

*Yannis, Wayne, Vint & Wendy,*

After a stimulating discussion with Yannis at the 50th Anniversary of The Internet event at the Royal Society, I promised I'd send a follow up to Wayne regarding the potential of metadata appendices in documents, either as a default or option on download, for PDF or other media. I understand there is a push to use XML and I think that is great, though XML is not currently generally readable as documents outside of a Web Browser, it is generally a data sharing format for machine reading.

Wendy, I included you in this thread since this approach builds on the need for documents to be clearly readable by AI as well as XR environments for richer reading experiences.

First of all, the term 'metadata' is unnecessarily vague and not very descriptive (even I think so and I have a PhD in document metadata thanks to Wendy!) so let's just look at *what the text contains*. It is time to move beyond the idea that plain digital text is simply what is shown on the display. Changing the font or even the font size instantly disproves that notion. Digital text is not the same as analog text and electronic text—as in text in electronic literature—acknowledges and takes advantage of this. Even for the most simple, 'plain text' representations there is code behind the 01110100 01100101 01111000 01110100 (which represents the word 'text' in binary and 116 101 120 116 represents it in ASCII Code). Text for presentation, in a specific font, weight, size, spacing and leading aligned in a specific way requires further code. All digital text needs to be interpreted and rendered. The only question is what we will choose to have the text encode and how open (technically and in terms of author and reader effort) the encoded information should be. Text encoded in manuscript formats, such as Microsoft Word's .doc and .docx and Apple's Pages are encoded in such ways plus they are wrapped in further code to define the layout of the pages, which can contain graphical elements such as images and even video. This text is highly described and can be flexibly interacted with by the author, though this flexibility, along with years of modifications and additions to the format also introduces some brittleness, as anyone who has had format and templates issue with their writing can attest. This text can only be read, or viewed, by software which has the key to unlocking the formatting to print to screen or paper the text as intended by the author. Text encoded in HTML and XML obviates the need for specific formatting to be included in the document itself and offloads it to a separate 'Cascading Style Sheet'. Text in PDF was originally encoded pretty much as image, though this has since been greatly improved.

How can we take the fact that text is encoded and make it a great benefit for authors and readers? Two aspects:

- First, **reduce the burden**

For authors/publishers, first of all by making the burden as minimal as possible. Take as much information from the manuscript as is available and have the system automatically encode it.

For readers, provide the tools for any software developer to access this further information.

For both authors and readers, make the encoded information clearly AI accessible.

This needs to include data beyond the basic text of course, such as the numbers between charts and graphs and more.

- Then **provide useful interactions**

Make robust and accurate citing as easy as copy & paste.

Make examining and following References reliable and easy.

**Opportunities.** With documents actively featuring richer information, richer interactions can emerge through the use of AI integration where the AI can trust the data presented and not have to guess, and reading in future XR environments can be more dimensional since the environments can understand elements of the text for optimal reading, such as we are looking at with the Sloan Foundation work we are doing.

We have further experimented with what documents contain and we currently looking at the notion of ‘Proceedings’ in terms of a single document or more often a collection of documents and two they relate and what information a proceedings should contain in addition to what the papers it covers contains.

Digital tools can only act on what is known about the data, hence the vital need for reliable, accurate and accessible metadata.

One way I like to think about this is unleashing high resolution thinking, as is the subject of my 2024 ACM Hypertext ‘Human’ workshop paper. High resolution thinking is not only about sensory resolution and fit to the user, but also about interactions and connections. “Rich and flexible addressing vocabulary” were key aspects to Doug Engelbart’s Augment system (Engelbart, 1984), referring to the ability to link not only to documents or pages, but to sections and paragraphs, even sentences and to do so not only as static links. High resolution interactions are both a function of what affordances are made available for the user and the level of control the user can exercise over the control.

Simply; *extractable knowledge gives us flexible interactions to think in high resolution.*

**Opportunity Costs.** An opportunity cost comes both from the limiting means through which the reader can access the documents, only through ‘printed’ to digital views, rather than using font sizes, colours and other display variables to bring the user’s personal context to bear. A further opportunity cost comes from the lack of embedded data, making it harder to evaluate experiments, which is “why more than two-thirds of researchers have tried and failed to reproduce another scientist's experiments<sup>1</sup>”. AI augmented material which does not clearly state what AI was applied cannot easily have the AI added analysis removed later. This approach explicitly allows for that important eventuality.

**Suggestion/Invitation.** I have been running tests using the AI built into my software Reader (ChatGPT 4o) to generate some metadata from any documents. It works great, until it does not, really highlighting the need for the author to be able to include the authoritative metadata. Which is what Visual-Meta allows for.

I’d be happy to have a meeting with how PDF’s augmented with Visual-Meta can offer a compliment to XML documents and discuss how we can improve what we have and how we can really optimise for AI integration.

What do you think?

ACM Hypertext ’24 could be a good test. We have already done it manually for the conference before but we have not really looked at how we could support it for the ACM Digital Library workflow. This is where true electronic literature for academia can be born.

*An open and interactive ‘metaverse’ can only be built on  
open, reliable & accessible metadata,  
because it is the metadata which enables the metaverse.*

<https://visual-meta.info>

*Frode A. Hegland, PhD  
thefutureoftext.org*

# Endnotes

<sup>1</sup> <https://www.bbc.co.uk/news/science-environment-39054778>

## References

Engelbart, D., 1984. *Authorship Provisions in Augment*. <https://dougengelbart.org/content/view/148/>.  
[Accessed 09 06 2024].

# Visual-Meta Appendix

**This is where your document comes alive.** The information in very small type below allows software to provide rich interactions with this document. See [Visual-Meta.info](https://visual-meta.info) for more information.

This is what we call Visual-Meta. It is an approach to add information about a document to the document itself on the same level of the content. The same as would be necessary on a physically printed page, as opposed to a data layer, since this data layer can be lost and it makes it harder for a user to take advantage of this data. ¶ Important notes are primarily about the encoding of the author information to allow people to cite this document. When listing the names of the authors, they should be in the format 'last name', a comma, followed by 'first name' then 'middle name' whilst delimiting discrete authors with 'and' between author names, like this: Shakespeare, William and Engelbart, Douglas C. ¶ Dates should be ISO 8601 compliant. ¶ The way reader software looks for Visual-Meta in a PDF is to parse it from the end of the document and look for @ [visual-meta-end]. If this is found, the software then looks for @@ [visual-meta-start] and uses the data found between these marker tags. ¶ It is very important to make clear that Visual-Meta is an approach more than a specific format and that it is based on wrappers. Anyone can make a custom wrapper for custom metadata and append it by specifying what it contains. For example @ [dublin-core] or @ [rdft]. ¶ This was written Summer 2021. More information is available from <https://visual-meta.info> or from emailing [frode@heglund.com](mailto:frode@heglund.com) for as long as we can maintain these domains.

```
@ [visual-meta-start]
@ [visual-meta-header-start]
@ [visual-meta]
version = [1.1]; *generator = [Author 9.4 (1234)]; ¶
@ [visual-meta-header-end]
@ [visual-meta-bibtex-self-citation-start]
@ [article [2024-07-22T15:31:05Z/ACMMetadata,
author = [Frode Alexander Hegland], *editor = [Frode Alexander Hegland], *title = [ACM Metadata Letter 2024], *filename = [ACM Metadata Letter Summer 2024 liquid/Frode-Hegland-2024-07-22T15:31:05Z].pdf], *month = [jul], *year = [2024], *institution = [University of Southampton], *vm-id = [2024-07-22T15:31:05Z/ACMMetadata]; ¶
@ [visual-meta-bibtex-self-citation-end]
@ [references-index-start]
@ [references-index {
indexes = [0]; ¶
@ [references-index-end]
@ [references-start]
@ [misc [Douglas Carl Engelbart] Authorship,
author = [Douglas Carl Engelbart], *title = [Authorship Provisions in Augment], *year = [1984], *url = [https://dougelbart.org/content/view/full/148], *pages = [0], *pageRange = [0]; ¶
@ [references-end]
@ [endnotes-start]
@ [meta [1,
text = [https://www.bbc.co.uk/news/science-environment-39054778]; ¶
@ [endnotes-end]
@ [paraText-start]
@ [paraText]
visual-meta = [Visual-Meta Appendix]; ¶
@ [paraText-end]
@ [visual-meta-end]
```