Claremont Graduate University
A MEMBER OF THE CLAREMONT COLLEGES

Center for Writing & Rhetoric
150 E. 10th Street
Claremont, CA 91711
909-607-0012
cgu.edu

Source Matrix

A source (or synthesis) matrix is the use of a thematically organized table to impose an order on a set of sources. They are primarily used during the writing of literature reviews, but they can also be used while studying for qualifying exams that require writing about a large number of sources. They are useful in a number of ways, but primarily by: providing an easy way to take a bird's eye view of literature; allowing patterns in literature to be recognized across sources; and, having a resource of notes that can be plugged into literature reviews while writing.

Typically, the table is formed by dedicating the far-left column to providing a full or partial citation of the sources and the remaining columns to themes as seen in the example below.

After reading multiple articles, this writer has identified these three major themes.

Topic: Anxiety in Graduate Students

	Multiple Roles	Relationships	Classroom Environment
Fogg (2009)		Students can be blackballed in departments because those within the department can be very critical	Classroom contests to debate arguments and reading assignments could lead to extreme anxiety
Offstein, Larson, McNeill, & Mwale (2004)	Graduate students, especially doctoral students, are also expected to teach		
Austin, Cameron, Glass, Kosko, Marsh, Abdelmagid, & Burge (2009)	Graduate student socialization is unique in that not only does the student need to transition into the role as a student, but they must also be socialized into the profession		
Wolniewicz (1996)	Graduate students report feeling pressure to prioritize academic roles over health, financial security, and personal relationships	Personal relationships and connections suffer; socializing is not a priority	Anxiety over finishing large projects and meeting deadlines.
Davis & Coleman (2007)			Instructor feedback can be overwhelming, particularly when instructors use red ink when giving feedback
Wyatt & Oswalt (2013)	Graduate students often have problems juggling academic responsibilities, research, and financial responsibilities	Graduate students are often detached from the social and cultural events and activities largely promoted to undergraduate students on campus.	
Pallos, Yamada, & Okawa (2005)		Limited support and interactions with supervisors	A lot of independent learning and researching without much guidance
Salim (2011)	Graduate students must balance teaching responsibilities (office hours, student emails, preparation)		Managing and working with challenging students in the classroom can contribute to stress/anxiety
Perepiczka, Chandler, & Becerra (2011)			Statistics and research-focused courses can be overwhelming and produce anxiety/procrastination

This writer has included the names of the author(s) and the year. This provides all information needed for in-text citations.

There are some blanks in the matrix, as not all resources will discuss every identified theme.

Then, the columns can be filled with notes, direct quotes from the sources, or just a key word that describes the view or category a specific source falls into in relation to a theme. It can be useful to utilize key words because then columns can be sorted by the key words, giving you a clear view of how the other themes do or do not track with a specific sub-theme. Creating key words also asks you to define potential sub-themes, something that should be refined the more

you add and use the matrix. This generative process will help when it comes to outlining and structuring the literature review. Below is an example of a use of key words within thematic columns with limited notes. Remember, you can also add notes along with key words, just be sure to have the key words start every column.

	A	B	C	D	E
1	Last Name	Year	Title	Vulnerability Management Theme	AI Field
2	Allodi	2014	Comparing vulnerability severity and exploits usi	Intelligent management of known vulnerabilities	No AI used
3	Bozorgi	2010	Beyond heuristics: learning to classify vulnerabili	Intelligent management of known vulnerabilities	SVM
4	Bullough	2017	Predicting exploitation of disclosed software vuln	Advanced vulnerability management with AI/Modeling	SVM
5	Dobrovoljc	2017	Predicting Exploitations of Information Systems V	Advanced vulnerability management with AI/Modeling	No AI used
6	Ekelhart	2009	Aurum: A framework for information security ris	Cybersecurity threat intelligence in organizational contexts	No AI used
7	Ekelhart	2007	Formal threat descriptions for enhancing govern	Cybersecurity threat intelligence in organizational contexts	No AI used
8	Farris	2018	VULCON: A System for Vulnerability Prioritizatio	Advanced vulnerability management with AI/Modeling	No AI used
9	Frei	2006	Large-scale vulnerability analysis	Intelligent management of known vulnerabilities	No AI used
10	Fruhwirth	2009	Improving CVSS-based vulnerability prioritization	Transforming vulnerabilities to context-aware risks	No AI used
11	Ghani	2013	Predictive vulnerability scoring in the context of i	Advanced vulnerability management with AI/Modeling	LDA (Linear Discriminant Analysis)
12	Han	2017	Learning to predict severity of software vulnerab	Advanced vulnerability management with AI/Modeling	CNN (Convolutional Neural Network)
13	Holm	2011	A quantitative evaluation of vulnerability scannin	Cybersecurity threat intelligence in organizational contexts	No AI used
14	Hong	2014	What Vulnerability Do We Need to Patch First?	Transforming vulnerabilities to context-aware risks	No AI used
15	Jajodia	2005	Topological analysis of network attack vulnerabili	Transforming vulnerabilities to context-aware risks	No AI used
16	Jimenez	2016	Vulnerability prediction models: A case study on	Advanced vulnerability management with AI/Modeling	SVM, logistic regression, and Randon
17	Kotenko	2012	The Ontological Approach for SIEM Data Reposito	Intelligent management of known vulnerabilities	No AI used
18	Li	2017	A mining approach to obtain the software vulner	Advanced vulnerability management with AI/Modeling	Tf-Idf (Term Frequency-Inverse Docun
19	Maghrabi	2017	Improved software vulnerability patching techniq	Transforming vulnerabilities to context-aware risks	No AI used
20	Mell	2005	Creating a patch and vulnerability management p	Transforming vulnerabilities to context-aware risks	No AI used
21	Munaiah	2016	Vulnerability severity scoring and bounties: Why	Advanced vulnerability management with AI/Modeling	No AI used
22	Nayak	2014	Some vulnerabilities are different than others	Intelligent management of known vulnerabilities	No AI used
23	Noel	2009	Advances in Topological Vulnerability Analysis	Transforming vulnerabilities to context-aware risks	No AI used
24	Parate	2016	Assessment of System Vulnerability for Smart Gri	Advanced vulnerability management with AI/Modeling	SVM
25	Ross	2017	Latent feature vulnerability ranking of CVSS vecto	Advanced vulnerability management with AI/Modeling	Clustering (spectral)
26	Scandariato	2014	Predicting vulnerable software components via te	Advanced vulnerability management with AI/Modeling	Naïve Bayes and Random Forest
27	Shahzad	2012	A large scale exploratory analysis of software vul	Intelligent management of known vulnerabilities	No AI used
28	Shar	2015	Web application vulnerability prediction using hy	Advanced vulnerability management with AI/Modeling	Logistic regression and Random Fore
29	Singh	2016	Quantitative Security Risk Evaluation using CVSS I	Transforming vulnerabilities to context-aware risks	No AI used
30	Spanos	2017	Assessment of Vulnerability Severity using Text M	Advanced vulnerability management with AI/Modeling	Document-term matrix (for text-mini
31	Tom	2008	Recommended Practice for Patch Management of	Cybersecurity threat intelligence in organizational contexts	No AI used
32	ur Rahman	2016	Centralized vulnerability database for organizatic	Advanced vulnerability management with AI/Modeling	No AI used
33	Yamamoto	2015	Text-Mining Approach for Estimating Vulnerabilit	Advanced vulnerability management with AI/Modeling	SLDA (Supervised Latent Dirichlet Allo
34	Younis	2014	Using Software Structure to Predict Vulnerability	Advanced vulnerability management with AI/Modeling	SVM

To sort the above example, select the column, then select sort A-Z, expand the selection when prompted, and watch the sources shift. Then, you'd be able to see if there's any connection between Vulnerability Management and AI Fields.

A few other important points about source matrices:

- Method and methodology are two common themes
- Themes often become major sections and sub-themes to subsections in written reviews
- Starting a matrix early, even when you are unsure of themes, makes it a tool for understanding literature better by thinking of larger conversations and classifications
- Don't be afraid of changing themes or adding more than the usual 3-5

For more information, see Feak, Christine B, and John M Swales. *Telling a Research Story: Writing a Literature Review*. The Michigan Series in English for Academic & Professional Purposes. Ann Arbor, Mich.: University of Michigan Press, 2009.