Contextual Computing: Laying A Global Data Foundation

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25+ Years – Library systems technology
10+ Years – Semantic Web & Linked Data

W3C Community Groups:
• Schema Bib Extend (Chair)
  • Schema.org for bibliographic data
  • bib.schema.org
• Schema Architypes (Chair)
• Financial Industry Business Ontology – fibo.schema.org
• Tourism Structured Web Data (Co-Chair)
• Schema Course Extension

Working With:
• **Google** – Schema.org vocabulary, site, extensions documentation and community
• **OCLC** - Global library cooperative
• **FIBO** – Financial Industry Business Ontology
• Various Clients – Implementing/understanding Schema.org
  e.g. Singapore National Library Board - Europeana
Cognitive computing

From Wikipedia, the free encyclopedia

Contextual elements such as meaning, syntax, time, location, appropriate domain, regulations, user’s profile, process, task and goal.

Adaptive: They may learn from dynamic data in real time.

Interactive: They may interact with people.

Iterative and stateful: They may aid in defining a problem by asking questions or finding additional source input if a problem statement is ambiguous or incomplete. They may "remember" previous interactions in a process and return information that is suitable for the specific application at that point in time.

Contextual: They may understand, identify, and extract contextual elements such as meaning, syntax, time, location, appropriate domain, regulations, user’s profile, process, task and goal. They may draw on multiple sources of information, including both structured and unstructured digital information, as well as sensory inputs (visual, gestural, auditory, or sensor-provided).
Contextual Computing: Knowledge Graphs

The Web of Entities

The trilogy are:

Contextual Computing: Knowledge Graphs 
The Web of Entities
“I have a dream for the Web [in which computers] become capable of analyzing all the data on the Web – the content, links, and transactions between people and computers. A ‘Semantic Web’, which should make this possible, has yet to emerge, but when it does, the day-to-day mechanisms of trade, bureaucracy and our daily lives will be handled by machines talking to machines. The ‘intelligent agents’ people have touted for ages will finally materialize.”

Tim Berners-Lee, 1999
The Infamous 
Open Linked Data Cloud

Impressive!

But Useful?

- Raw RDF
- Many Vocabs
- SPARQL

British Library Data Model

```xml
@prefix blt: <http://data.bl.uk/schema/bibliographic/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns/> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema/> .
@prefix owl: <http://www.w3.org/2002/07/owl/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema/> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix isbd: <http://ilastandards.info/ns/isbd/elements/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core/> .
@prefix bibo: <http://purl.org/ontology/bibo/> .
@prefix rda: <http://RDVocab.info/ElementsGr2/> .
@prefix bio: <http://purl.org/vocab/bio/0.1/> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix event: <http://purl.org/NET/c4dm/event.owl/> .
@prefix org: <http://www.w3.org/ns/org/> .
@prefix geo: <http://www.w3.org/2003/01/geo/wgs84_pos/> .
```
Introducing schema.org: Search engines come together for a richer web

Posted: Thursday, June 02, 2011

Webmaster Level: All

Today we're announcing the new schema.org project, a common set of standards that support a consistent way to mark up structured data on web sites. It's an effort by Google, Microsoft, Yahoo! and Yandex to support a common standard for Sitemaps in 2006. With schema.org, site owners can improve how their site appears in search results not only on Google, but on Bing, Yahoo! and potentially other search engines as well as other types of improvements to help people find their sites.

We're excited to see how this will get the open web richer and more useful. We know that it takes time to add rich snippets markup. And adding markup is much harder if every search engine asks for data in a different way. We hope to come together with other search engines to support a common set of schemas, just as we can with Sitemaps. We've asked a group of top search engines to support a common standard for Sitemaps in 2006. With schema.org, site owners can improve how their site appears in search results not only on Google, but on Bing, Yahoo! and potentially other search engines as well as other types of improvements to help people find their sites.

Now let's discuss some of the details of schema.org relevant to you as a webmaster:

* Creative works: CreativeWork, Book, Movie, MusicRecording, Recipe, TVSeries
* Embedded non-text objects: AudioObject, ImageObject, VideoObject
* Event
* Organization
* Place, LocalBusiness, Restaurant
* Product, Offer, AggregateOffer
* Review, AggregateRating

Spearhead - Thai Green Mango Salad Recipe

5 reviews - Total cook time: 20 mins

Salad recipe, so here it is! This salad will blow you away with its ...
Knowledge Graph

Sources for the Graph

- Freebase
- Wikipedia
- Wikidata
- schema.org
• Data embedded in website html
  - Microdata / RDFa / JSON-LD
• Harvested during normal web crawls
• Under control of the [site] publisher
• In use on over 12 million domains

• Broad core vocabulary:
  - Types: 571   Properties: 832   Values: 114

• Extensions published:
  - auto.schema.org
  - bib.schema.org
  - health-lifesci.schema.org

Schema.org today
So, what does it look like ....
A Banking Example

Banc of California provides a comprehensive suite of [loan type](https://dbpedia.org/data/Category:Mortgage) services, including [residential lending](https://www.bancofcal.com/lending/residential-lending) and commercial financing. The bank is known for its commitment to customer service and innovative financial solutions.

```
{
  "@type": "Offer",
  "offeredBy": "https://bankofcal.com",
  "itemOffered": {
    "@type": "LoanOrCredit",
    "@id": "https://www.bancofcal.com/lending/business-lending",
    "name": "Business Lending | Banc of California",
    "alternateName": "Business Financing, Commercial & Industrial"
  }
}
```

Contact Banc of California for more information on their services.

DC-2016 Copenhagen, Denmark

Data Liberate
Why?
Our world is Changing!
How To Participate
A strategy for sharing data

- Identify your data entities
- Map to Schema.org
- Look for external links
- Add markup to pages
- Markup your organisation
- Help the crawlers
- Monitor effects
- Continuously improve

Make the Search Engines Aware of Your Entities

Implementing Schema.org
A Structured Web Data Revolution

Enriching Knowledge Graphs with our Data

- Rich Snippets
- Conversational Search
- Answer Boxes
- Knowledge Panels
- Semantic Search
- Enhanced Analytics
- Info Boxes
- Semantic SEO
- Rich Cards
- RankBrain

Structured Data Powering Discovery
A Structured Web Data Revolution

Enriching Knowledge Graphs with our Data

Wherever possible link to Trusted Reputable Hubs of Authority

Authoritative URIs
Authoritative Linking
Authoritative Descriptions

OCLC… working with a large community of libraries and partners to create an infrastructure of identifiers and data sustainable over the long term.
Structured Data Web

A Global Graph of Related Entities

Providing Context on a Global Scale

cognitive computing needs

contextual elements such as meaning, syntax, time, location, appropriate domain, regulations, user’s profile, process, task and goal.
Cognitive Computing is evolving from a world constrained by Local Context:

- Domain
- Local Familiarity
- Developer experiences
- Local data models
- Industry focused vocabularies
Cognitive Computing is emerging into a world enabled by:

Global Context
- Cross Domain
- Broad Familiarity
- Many Developers
- Flexible data model
- De facto vocabulary
- Knowledge Graphs
- Millions* of Entities

*12+ Million Sites
For Cognitive Computing

Delivering on one revolution …
Laying foundations for another

Building a Contextual Web of Entities

THE FUTURE IS CONTEXTUAL

schema.org

Image: http://enable5.com/
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Cognitive Contextual Computing: Knowledge Graphs
The Global Web of Entities
Helped by Knowledge Graphs

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*Assisted by schema.org