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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 static 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 XML, formats (XML).
- Can be embedded in web pages.

Concept maps 2.0
- Can be created using dedicated online / web based tools (Cmap Cloud).
- Utilize social web (web 2.0) technology to facilitate sharing and collaboration.
- Are represented in open standards such as HTML (Suitable Vector Markup).

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.
- Are typically created using desktop tools (CmapTools, VUE).
- Can be created using dedicated online / web based tools (Cmap Cloud).
- Can be created using any means of semantic markup, e.g., XML, JSON-LD, RDFa.
- Can be linked to external semantic web resources, as well as for alternative visualization of both internal and external data.
- Are typically linked to other resources to enhance their informational or learning value. Links should be typed if possible to signal their commun.
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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
- Parseable
- Usable
- Understandable
- 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 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, L. & Jensen, J., 2016)

2. “This is to be implemented in open formats that do not require proprietary software for processing and whose source code is open to inspection.” (Johnson, L. & Jensen, J., 2016)

3. “Concept maps should be Parseable using the "well known" and/or "well known" metadata that is accessible via persistent or 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 be linked to specific entities or objects in the structure.” (Johnson, L. & Jensen, J., 2016)

4. “Concept maps should be Usable to other resources to enhance their informational or learning value. Links should be typed if possible to signal their commun.

5. “Concept maps should be Understandable to the user’s nature of their target and to enable automatic processing. Individual concepts should be linked to external resources to better determine their identity.” (Johnson, L. & Jensen, J., 2016)

This can be achieved by linking to a Creative Commons license, which will allow the concept maps to be used by other resources to enhance their informational or learning value. Links should be typed if possible to signal their commun.

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="alternateName">General George Armstrong Custer</concept>
<concept type="browseTopic">The Battle of the Little Bighorn</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.jpg</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn-2.png</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.png</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.jpg</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn-2.png</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.png</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.jpg</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn-2.png</concept>
<concept type="relatedLink">http://commons.wikimedia.org/wiki/File:Battle_of_Little_Bighorn.png</concept>