Fragile Reference, Faked Authority, and the Advance of Counterknowledge

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Abstract: The digital landscape has disrupted the stability of connection to past knowledge built around the bibliographic reference system, introducing phenomena like reference rot and the disappearance or manipulation of online sources. The paper explores the challenges posed by the digital age to the verifiability and fixity of texts, highlighting the volatility of digital information and the risks associated with unverifiable and fluid online content. It discusses the impact of these challenges on scholarly communication, the dissemination of poor-quality science through predatory and problematic journals, and the proliferation of misinformation. Possible solutions to address these issues are presented, emphasizing that media and information education are crucial in equipping individuals with the skills to evaluate and trust sources effectively. Ultimately, the paper argues for a concerted effort to adapt traditional principles of reference and verification to the digital environment, ensuring that the knowledge we rely on remains durable, reliable, and accessible for future generations.

Keywords: bibliographic references, online information sources, digital preservation, information evaluation, epistemic trust, cognitive authority, misinformation

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Motto:
Pe ce te bazezi? / What are you relying on? (Marin Preda, *Moromeții*)
Believing other people in order to acquire information is one of the most common epistemic practices in our cognitive lives (Gloria Origgi, *Epistemic trust*)

Introduction

A reference, in a general cultural sense, is a relationship that someone establishes with what others have spoken, written, or created. This relationship, whether it is one of appropriation or distancing, contextualises, connects with precedents, and aims to objectify and validate one's approach. A reference is a link with the past. In written culture, a bibliographic reference identifies as precisely as possible a specific document or part of a document that has been used as *source* by the author(s) of a work. The mere presence of bibliographic references in a work makes it more *trustworthy* by default. This trustworthiness stems from recognizing that knowledge acquisition cannot be confined to one's own experiences. Progress is based on previous accumulations, on current knowledge used as a source of documentation, as a landmark for new approaches built in relation to it through assimilation and differentiation, through acceptance and contestation, through (re)interpretation. Acquiring information not through direct experience but through "second-hand knowledge"[1] is an extremely

1. As Patrick Wilson named it—see Patrick Wilson, *Second-Hand Knowledge: An Inquiry into Cognitive Authority* (Westport, CT: Greenwood Press, 1983).

common epistemic practice. As Origgi states, "trusting others is a primary source of knowledge acquisition"; the more so trust is "a fundamental ingredient in knowledge" in our society where the amount of information is overwhelming for an individual's processing capability.[2]

This *epistemic trust*—the confidence we place in someone else as a knowledge source and, therefore, in the information he or she provides—is not unconditional: it derives from the possibility that references give us to read critically, to check the cited sources and the claims based on them. In his history of the footnote[3], Anthony Grafton underlines the role of bibliographic references in identifying sources from which the statements about the past are derived, offering a unique ground to trust these statements. Therefore, *verifiability* is a primary condition of trust in the information provided by a source. Equally important is the textual stability or *fixity*, in Elizabeth L. Eisenstein's terms, considered a primary advantage of printing press over scribes[4]. Compared to the manuscript age, when the texts could have been modified / corrupted by each scribe, the printing press has generated a fixed text whose copies are identical and unexposed to unwanted interventions during the multiplication process. Text fixity enhances the written sources' verifiability by allowing the reference not only to a work but to a specific part (chapter) or place (page, paragraph or line) in that work.

These characteristics have particular importance for the scholarly communication, as scientists are "perforce and explicitly *homo citans et citatus*".[5] In science, verifiability is essential to "substantiate arguments, give authors credit and enable readers to reproduce conclusions".[6] References and the connections between them form a map of the author's approach, the composition and scope of which can be assessed against the corpus of sources relevant to the subject; in the meantime, they propose a knowledge path that can be followed and extended by those interested in the subject.[7]

Not only the citation but also the quality of the cited sources contributes to build trust. One of the criteria for evaluating sources is their *authority*, whose epistemic component is central for its acceptance. In 1983, in his book *Second-Hand Knowledge: An Inquiry into Cognitive Authority*, Patrick Wilson defined *cognitive authority* as the "influence on one's thoughts that one would consciously recognize as proper"[8] due to the perceived trustworthiness and credibility of the source. This source can be a person, but also an institution (e.g., a university library), a publication (e.g., a scientific journal) or a reference work (e.g., an encyclopaedia).

If verifiability and fixity are hallmarks of print culture, in the digital age these pillars of trust are shaken. Ever since the advent of the Internet, researchers have drawn attention to a number of phenomena affecting the availability of online content, such as (Uniform Resource Locator) migrations/changes or even its disappearance without a trace. Another aspect is the ease with which content can be modified or replaced without tracing the changes. Similarly, it is very easy to circulate such content or a part of it in a different context than the original one, without specifying its source or with incorrect attribution. I will further discuss how these features of online content impact the acquisition of information and knowledge.

Missing Sources

It is common knowledge that digital information is highly volatile. Its ephemeral nature is reflected, inter alia, by the instability of citations and loss of referential information. Over time, hyperlinks tend to cease to point to their original target resources because these have been relocated to new addresses or become permanently unavailable. This phenomenon is known as *reference/link rot*, *link death*, or *link breaking*. As a result of the growing number of scientific resources available online (mainly due to the open science movement), online sources and references have become increasingly common in scholarly communication. Here, Web documents have been compared to the "print fugitive materials

2. Origgi, "Epistemic Trust." In *Information Evaluation*, edited by Philippe Capet and Thomas Delavallade (Hoboken: Wiley-ISTE, 2014), 44.

3. Anthony Grafton, *The Footnote: A Curious History* (Cambridge, MA: Harvard University Press, 1997), 233.

4. See Elizabeth L. Eisenstein, *The printing press as an agent of change* (Cambridge: Cambridge University Press, 1991).

5. Roald Hoffmann, Artyom A. Kabanov, Andrey A. Golov, and Davide M. Proserpio, "Homo Citans and Carbon Allotropes: For an Ethics of Citation," *Angewandte Chemie International Edition* 55, no. 37 (September 5, 2016): 10962.

6. Elias Rohrer, Steffen Heidel, and Florian Tschorsch, "Enabling Reference Verifiability for the World Wide Web with Webchain," *ACM Trans. Internet Technol.* 20, no. 4 (October 2020): 1.

7. Robert Coravu, "Eroare 404," *Anthropos. Revista de filosofie, arte și umanioare* 1, no. 11 (2023).

8. Wilson, *Second-Hand Knowledge*, 15.

and grey literature" and situated "somewhere between ephemera and permanent" sources.[9] During the Internet's first two decades of existence, several studies have documented the instability of citations of online resources and the decreasing availability of cited content over time.[10] Further research has not shown a positive evolution.

The availability of online sources is depending on the existence of digital preservation policies and solutions. And while predatory journals and publishers are known for their lack of concern for digital preservation, as their main interest is to make a quick profit rather than the sustainability of scholarly communication, many legitimate scientific publishers also appear less committed to the long-term preservation of their digital content. Martin Paul Eve published recently the worrisome conclusions of his analysis of over 7 million scientific articles with assigned DOI persistent identifiers: apparently, 32.9% of Crossref members do not use any adequate solution for digital preservation, only 0.96% of them digitally preserve over 75% of their content in three or more archives, and 8.5% preserve over half of their content in two or more archives.[11] Thus, in the absence of adequate digital preservation practices, the availability of online scientific publications is not guaranteed, even for those with assigned persistent identifiers, exposing them to the phenomenon of reference rot.

When the availability of an online referenced source is affected, its verifiability becomes difficult (if the source changed its address) or impossible (when the source had disappeared). This is of particular importance in science because it threatens its reliability. The vanishing of large amounts of online sources used in scholarly communication damages the credibility of the scientific method because the replicability and reproducibility of research become untestable.[12]

Preserving journalism in the digital age is another complex task. We know from experience that the archives of many Romanian newspapers either born digital or that were published exclusively online at one point became inaccessible after they ceased to appear. This is a widespread phenomenon, with dramatic consequences. As Zarndt et al. note, without collecting and preserving systematically the increasing amount of born-digital news published on the Internet the link with the past is weakened: in absence of this "first rough draft of history", it is much harder to understand how the past shapes the present.[13] We must add that this is not only about understanding the past but also about establishing facts. Access to central and local news archives allows to verify current claims about past events against the reporting from that period, thereby exposing possible disinformation.

Missing Citations and Faked Authority

In the online environment, content is often disseminated without citing its source, which means that its origin is unknown when it is accessed, or its source is partially identified (e.g., the author is specified but not the work from which the ideas or words attributed to him/her have been taken). Thus, it is difficult or often impossible to verify the source, hence the authenticity or the accuracy of the attribution. This facilitates the manipulation of the relationship between cognitive authority and trust in order to confer credibility to and validate fakes. For example, quotes falsely or mistakenly attributed to sources with cognitive authority (renowned people in various fields, usually) and often disseminated as memes are not only very popular as digital folklore but sometimes permeate academia. This kind of fake persists on the Internet despite any attempts to debunk it and forms a massive and long-term available corpus of misinformation. The rise of *faked authority* is a significant issue especially in science. Under the umbrella of their pretended scholarly status, the ever-increasing number of predatory and questionable journals not only disseminate poor science but also ideas

9. Mary F. Casselry and James E. Bird, "Web Citation Availability: Analysis and Implications for Scholarship," *College & Research Libraries* 64, no. 4 (July 2003): 300-301.

10. See, for example, Lawrence et al., "Persistence of Web References in Scientific Research." Computer, 34, no. 2 (February 2001): 26-31; Diomidis Spinellis, "The Decay and Failures of Web References," *Communications of the ACM* 46, no. 1 (2003): 71–77; Casselry and Bird, "Web Citation Availability"; Casselry and Bird, "Web Citation Availability: A Follow-up Study," *Library Resources & Technical Services* 52, no. 1 (January 2008): 42–53; M. K. Saberi and H. Abedi, "Accessibility and Decay of Web Citations in Five Open Access ISI Journals," *Internet Research* 22, no. 2 (January 1, 2012): 234–247.

11. Martin Paul Eve, "Digital Scholarly Journals Are Poorly Preserved: A Study of 7 Million Articles," *Journal of Librarianship and Scholarly Communication* 12, no. 1 (2024): 9.

12. Rohrer, Heidel, and Tschorsch, "Enabling Reference Verifiability," 3.

13. Frederick Zarndt, Dorothy Carner, and Edward McCain, "An International Survey of Born Digital Legal Deposit Policies and Practices" (2015): 2. https://www.ifla.org/wp-content/uploads/2019/05/assets/clm/publications/13_-_2015_an_international_survey_of_born_digital_legal_deposit_policies_and_practices.pdf.

that fuel denialism and conspiracy theories, which are then promoted and cited by their proponents. In this manner, counterknowledge — "misinformation packaged to look like fact"[14] — comes to shape public opinion, with consequences like those we saw during the COVID-19 pandemic, among others.

Altered Sources

We know that the content of a print publication remains the same yesterday, today, tomorrow, and throughout its entire lifetime. We know that a quoted text will be found on the same page of a given print edition of a work, as long as there exists at least one copy of it. An online document, however, can undergo successive and substantial — sometimes even fraudulent — changes over time without this being flagged or marked in any way. Thus, it can have several successive versions not announced as such, and its shape or structure can change too.

The possibility to modify and overwrite online content is incompatible with fixity and has a negative impact on the effectiveness and credibility of the bibliographic reference system. Let's consider the case of Wikipedia. This online encyclopaedia takes advantage of the opportunity to exploit collective wisdom, which, as Pierre Levy defined it[15], allows collective problem-solving. Peer production, the large-scale technology-mediated collaboration model adopted by Wikipedia, supports anyone who wants to contribute to its content. On the other hand, despite the control mechanisms in place, since anyone can modify an entry in this encyclopaedia, the possibility of inappropriate interventions that could lead to misinformation is high. Can one cite and therefore use as reference in a research paper such fluid content? The response from academia is negative.

Fabricated and Dissolved Sources (or the Delights of Generative AI Models)

The so-called artificial intelligence hallucinations manifest themselves, among others, by making up bibliographic references to support the generated answer — e.g., fabricated journal titles that are very close to real ones, fabricated article titles that cannot be found in the journal cited as source, or real authors credited for fabricated works.[16] At the other end is the AI output generated without bibliographic references. This kind of output, whose quality and validity cannot be verified against its sources because these have been dissolved and mixed like in an alchemist's furnace, requires the reader's blind trust. Over time, this synthetic content may in turn become the prevailing source for training other AI models, in a relentless process of dilution that would eventually erase any trace of the cultural origins of AI-generated content.

Conclusions

Some have compared the Internet with a huge library. If we accept this parallel, we must wonder how the knowledge we have access to today would look like if it were based on library collections built without selection criteria, from which many of the publications vanished for good after a while, or were no longer found in their usual place on the shelves, or their content changed over time. Most likely, nothing durable and reliable could have been built on such quicksand.

Digital cultural memory is fragile. Due to the increasing volume of knowledge available on the Internet and the changing information behaviours, we have migrated from a written culture characterised by the fixity of text and relying on the stability of bibliographic references to one in which we face the volatility and mutability of online documents. We are forced to deal with an environment that is unstable and prone to amnesia. Is it realistic to try to control this environment, or do we have to resign ourselves and accept it as such? There are several possible solutions to restore the status of the reference and (re)build trust in the digital environment. In scholarly communication, as Eve states, "scholarly objects must be identified by a stable reference system if readers are to be able to find and check subsequent assertions based on them".[17] For this, as we have shown above, we must ensure that technical solutions like persistent identifier systems are effective by correlating them with adequate digital preservation measures. Eve proposes a range of actions and activities that persistent identifier providers, libraries and other organizations could undertake to promote better preservation practices and help safeguard the digital scholarly record.

14. Damien Thompson, *Counterknowledge: How We Surrendered to Conspiracy Theories, Quack Medicine, Bogus Science and Fake History* (London: Atlantic Books, 2008), 1.

15. See Pierre Levy, *L'intelligence collective. Pour une anthropologie du cyberspace* (Paris: La Découverte, 1994).

16. Willa Roberta Powell and Marydee Ojala, "Slippery Slopes of Citation Searching." *Computers in Libraries* 43, no. 4 (2023): 39.

17. Eve, "Digital Scholarly Journals," 3.

Libraries have a specific preservation solution, the electronic legal deposit, which unfortunately remains merely an aspiration in many countries for now.[18] The progress of legislation in this area is slow, and the complexity of the task often surpasses the libraries' good intentions and resources. Nevertheless, by virtue of their status and specific functions, libraries — especially national and academic libraries — are among the most qualified institutions to implement effective measures for preserving digital resources and ensuring their long-term availability.

Another solution proposed in recent years is the use of blockchain technology to record the history of online sources creation and ownership and thus secure their referential integrity.[19] As for generative AI, its power can be exploited beneficially by controlling the input, i.e., by training the large language models on transparent trustworthy sources in order to obtain trustworthy, verifiable output.

Beside this, we cannot ignore that, if information literate people are more likely to know how to evaluate sources and where to find reliable information not only online but also in print, more and more poorly-educated and/or information illiterate people consider and use the Internet as the one and only way to acquire information. For this, media and information education seem to be the best tool we have at the moment to protect citizens from the advance of counterknowledge.

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18. For more on this topic see Zarndt, Carner and McCain, "An International Survey" and Frederick Zarndt et al., "Results of the 2017 Survey of Electronic Legal Deposit Policies and Practices at National Libraries" (2018).

19. See Rohrer, Heidel, and Tschorsch, "*Enabling Reference Verifiability*".