Managing Context during Scholarly Knowledge Synthesis: Process Patterns and System Mechanics

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ABSTRACT

Scholarly knowledge synthesis — the production of a novel conceptual whole such as an effective literature review or theory — is a critical yet consistently challenging subtask of research. We explore how managing the context of knowledge claims being synthesized, such as their production context or methodology, may be a critical under-supported subtask of synthesis in existing tools. Through *in situ* protocol analyses of researchers doing the work of synthesis, we studied how researchers capture contextual information in their notes and annotations, and how this varies across generic vs. specialized systems for synthesis. Our analysis revealed common process patterns of context capture, and qualitative differences in the nature of support for context capture across generic and specialized systems. Based on these findings, we discuss design implications for systems that aim to better support scholarly synthesis.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**.

KEYWORDS

scholarly workflows, sensemaking, context, literature reviewing systems

ACM Reference Format:
John Morabito and Joel Chan. 2021. Managing Context during Scholarly Knowledge Synthesis: Process Patterns and System Mechanics. In *Creativity and Cognition (C&C '21), June 22–23, 2021, Virtual Event, Italy*. ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3450741.3465244

1 INTRODUCTION

Synthesis is an essential creative task for scholarly knowledge work: it integrates existing knowledge into innovative conceptual wholes [6, 33], such as a theory, an effective systematic or integrative literature review, a cogent research proposal, or model of a design space. Unfortunately, the experience of synthesis work is arduous and effortful [13, 15, 21], and very time-consuming [13, 27, 32], with the labor of transforming the "raw data" of unstructured texts into forms amenable for analysis comprising a major portion of these time costs. In this short paper, we consider how support for managing *context* might be a critical target for design efforts to support synthesis work.

Extensive research in HCI and CSCW has found that effective management of context — the information or circumstances that surround a focal point [4, 10], such as authorship/provenance and history of changes — is critical for supporting effective reuse of information [1], in such diverse settings as human-resource records [2], aircraft technical support [23], healthcare systems [5], steelwork [18], and logistical coordination [11].

Synthesis also fundamentally involves knowledge reuse, whether synthesizing claims from past papers written by other authors, or making sense of your own or collaborators' notes and annotations. Therefore, it is likely that deep engagement with the context of knowledge claims — such as their production context and methodology — is also important for knowledge reuse for synthesis [6, 14]. To illustrate what context means in synthesis work, consider an HCI researcher who wants to understand what interventions might be most promising for mitigating online harassment. To judge the validity of past findings and synthesize an understanding of the research frontier, she might need to know which findings came from which measures (e.g., self-report, behavioral measures) and appropriately weigh the strength of evidence, the extent to which findings have been replicated across authors from different labs, and across settings (e.g., year, platform, scale), and whether/how variations in setting might reveal new explanatory pathways.

Research on knowledge reuse in CSCW has identified that manually adding context, to support information reuse and retrieval, can be challenging for a variety of reasons, including the difficulty of presenting or even enumerating what types of contextual information might prove relevant for future reuse [2, 5].

However, less is known about whether and how challenges related to context manifest in synthesis work, and how these challenges might interact with the tools that are used to support synthesis. Studies of active reading in scientific work [3, 20, 26, 30, 34] yield insights into the mechanics of reading and note-taking, but do not analyze them explicitly in terms of the concepts of context and information reuse. Knight and colleagues' [21] cognitive work analysis of systematic review work groups did examine how contextual information — such as participant information and experimental measures and design — can be difficult to extract when creating systematic reviews. However, they did not analyze in detail how these challenges intersected with the tools they used were used to support the process. Blake and Pratt [6] identified context — such as metadata and methods information — as a critical type of information that is created and managed during the systematic review

C&C '21, June 22–23, 2021, Virtual Event, Italy

ACM ISBN 978-1-4503-8376-9/21/06…$15.00
https://doi.org/10.1145/3450741.3465244

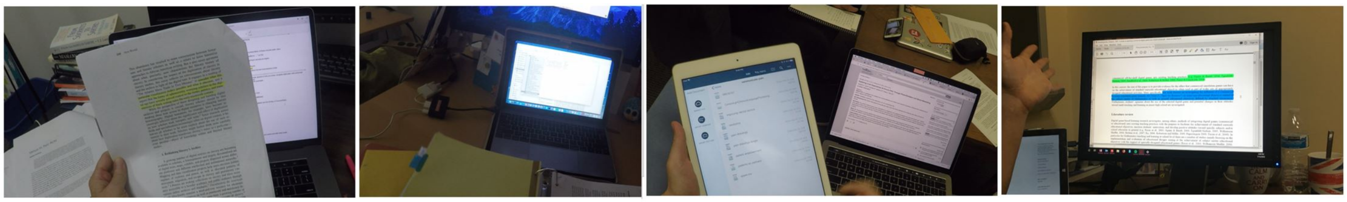

Figure 1: Data collection set up: Participants conducted their synthesis work with an overhead camera that was set to wide view to capture as much of the workspace and field of attention as possible.

process, but did not analyze in detail whether/how systems support this task.

A detailed description of the mechanics of context capture in synthesis work, and how this varies across tools, could help us identify possible pain points and design ideas for how we can better support context management in synthesis systems. As a first step towards understanding how to support context capture and management for synthesis, we conducted detailed *in situ* observations of researchers working on their own synthesis, focusing on how the researchers captured contextual information in their notes and annotations, and how this varied across tools.

2 METHODS

2.1 Participants and Procedure

We recruited four participants from a large public research institution in the northeastern United States. Two participants used tools without special features for synthesis (P1 and P2), such as OneNote, printed papers, Google Docs, and generic PDF readers, and two used tools with specialized features for synthesis (P3 using NVivo[1] P4 using LiquidText[2]). This allowed us to explore how the mechanics of context capture might vary by tool. For the rest of the study we will refer to the first group as the "**generic** tools" group and the second group as the "**specialized** tools" group in order to differentiate between the perceived difference in how much their tools are designed to support synthesis. All participants were PhD students working in the general domain of interdisciplinary human-computer interaction research, with topics ranging from privacy issues in children, assistive technology for chronic pain, critical perspectives on "big data" analyses of cultural archival data, and learning technologies for computational thinking.

We conducted a 45-minute observation of a synthesis work session for each participant, focused on capturing information from papers in the form of annotations and notes for later use in synthesizing arguments and outlines. Sessions were aimed at an authentic task of their choosing, and took place in a setting as close to their natural workflow as possible, such as their office. Participants wore a hat-mounted GoPro camera to record the full range of their actions, which often involved mixed-media workflows (e.g., printed paper and note-taking apps on a computer; multiple monitors). (see Fig. 1). Participants were also asked to think aloud while working on their synthesis. Brief training (with examples) for thinking aloud was provided at the beginning of each session.

[1] https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/resources/blog/extending-your-literature-review-nvivo-12-plus
[2] https://www.liquidtext.net/

2.2 Data Preparation

To prepare data for analysis, we first segmented video footage into **information capture events**, defined as an action that created an externally observable trace or record that persisted in some media (e.g., highlight, margin note). We focused on identifying capture events where the information captured in the trace or record was either 1) **Conceptual Building Blocks (CBBs)**: excerpts/notes that could be (re)used as a building block of a later synthesis, such as an idea, concept, finding, research question, or theory, or 2) **Context**: contextual information that could assist with the interpretation, appraisal, and reuse of a scientific concept or claim, such as metadata or methods information.

To conceptualize and operationalize **CBBs** for this analysis, we drew on epistemological theories of scientific discourse [8, 12, 17, 24, 28] to define ideas, concepts, findings, questions, and theories as core examples of CBBs that can be used in a synthesis. We also used cues from participants' think aloud commentary — such as "this is what I'm really interested in", or "I might use this later in my paper", or "this is the main idea here" — as well as knowledge of their particular research goals, to identify information that might serve as building blocks in downstream synthesis.

To conceptualize and operationalize **context**, we drew on studies of metascience, information science, and argumentation theory to operationalize context for synthesis in terms of methods, metadata, and discourse context. As discussed above, methodological information, such as details of a task, a measurement, or participant demographics — are frequently used to assist with appraisal and aggregation of evidence for claims, such as in a meta-analysis or systematic review, and enrich conceptual models and theories [7, 19, 22, 33] [3]. Second, metadata around sources, such as their title, publication outlet, author, affiliation, and year, can assist in appraisal of "metaknowledge" aspects of scientific claims: for example, older claims might be superseded by later ones, and ideas supported by diverse authors might gain more credence; and academic lineages can shape what questions are asked and what answers are considered credible [14]. Similarly, formal element names, such as figure/table name, page numbers, and footnote numbers, assist in retrieving contextual details, and are also considered to be context. Finally, scientific claims are contextualized by other observations, claims, and theories [14, 16]; for example, an observation can count as an anomaly if it contradicts predictions from previous theories. Thus, CBBs could also act as discourse context for other CBBs.

[3] Methods could conceivably be regarded as CBBs for certain types of synthesis projects, such as a methodological review. Our conceptualization does not rule out these kinds of CBBs *a priori*; however, none of our participants were doing this kind of synthesis.

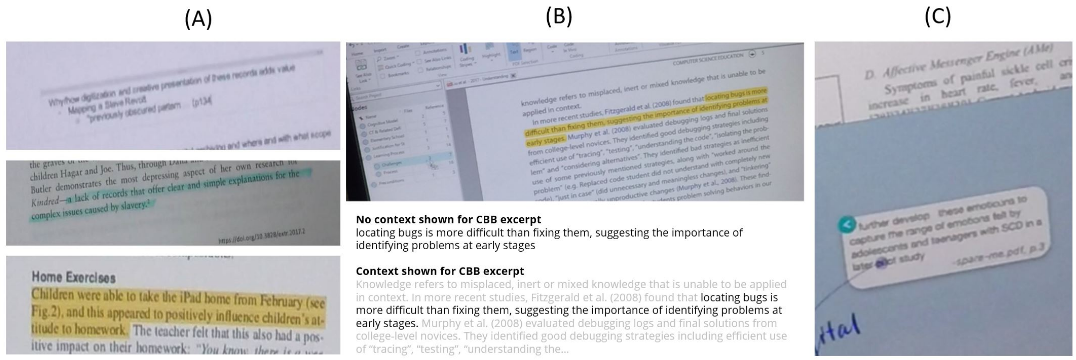

Figure 2: Examples of integrated context, such as integrated figure/caption metadata in highlights in generic synthesis tools (A), "coding" excerpts with expandable context and hyperlinks to source text in NViVo (B) and "liquid capture" excerpts with integrated metadata and hyperlinks to source text in LiquidText (C).

Each action-information pair was considered as its own event for analysis. Segmentation was performed by the first author. A research assistant coded another overlapping portion of the video data (approximately 40% of the data) to estimate reliability of segmentation. The video footage does not contain natural divisions we can use to identify the base rate of information capture events. Therefore, we approximate inter-rater reliability with percent agreement, which was 0.83. In total we observed 177 information capture events across approximately 2.5 hours of observational footage from the four participants.

3 RESULTS

We analyzed the information capture events using an iterative open coding approach, focused on identifying recurring higher-level patterns in instances of context capture, defined as information capture events that involved methods, metadata, or discourse context. Our analysis revealed three main recurring patterns of context capture: 1) integrated context capture, 2) standalone context capture, and 3) conceptual building blocks acting as context. We focus our reporting here on not just similarities in how these patterns manifest, but also subtle qualitative differences in the mechanics of these patterns across generic and specialized tools.

3.1 Integrated Context Capture

First, participants captured context by integrating it into the CBB information object itself. In the **generic** tools, this integrated context capture is largely a manual process: examples from our data include manually typing out page numbers with quotes, or including footnote metadata or figure references in highlighted CBBs (Fig. 2A). In contrast, the more **specialized** tools displayed additional features for more seamlessly and automatically integrating context. For example, P3 used the "code" function in NVivo to capture PDF excerpts as CBBs for later reuse: this code record includes hyperlinks that can be followed in a single click back to the source document. P1 can also explore the context around the segment using NVivo's coding context menu feature[4] (Fig. 2B). Similarly, P4 uses the LiquidText system to create excerpts that have automatically integrated contextual information: captured CBBs excerpts include a file name and page number at the bottom right of the text bubble, and the arrow icon in the top left of the text bubble is a hyperlink back to the original location in the source PDF for that excerpt (Fig. 2C).

3.2 Standalone Context Capture

Second, participants captured context separately from any conceptual building block. With **generic** tools, this was again a largely manual process, either writing out metadata, such as article title and author name or highlighting methodological information separately from a CBB With **specialized** tools, the mechanics of capture were often similarly manual as the generic tools: for example, P3 used the annotation feature in NVivo (distinct from the coding operation) to highlight methods information, such as details of the participant sample, and the rubric used to measure the phenomenon of interest. Similarly, sometimes P4 used the regular "highlight" feature in LiquidText to mark up methods information, such as the study design, in the PDF itself, without creating a separate information object.

3.3 Conceptual Building Blocks as Context

Third and finally, participants contextualized CBBs with other CBBs, by implicit linking through intentional proximity, or explicit linking through the a tool's metadata structure or a direct marking that links the CBBs. In **generic** tools, this largely happened through spatial proximity (e.g., position in a bullet hierarchy, proximity on a map) and markings (e.g., drawing connecting lines between CBBs; see Fig. 3A). **Specialized** tools demonstrated additional explicit features for linking CBBs to act as context for each other. For example, NVivo's code segment information structure contextualizes CBBs with other CBBs by explicitly grouping related code segments under the same "node" in the code hierarchy (and allowing the user to browse them together), and also encode hierarchical relationships between CBBs through the code hierarchy (Fig. 3B). In LiquidText, this ability to independently manipulate and implicitly and explicitly link CBBs goes beyond the capabilities of generic tools or NVivo. The liquid capture segments can be manipulated in

[4]https://help-nv11.qsrinternational.com/desktop/deep_concepts/narrow_broad_-and_custom_reach_settings.htm

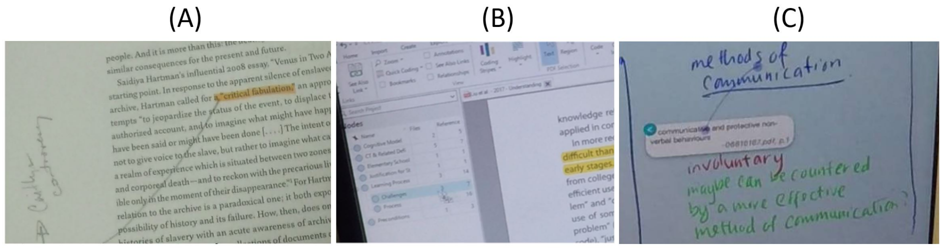

Figure 3: Examples of CBBs as context, such as spatial proximity and markings connecting CBBs in generic synthesis tools (A), coding excerpts into a conceptual hierarchy in NViVo (B), and creating machine-readable explicit connections between CBBs on a LiquidText canvas (C).

a canvas view while simultaneously being able to view captured information from a pdf. These segments can be linked together explicitly (by drawing arrows to connect them), and also implicitly through spatial proximity. These CBBs can also be contextualized by other handwritten notes on the canvas, which can all act as context for each other (Fig. 3C).

4 DISCUSSION AND CONCLUSION

In summary, our qualitative analysis of information capture events from observations of researchers' *in situ* synthesis work sessions revealed **three recurring context capture process patterns**: 1) integrated context capture, 2) standalone context capture, and 3) CBBs as context. While these patterns were common across participants, some nuances emerged, including **richer and more automated context capture with specialized tools such as NVivo and LiquidText**.

Considering differences in mechanics of context capture between the generic and specialized tools more deeply suggests possible design dimensions of support (or the lack thereof) around context that are worth exploring further in system designs for synthesis tools. For instance, both NVivo and Liquidtext enabled a form of **transclusion** [25], where information is disembedded from one place, embedded in another, and able to be directly referenced back to its source from the new location (vs. requiring manual lookup with metadata, for example). This specific mechanic seems particularly well-suited to meet the challenge of predicting what specific details might be necessary for various trajectories of future reuse of an information record [2, 5]: we observed multiple instances of useful information located around conceptual building blocks in their source location, such as metadata or other study details. Exploring the design space of tradeoffs between this sort of "latent" or preparatory context capture, and the need to retrieve and explore these details in a useful and manageable way during reuse, could be a fruitful area for future design work. This line of work could build on related concepts of details-on-demand [31], "flexible compression" [29], and punctuated crystallization of context [23].

Additionally, the ability to **disembed** CBBs as information objects capable of one-to-many relationships with other CBBs, **while retaining flexible contextualizability**, might be an important design pattern. Both of our participants who used specialized tools made contextual links between CBBs quite frequently (approximately 40% of their capture events), while only one of the generic tool participants (P1) made similar links. There were also important qualitative differences in system mechanics: with generic tools such as OneNote, using CBBs as context involves *lossy* disembedding: any contextual information for the CBB needs to be specified manually. This can create a tradeoff between retaining contextual information from the original source, or recombining and contextualizing CBBs amongst other CBBs. In contrast, all CBBs created in specialized tools like LiquidText and NViVo can in principle be richly contextualized (via hyperlinks to source locations, progressive reveal of surrounding context, etc.). Additionally, the links between CBBs in these tools are often *explicit* in a machine-readable sense, enabling more efficient navigation and retrieval of links independent of spatial proximity.

Future work should explore the behavioral consequences of these differences. For example, do the qualitative differences in context capture mechanics lead to more context being captured? Do variations in context capture patterns correlate with ease/quality of downstream synthesis? As an initial step towards this, we conducted exploratory analysis, using our recurring patterns to classify information capture events into non-exclusive categories of context capture, and found that participants using specialized tools seemed to capture substantially more context with their CBBs compared to participants using generic tools: for example, almost none of the CBBs in specialized tools were context-free; in contrast, standalone CBBs (i.e., without associated context) accounted for approximately 30% of P1's information capture events, and approximately 70% of P2's events. With such a small sample, inferential statistics would not be appropriate: we simply note these as preliminary descriptive patterns of quantitative differences, which could point to how the move from generic tools like Google Docs and OneNote to niche and bespoke tools such as NViVo and LiquidText (as documented in, among others, [9]), may reflect real gains in fundamental support for synthesis work.

ACKNOWLEDGMENTS

We thank our participants for their insights, Kunal Eapen for spearheading initial data collection, and Wayne Lutters and Katrina Fenlon for helpful discussions on earlier drafts of this manuscript.

REFERENCES

[1] Mark S. Ackerman, Juri Dachtera, Volkmar Pipek, and Volker Wulf. 2013. Sharing Knowledge and Expertise: The CSCW View of Knowledge Management.

Computer Supported Cooperative Work (CSCW) 22, 4-6 (Aug. 2013), 531–573. https://doi.org/10.1007/s10606-013-9192-8

[2] Mark S. Ackerman and Christine Halverson. 2004. Organizational Memory as Objects, Processes, and Trajectories: An Examination of Organizational Memory in Use. *Computer Supported Cooperative Work (CSCW)* 13, 2 (April 2004), 155–189. https://doi.org/10.1023/B:COSU.0000045805.77534.2a

[3] Annette Adler, Anuj Gujar, Beverly L. Harrison, Kenton O'Hara, and Abigail Sellen. 1998. A diary study of work-related reading: design implications for digital reading devices. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '98)*. ACM Press/Addison-Wesley Publishing Co., Los Angeles, California, USA, 241–248. https://doi.org/10.1145/274644.274679

[4] Naresh Kumar Agarwal. 2017. Exploring Context in Information Behavior: Seeker, Situation, Surroundings, and Shared Identities. *Synthesis Lectures on Information Concepts, Retrieval, and Services* 9, 7 (Dec. 2017), i–163. https://doi.org/10.2200/S00807ED1V01Y201710ICR061 Publisher: Morgan & Claypool Publishers.

[5] Stuart Anderson, Gillian Hardstone, Rob Procter, and Robin Williams. 2008. Down in the (Data)base(ment): Supporting Configuration in Organizational Information Systems. In *Resources, Co-Evolution and Artifacts: Theory in CSCW*, Mark S. Ackerman, Christine A. Halverson, Thomas Erickson, and Wendy A. Kellogg (Eds.). Springer, London, 221–253. https://doi.org/10.1007/978-1-84628-901-9_9 00021.

[6] Catherine Blake and Wanda Pratt. 2006. Collaborative information synthesis I: A model of information behaviors of scientists in medicine and public health. *Journal of the American Society for Information Science and Technology* 57, 13 (2006), 1740–1749. https://doi.org/10.1002/asi.20487 00097 _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1002/asi.20487.

[7] David N. Boote and Penny Beile. 2005. Scholars Before Researchers: On the Centrality of the Dissertation Literature Review in Research Preparation. *Educational Researcher* 34, 6 (Aug. 2005), 3–15. https://doi.org/10.3102/0013189X034006003

[8] Mario Bunge. 1998. *Philosophy of Science* (1 edition ed.). Routledge, New Brunswick, N.J.

[9] Joel Chan, Xin Qian, Katrina Fenlon, and Wayne G. Lutters. 2020. Where the rubber meets the road: Identifying integration points for semantic publishing in existing scholarly practice. In *JCDL 2020 Workshop on Conceptual MOdeling*. 00000.

[10] Paul Dourish. 2004. What we talk about when we talk about context. *Personal and Ubiquitous Computing* 8, 1 (Feb. 2004), 19–30. https://doi.org/10.1007/s00779-003-0253-8

[11] Paul Dourish and Wendy Mackay. 1993. Information and Context: Lessons from a Study of Two Shared Information Systems. In *Proceedings of the conference on organizational computing systems (COCS '93)*. 10.

[12] Robert Dubin. 1978. *Theory Building* (2nd edition ed.). Free Pr, New York.

[13] Ann-Margret Ervin. 2008. Motivating authors to update systematic reviews: practical strategies from a behavioural science perspective. *Paediatric and perinatal epidemiology* 22, 0 1 (Jan. 2008), 33–37. https://doi.org/10.1111/j.1365-3016.2007.00910.x

[14] James A. Evans and Jacob G. Foster. 2011. Metaknowledge. *Science* 331, 6018 (Feb. 2011), 721–725. https://doi.org/10.1126/science.1201765

[15] Darcy Haag Granello. 2001. Promoting Cognitive Complexity in Graduate Written Work: Using Bloom's Taxonomy as a Pedagogical Tool to Improve Literature Reviews. *Counselor Education and Supervision* 40, 4 (June 2001), 292–307. https://doi.org/10.1002/j.1556-6978.2001.tb01261.x

[16] Howard E. Gruber and Paul H. Barrett. 1974. *Darwin on man: A psychological study of scientific creativity.* E. P. Dutton, New York, NY, England. Pages: xxv, 495.

[17] Alexander Hars. 2001. Designing Scientific Knowledge Infrastructures: The Contribution of Epistemology. *Information Systems Frontiers* 3, 1 (March 2001), 63–73. https://doi.org/10.1023/A:1011401704862

[18] Joachim Hinrichs, Volkmar Pipek, and Volker Wulf. 2005. Context Grabbing: Assigning Metadata in Large Document Collections. In *ECSCW 2005*, Hans Gellersen, Kjeld Schmidt, Michel Beaudouin-Lafon, and Wendy Mackay (Eds.). Springer Netherlands, Dordrecht, 367–386. https://doi.org/10.1007/1-4020-4023-7_19 00012.

[19] A Holbrook. 2008. Levels of success in the use of the literature in a doctorate. *South African Journal of Higher Education* 21, 8 (Aug. 2008), 1020–1041. https://doi.org/10.4314/sajhe.v21i8.25757

[20] Matthew Hong, Anne Marie Piper, Nadir Weibel, Simon Olberding, and James Hollan. 2012. Microanalysis of Active Reading Behavior to Inform Design of Interactive Desktop Workspaces. In *Proceedings of the 2012 ACM International Conference on Interactive Tabletops and Surfaces (ITS '12)*. ACM, New York, NY, USA, 215–224. https://doi.org/10.1145/2396636.2396670

[21] Ian A. Knight, Max L. Wilson, David F. Brailsford, and Natasa Milic-Frayling. 2019. Enslaved to the Trapped Data: A Cognitive Work Analysis of Medical Systematic Reviews. In *Proceedings of the 2019 Conference on Human Information Interaction and Retrieval (CHIIR '19)*. ACM, New York, NY, USA, 203–212. https://doi.org/10.1145/3295750.3298937 event-place: Glasgow, Scotland UK.

[22] Yair Levy and Timothy J. Ellis. 2006. A Systems Approach to Conduct an Effective Literature Review in Support of Information Systems Research. *Informing Science: The International Journal of an Emerging Transdiscipline* 9 (2006), 181–212. https://doi.org/10.28945/479

[23] Wayne G. Lutters and Mark S. Ackerman. 2007. Beyond Boundary Objects: Collaborative Reuse in Aircraft Technical Support. *Computer Supported Cooperative Work (CSCW)* 16, 3 (June 2007), 341–372. https://doi.org/10.1007/s10606-006-9036-x

[24] Ernest Nagel. 1979. *The Structure of Science: Problems in the Logic of Scientific Explanation* (2nd edition ed.). Hackett Publishing Company, Inc., Indianapolis, Ind.

[25] Theodor Holm Nelson. 1995. The heart of connection: hypermedia unified by transclusion. *Commun. ACM* 38, 8 (Aug. 1995), 31–33. https://doi.org/10.1145/208344.208353 00145.

[26] Kenton O'Hara, Fiona Smith, William Newman, and Abigail Sellen. 1998. Student readers' use of library documents: implications for library technologies. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '98)*. ACM Press/Addison-Wesley Publishing Co., Los Angeles, California, USA, 233–240. https://doi.org/10.1145/274644.274678

[27] Anthony Petrosino. 1999. *Lead authors of cochrane reviews: Survey results.* Technical Report.

[28] Karl R. Popper. 1959. *The logic of scientific discovery.* Basic Books, Oxford, England.

[29] Xin Qian, Matt J. Erhart, Aniket Kittur, Wayne G. Lutters, and Joel Chan. 2019. Beyond iTunes for Papers: Redefining the Unit of Interaction in Literature Review Tools. In *Conference Companion Publication of the 2019 on Computer Supported Cooperative Work and Social Computing (CSCW '19)*. Association for Computing Machinery, Austin, TX, USA, 341–346. https://doi.org/10.1145/3311957.3359455

[30] Bill N. Schilit, Gene Golovchinsky, and Morgan N. Price. 1998. Beyond paper: supporting active reading with free form digital ink annotations. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '98)*. ACM Press/Addison-Wesley Publishing Co., Los Angeles, California, USA, 249–256. https://doi.org/10.1145/274644.274680

[31] B. Shneiderman. 1996. The eyes have it: a task by data type taxonomy for information visualizations. In *Proceedings 1996 IEEE Symposium on Visual Languages*. 336–343. https://doi.org/10.1109/VL.1996.545307 06230 ISSN: 1049-2615.

[32] Kaveh G. Shojania, Margaret Sampson, Mohammed T. Ansari, Jun Ji, Steve Doucette, and David Moher. 2007. How Quickly Do Systematic Reviews Go Out of Date? A Survival Analysis. *Annals of Internal Medicine* 147, 4 (Aug. 2007), 224. https://doi.org/10.7326/0003-4819-147-4-200708210-00179

[33] Kenneth Strike and George Posner. 1983. Types of synthesis and their criteria. (1983).

[34] Craig S. Tashman and W. Keith Edwards. 2011. Active reading and its discontents: the situations, problems and ideas of readers. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '11)*. Association for Computing Machinery, Vancouver, BC, Canada, 2927–2936. https://doi.org/10.1145/1978942.1979376