DEFINING THE NOTION OF CONCEPT MAPS 3.0
Jesper Jensen & Lars Johnsen, University of Southern Denmark, Denmark
Email: jense@su.dk, larsj@sunet.dk

Web based concept maps can be viewed as reflections of generations of web technology. Thus we define the following generations of concept maps:

Concept maps 3.0
- Can be created using dedicated online / web based tools (CmapCloud).
-Utilize semantic web (web 3.0) technology for semantic data integration.
- Are represented in open standards such as JSON (Suitable Vector Graphics).

Concept maps 3.0
- Can make use of semantic metadata for meaningful integration of data from external sources.
- Can be linked to Wikidata entities for unique identification.
- Can be represented in open formats that do not require proprietary software for processing.

Concept maps 3.0
- Are typically created using desktop tools (CmapTools, VUE).
- Can be exported to web 1.0 formats (GIF, HTML) or XML (CXL).
- Can be created using dedicated online / web based tools (Cmap Cloud).

Defining Five Fundamental Requirements for Concept Maps 3.0

We have adopted the following Web Data Principles (Wilde, E., 2016, http://direct.github.io/webdata/), which outline five recommendations for exposing data on the Web of Data / Semantic Web.

These recommendations state that Web Data should be:
- Usable
- Parseable
- Linked
- parseable
- Identifiable
- Semantic

Based on the Web Data Principles above, we propose five requirements for concept maps 3.0 as data sets:

1. “Concept maps should be Usable, i.e. that is accessible as persistent and stable identifiers. This obviously applies to the concept map as a whole but preferably also to its constituent parts. In this way, external resources can provide specific entities as subjects in the structure.” (Johnsen, J. & Jensen, L., 2016)

We suggest representing concept maps as JSON (Suitable Vector Graphics), which is an XML (Extensible Markup Language) for two-dimensional graphs that also makes it possible to attach unique identifiers to all the vector visual elements that constitute a concept map.

2. “Concept map distributions should be represented in open formats that do not require proprietary software for processing and whose source code is open to inspection.” (Johnsen, J. & Jensen, L., 2016)

XML can also be utilized to fulfill this requirement of concept maps being accessible, as XML is a W3C (World Wide Web Consortium) endorsed open format and standard, is supported by browsers, can be embedded in HTML (Hypertext Markup Language), and can be rendered as part of larger web pages.

3. “Concept maps should be parseable by metadata using “web known” and/or “well documented” vocabularies.” (Johnsen, L. & Jensen, J., 2016)

We propose to use schema.org (http://schema.org) as the main vocabulary to mark up concept maps because it is both well known, well documented, and supported by major search engines. This allows concept maps to be enumerated and makes understandable and verifiable maps. Furthermore, we propose that this schema.org metadata be added to JSON concept maps by using formats such as SDVLD (JavaScript Object Vocabulary for Linked Data) or RDF (Resource Description Framework in Attributes).

4. “Concept maps should be Linked to other resources to enhance their informational and learning value. Links should be typed if possible to signal their communicational purpose and the nature of their target and be made automatically processable. Individual concepts should be linked to external resources to better determine their identity.” (Johnsen, J. & Jensen, L., 2016)

This can be achieved by linking to a Creative Commons license, which will allow the concept maps in question to be linked if "they are"

5. “Concept maps should be labeled with a license to signify when, where, how and by whom they may be put to use and under what circumstances.” (Johnsen, J. & Jensen, L., 2016)

This can be achieved by linking to a Creative Commons license, which will allow the concept maps in question to be linked if "they are"

A simple example of how a concept map 3.0 can be annotated and exposed as web data using the schema.org vocabulary and the format JSON-LD

This particular example includes a snippet of code specifying metadata for a history concept map about the American general George Armstrong Custer.