DEFINING THE NOTION OF CONCEPT MAPS 3.0

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

1. Concept maps 1.0
   - Can be represented in web 1.0 formats (GIF, HTML) or XML (Suitable Vector Graphics).
   - Can be embedded in webpages.
   - Can be created using dedicated online / web based tools (Cmap Cloud).
   - Can be exported to web 1.0 (HTML).

2. Concept maps 2.0
   - Can be linked to other resources to enhance their informational or learning value. Links should be typed if possible to signal their commun
   - Can be created using dedicated online / web based tools (Cmap Cloud).
   - Can be embedded in webpages.
   - Can be exported to web 2.0 formats (GIF, HTML) or XML (Suitable Vector Graphics).

3. Concept maps 3.0
   - Utilize semantic web / linked data technology to make concept maps 3.0
   - Can be created using dedicated online / web based tools (Cmap Cloud).
   - Can be embedded in webpages.
   - Can be exported to web 3.0 formats (CXL).

Defining Five Fundamental Requirements for Concept Maps 3.0

We have adopted the following Web Data Principles (Wilde, E., 2016, http://dret.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:
- Linked
- Permanent
- Machine-processable
- Licensed
- Scalable

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

1. Concept maps should be Linked, that is accessible via persistent or stable identifiers. This applies to the concept map as a whole but preferably also to its constituent parts. In this way, external resources can point to specific entities or objects in the structure. (Johnsen, J. & Jensen, J., 2016)
   - Links to the concept map and its elements should be supported by major search engines. This allows concept maps to be discoverable and easy to find and also possible to attach unique identifiers to all the verbal 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, J., 2016)
   - SVG can also be utilized to fulfill this requirement of concept maps being accessible, as SVG is a W3C (World Wide Web Consortium) endorsed open format and standard, supported by browsers, can be embedded in HTML (Hyper Text Markup Language), and can be rendered as part of larger web pages.

3. Concept maps should be Linked via metadata using "well known" and/or "well documented" vocabularies. (Johnsen, J. & Jensen, J., 2016)
   - We propose to use schema.org (http://schema.org) as the main vocabulary to link up concept maps because it is both well known, well documented, and supported by major search engines. This allows concept maps to be discoverable and easy to find.
   - We propose that this schema.org metadata be added to the SVG concept maps using namespaces such as LD+JSON (Linked Data in Attributes).

4. Concept maps should be Linked to other resources to enhance their informational or learning value. Links should be typed if possible to signal their communicational purpose and/or 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, J., 2016)
   - This can be achieved by providing links to Wikidata entities, which can act as unique identifiers to a concept or set of concepts.
   - This can be achieved by linking to a Creative Commons license, which will allow the concept maps in question to signal how they are used.

5. Concept maps should be Linked with a license to signify who, where, how, and why they may be used and under what circumstances. (Johnsen, J. & Jensen, J., 2016)
   - This can be achieved by linking to a Creative Commons license, which will allow the concept maps in question to signal how they are used.

References:

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

```json
<script type="application/ld+json">

{ "@context": "http://schema.org/",
  "@type": "ConceptMap",
  "isBasedOn": "http://cmap.ihmc.us/xml/CXL.html#concept-2",
  "@type": "CreativeWork",
  "license": "https://creativecommons.org/licenses/by/2.0",
  "keywords": ["American Civil War", "Yellowstone", "Custer""]

</script>
```