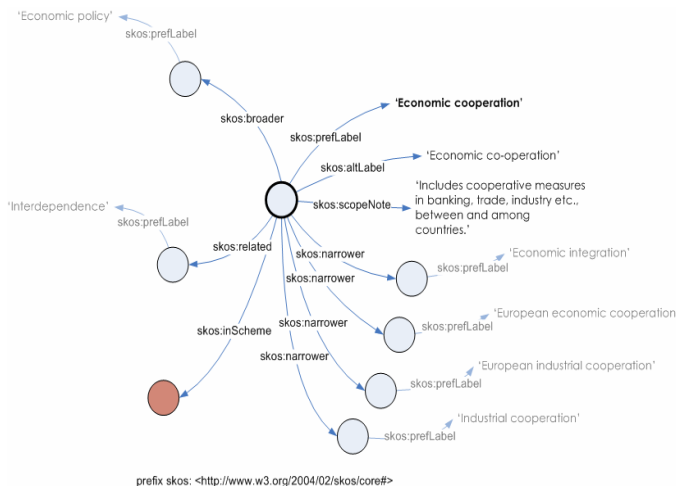

prefix skos: <http://www.w3.org/2004/02/skos/core#>

Figure 3: Concept as RDF graph in SKOS

The use of SKOS is illustrated by the entry given in Figure 2, taken from the UK Archival Thesaurus. This describes

the concept *Economic Cooperation,* defines alternative terms for the concept, relationships to *broader,* and *narrower* terms, defining a concept hierarchy, and to *related* for cross-links across the hierarchy. A *scope note* provides a documentary commentary on the concept. This concept structure is represented via the RDF graph given in Figure 3, serialised into XML/RDF in Figure 4.

```
<rdf:RDF xmlns:rdf=
"http://www.w3.org/1999/02/22-rdf-syntax-ns#"
xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
xmlns:skos="http://www.w3.org/2004/02/skos/core#">
  <skos:Concept rdf:about=
"http://www.ukat.org.uk/thesaurus/concept/1750">
    <skos:prefLabel>Economic coopera-
tion</skos:prefLabel>
    <skos:altLabel>Economic co-
operation</skos:altLabel>
    <skos:scopeNote>Includes cooperative measures
in banking, trade, industry etc., between and
among countries.</skos:scopeNote>
    <skos:broader rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/4382"/>
    <skos:narrower rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/2108"/>
    <skos:narrower rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/9505"/>
    <skos:narrower rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/15053"/>
    <skos:narrower rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/18987"/>
    <skos:related rdf:resource=
"http://www.ukat.org.uk/thesaurus/concept/3250"/>
    <skos:inScheme rdf:resource=
"http://www.ukat.org.uk/thesaurus"/>
  </skos:Concept>
</rdf:RDF>
```

Figure 4: RDF/XML Serialisation of concept

3 SKOS Development

SKOS Core is developed and maintained by the W3C's Semantic Web Best Practices and Deployment Working Group[4]. The Working Group has published *the SKOS Core Guide,* and *the SKOS Core Vocabulary Specification*, as first Public Working Drafts within the W3C process. The Working Group will review these Working Drafts at 3 monthly intervals to allow for further development in response to deployment experience and feedback from the community. Further, a *Quick Guide to Publishing a Thesaurus the Semantic Web* has also been drafted, highlighting issues pertaining to the task of migrating thesauri in typical currently used electronic formats to the SKOS Core RDF representation. Further proposals exist for thesaurus mapping in SKOS, as well as guidance on providing extensions to the core language.

The Working Group is committed to a public, consensus-driven design environment for SKOS Core, and to this end conducts SKOS-related discussion in public, in particular drawing on feedback from the Semantic Web Interest Group mailing list public-esw-thes@w3.org.

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[4] http://www.w3.org/2004/02/skos/core/

Explanation of Demonstration: Semantic Web Environmental Directory

The Semantic Web Environmental Directory (SWED) <http://www.swed.org.uk> will be demonstrated. This web portal is a directory that allows users to browse and search for environmental organisations and projects throughout the UK. The faceted-browsing style functionality of the portal is driven by hybrid SKOS/RDFS/OWL ontologies. This provides an elegant example of how the expressivity of SKOS, RDFS and OWL can be combined to achieve a rich browsing and searching interface for the user, while minimising the cost and complexity of developing and maintaining the underlying ontologies.

The software driving the Semantic Web Environmental Directory is a product of the Semantic Web Advanced Development for Europe (SWAD-Europe) project. The goal was to provide a rich user interface, driven by data that is harvested from distributed sources, rather than centralised within a single database. This architecture gives the organisations and projects listed within SWED the power to create maintain, and publish the RDF descriptions of themselves that underpin the portal, which are then harvested. Thus the cost of maintaining the data is reduced, because organisations and projects do not have to maintain duplicate descriptions within multiple directories, and distributed across the organisations and projects. By sharing and re-using a common set of SKOS concept schemes and RDFS/OWL ontologies, describing for example the 'topic of interest', 'organisation type' and 'operational area' of the organisation or project, each member of this community is able to effectively describe themselves using a common vocabulary, in turn enabling applications such as SWED.

The software driving SWED is freely available, and can be easily configured for searching and browsing of different types of data.