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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:

Concept maps 1.0
- Certain data contents, which must be manually updated either directly in the source code or through an interface.
- Are typically created using desktop tools (CmapTools, VUE).
- Can be exported in web 2.0 formats (GIF, HTML) or in XML (cmap).
- Can be embedded in webpages.

Concept maps 2.0
- Can be created using distributed web tools (CmapCloud).
- Web social web (web 2.0) technology for facilitating sharing and collaboration.
- Are represented in open standards such as SVG (Scalable Vector Graphics).

Concept maps 3.0
- Utilize semantic web / web of data (web 3.0) technology to make content dynamic.
- Utilize social web (web 2.0) technology to facilitate sharing and collaboration.
- Can be embedded in webpages.
- Are typically created using desktop tools (CmapTools, VUE).
- Can be exported in web 2.0 formats (GIF, HTML) or in XML (cmap).
- Can be embedded in webpages.

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:
- Usable
- Usable
- Usable
- Usable
- Usable

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, that is, accessible via persistent identifiers. This obviously applies to the concept map as a whole but preferably also to its constituent parts. In this way, external resources can be linked to specific entities or objects in the structure.” (Johnson, S., & Jensen, J., 2016)

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, L. & Jensen, J., 2016)

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

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 available automatically, enabling individuals to better determine their identity.” (Johnson, J. & Jensen, J., 2016)

5. “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 available automatically, enabling individuals to better determine their identity.” (Johnson, 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 licensed.

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

```
<concept type="schema.org/Event">
  <name>"Custer's Last Stand"</name>
  <url>"http://www.cmap.ihmc.us/xml/CXL.html#cmap_16M4BB#Custer"</url>
  <description>"General George Armstrong Custer, known as the 'Little Big Horn' or 'Custer's Last Stand', was a hero of the American West, famous for his bravery and leadership in the Battle of the Little Bighorn in 1876. He was killed in action during the massacre of the 7th Cavalry by the Sioux and Cheyenne tribes. His death is still remembered as a tragic event in American history and has been the subject of much debate and speculation."</description>
  <additionalType>"LearningResource"</additionalType>
  <learningResourceType>"concept map"</learningResourceType>
  <identifier>"http://cmap.ihmc.us/xml/CXL.html#Custer"</identifier>
  <license>"https://cmapscloud.ihmc.us/viewer/licenses/480"</license>
</concept>
```

A link specifying the metadata and properties used in the code follows the schema.org vocabulary.

Although our concept map 3.0 example is for a historical subject, the principles also apply to a wide range of subjects. Additional features may be added.

A link to a Creative Commons license specifying how the concept map may be used is also included.

Indicates the schema.org format used when designing annotations for the battle of little bighorns.