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The architecture of meaning

A commentary

Abstract

It is the job of the information architect to discern the internal structure of content and than give it external form to support users in constructing meaning, in relating the content to their own knowledge, needs, and purposes, and thus making sense of the content**.**

The significance of meaning

Some people in the field of Information Architecture say "it is all about content". Others say "it is all about the user". But it really **is** all about meaning. Meaning is where content and user meet. It is the job of the information architect to discern the internal structure of content and then give it external form to support users in constructing meaning, in relating the content to their own knowledge, needs, and purposes, and thus making sense of the content. This is exactly parallel to the job of the building architect, which is to discern the functions and intentions of a building's users and then give external form to these intentions and support the users' functions. If a presentation succeeds in helping users make a meaningful connection between their own values, desires, and motivations and what the presenter has to offer or wants users to do, we can speak of the *architecture of persuasion*.

Meaning resides in relationships – hierarchy, part/whole, causation, prerequisite, helpful for, to name a few. And meaning resides in structures that are built from relationships. The information architect must make these structures visible through external form. Consider the examples in Figures 1 and 2, comparing the unstructured alphabetical arrangement on Yahoo's directory site with an arrangement that makes explicit underlying conceptual relationships. If the structure is presented in such a meaningful way, users can learn just from the structure itself, not only to better navigate the site but to gain a better understanding of their information need and how it fits into a larger context. To quote from Soergel 1985

> "[A classification] gives the user a mental framework, a knowledge map, a guide through the collection of information available in the information system. (In a library where materials are arranged in a meaningful order or in a grocery store the user literally has a map of where to find what.) If the structure of such a knowledge map can be made congenial to the user's own mental framework, so much the better. But the user's framework may be less suitable, less powerful for organizing the subject matter at hand than a classification constructed through careful consideration of the foundations of the subject. The classification then ceases to be a mere tool for retrieval and becomes a powerful agent for education, enriching the user's mind. The conceptual framework developed for the external

> information system can be used to improve organization of the user's own internal information system. This takes on particular significance with an information system for children or students, since young minds are apt to absorb the organizing principles used in such a system and use them to build their own view of the world."

The representation of meaning

This little note does not claim to even begin coverage of this vast subject. (Some pointers to resources are given at the end.) Here are just four simple (as opposed to flashy), effective, but often overlooked techniques for representing meaning, illustrated with examples that are intended to further underscore the significance of meaning.

Simple hierarchies are shown best in a meaningful linear arrangement as shown in Figures 1 - 3; for further examples see the AOD Thesaurus on the Web. The key here, as well as in other forms of representation, is to express meaning through sequence. In fact, I have often seen users try to find a meaningful rationale for understanding the arrangement of a list of terms when the arrangement was simply alphabetical. More complex concept relationships can be shown through concept maps as shown in Figures 4a and b (examples from Cmap, see ICMH).

Another way for representing meaning is showing meaningful relationships through links that are clearly labeled as to their purpose and destination (Nielsen 1998). This argues for typed links. Perhaps there should be a small standard set of link types, each associated with a small, but suggestive, icon (matterform). Such a standard set of link type icons might in time enter the vocabulary of most users for quick communication. Of course, the set of link types could be extended for particular applications. Figure 5 gives an example of link types used in MetaLinks, an educational application (Murray 1998). Figure 6 illustrates the use of typed thesaurus relationships in assisting users in topic exploration (Schmitz-Esser 2001 as cited in Soergel 2001).

A third way for representing meaning is to use standard templates to represent the structure of documents (see Figure 7). To show information on products in a certain class, an ecommerce site could use a template based on the feature list used in Consumer Reports for that class of products. Templates can be shown through graphical means such as lines or light color backgrounds to mark boxes. Standard templates allow the user to quickly grasp information and extract specific meaning. As the user internalizes standard templates, she can apply them to structure other information on her own, as we discussed above.

Templates can be used to show multiple dimensions or facets of a concept or problem space, as in the product template mentioned above. The representation of such multiple dimensions is of enormous importance in helping users to construct meaning. One way to do this is to use a template or facet frame as the basis for a dialog with the user, as in a query-based decision aid for product selection (Pereira 2000). A similar dialog can be used to guide the user through a facet analysis of a bibliographic or factual query. For example, a health information system might guide the user seeking information about a health problem by asking about the body site (point to

it on an image of the body), type of symptom (select from structured list), age and gender of patient, time passed since onset, and perhaps others, and construct a query from the responses. i411.com uses a very simple but effective approach to searching yellow page data by the interaction of two facets, *business type* and *location*.

The job of the information architect: Discerning and representing meaning

Discerning the underlying structure of a unit of content is no easy task. Information architects need to be trained in methods or heuristics for doing this. Disciplines to draw on for this task include

- knowledge representation and data modeling (including the entity-relationship approach),
- classification / ontology (especially the simple but powerful principle of examining a topic from multiple perspectives or facets, see Figure 2b),
- cognitive psychology,
- problem solving (see, for example, Polya 1957), and
- instructional design.

The information architect should reuse structural knowledge expressed in facet schemes, frames, templates, data models etc. in classification schemes, textbooks, design documents for databases, document type definitions and XML schemas (especially those worked on by communities of practice), etc. For ideas on how to connect pieces of information to user concerns, one can draw on the concept of *situational relevance* (Wilson 1973).

Once the internal structure is discerned, it needs to be given external form, represented through the structure of text and images. To accomplish this task, the information architect can draw on the following disciplines, among others. Since external design is really inseparable from internal structure, many of these disciplines address the task of discerning the structure of content as well.

- Information design generally, Web design
- rhetoric and technical writing,
- journalism
- graphic design and visualization, informational graphics (graphs, tables, figures) , concept mapping
- human-computer interface design,
- document design, book design, dictionary design, map design, comic books
- advertising,
- instructional design.

For another view of fields contributing to information architecture see Info. Design.

Design of information products, be they print. documents, user interfaces, or Web sites, needs to work from the inside out, from content and purpose to form. The Web would be much more useful if designers would spend less time tinkering from the outside, inserting wallpaper backgrounds that make the pages hard to read and fancy graphics that distract, and more time on discovering the inside, discerning the structure of content, and then move to the outside, representing that structure meaningfully.

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References

AOD Thesaurus. Alcohol and Other Drug Thesaurus
(http://etoh.niaaa.nih.gov/AODVol1/Aodthome.htm)

i411.com www.i411.com

IHMC. Institute for Human and Machine Cognition. The University of West Florida
CMap concept map software. http://cmap.coginst.uwf.edu/
For another example of a concept map see
http://www.schoolnet.edu.mo/general/biology/temp/cmap/carbon.html

Info. Design. Fields that define info0rmation architecture.
http://www.infodn.com/res_field.shtml

matterform media. **QBullets**. http://www.matterform.com/qbullets/index.html (These bullets illustrate the general idea, but they actually symbolize the type of the link destination, not the type of the link or relationship itself.)

Murray, T.; Condit, C.; Haugsjaa, E. 1998. **A preliminary framework for concept-based adaptive hypermedia**. *ITS-98 workshop on WWW-Based Tutoring*.
www.cs.umass.edu/~tmurray/papers/MetaLinksITS98Wkshp/MetaLinksITS98.html.

Nielsen, J. 1998. **Using link title to help users predict where they are going**. Jacob Nielsen's Alertbox, January 11, 1998. http://www.useit.com/alertbox/980111.html

Pereira, Rex Eugene 2000. Optimizing Human-Computer Interaction for the Electronic Commerce Environment. Journal of Electronic Commerce Research 1(1), 2000
http://www.csulb.edu/web/journals/jecr/issues/20001/paper5.htm

Polya, G. How to solve it. 2nd ed., Princeton University Press, 1957. For a summary see
http://www.cis.usouthal.edu/misc/polya.html

Schmitz-Esser, Winfried 2001
SERUBA - A new search and learning technology for the Internet and intranets. In Classification for User Support and Learning. *Advances in Classification Research. Volume 11.* Information Today. To appear late 2001.

Soergel, Dagobert 1985. **Organizing information. Principles of data base and retrieval systems.** Orlando, Fl: Academic Press; 1985. 450 p. P. 249.

Soergel, Dagobert 2001. ASIS&T SIG/CR 2000. Classification for User Support and Learning. To appear in Bulletin of ASIST February/March 2001 and in Knowledge Organization, first 2001 issue

Wilson, Patrick. 1973. "Situational Relevance" Information Storage and Retrieval vol. 9 no. 8, p.457-471

Zeilik, Michael. Concept mapping. http://www.wcer.wisc.edu/nise/cl1/flag/cat/catframe.asp select Concept mapping

Some classics and other resources on design

Tufte, E. (1983). The Visual Display of Quantitative Information. Cheshire, CT: Graphics Press.

Hyerle, David . Visual Tools for Constructing Knowledge. Assn for Supervision & Curriculum; 1996. 139 p.
http://www.ascd.org/readingroom/books/hyerle96book.html

Schriver, K.A. (1997). Dynamics in Document Design. New York: Wiley Computer Publishing. (Design recommendations based on empirical work and findings)

Garcia, Mario. Redesigning Print for the Web. Hayden Books; 1997. 400 p.
See other journalism resources on http://www.mariogarcia.com/english/books/index.html

Carliner, Saul. Models, Processes, and Techniques of Information Design.
http://web.bentley.edu/empl/c/scarliner/id/

Visual journalism resource file. http://www.poynter.org/Visual/

Sullivan Patricia. Practicing safe visual rhetoric on the web.
http://austen.english.purdue.edu/handa.html

McCloud, Scott 1993 Understanding Comics. Kitchen Sink Press; 1993 (Reprint ed1994). 224 p.

McCloud, Scott 2000. Reinventing Comics. Harper Perennial Library; 2000. 256 p.
See also http://www.scottmccloud.com/

On the interaction of images and text

Culbertson, H. M. (1974). Words vs. pictures: Perceived impact and connotative meaning, Journalism Quarterly, 51(Summer), 226-237.

Braden, R.A. (1993). Examining visual verbal relationships. In: R.A. Braden (Ed.), Art, Science & Visual Literacy: Selected Readings from the Annual Conference of the International Visual Literacy Association (pp. 229-238). Blacksburg, Va.: Virginia Polytechnic Institute and State University.

Reinking, D. and Chanlin, L-J. (1994). Graphic aids in electronic texts. Reading Research and Instruction, 33(3), 207-232.

Scott, L.M. (1994a). Images in advertising: The need for a theory of visual rhetoric. Journal of Consumer Research, 21(September), 252-273.

Craig, R. (1992). Advertising as Visual Communication. Communication, 13(3), 165-179.

Bodner, G.R. (1992). Approaching the illustrated text. In G.E. Sadler (Ed.), Teaching Children's Literature: Issues, Pedagogy, Resources (pp. 72-79). New York: The Modern Language Association of America.

More links on concept mapping

Concept mapping. http://ase.tufts.edu/cte/occasional_papers/concept-map.htm

The Educational Development Resource Centre. Concept Mapping Resources. http://158.132.100.221/CMWkshp_folder/CM.ResFolder.html

Plotnick, Eric 1997. Concept Mapping: A Graphical System for Understanding the Relationship Between Concepts. ERIC Clearinghouse on Information Technology; June 1997. http://askeric.org/ithome/digests/mapping.html

http://dmoz.org/Reference/Knowledge_Management/Knowledge_Creation/Concept_Mapping/

Arts & Humanities Literature, Photography...	**News & Media** Full Coverage, Newspapers, TV...
Business & Economy B2B, Finance, Shopping, Jobs...	**Recreation & Sports** Sports, Travel, Autos, Outdoors...
Computers & Internet Internet, WWW, Software, Games...	**Reference** Libraries, Dictionaries, Quotations...
Education College and University, K-12...	**Regional** Countries, Regions, US States...
Entertainment Cool Links, Movies, Humor, Music...	**Science** Animals, Astronomy, Engineering...
Government Elections, Military, Law, Taxes...	**Social Science** Archaeology, Economics, Languages...
Health Medicine, Diseases, Drugs, Fitness..	**Society & Culture** People, Environment, Religion...

Figure 1a. **Yahoo classification. Home**

Reference and General Interest	Subjects
Reference Libraries, Dictionaries, Quotations.	**Science** Animals, Astronomy, Engineering...
Computers & Internet Internet, WWW, Software, Games	**Health** Medicine, Diseases, Drugs, Fitness..
	Social Science Archaeology, Economics, Languages..
	Society & Culture People, Environment, Religion...
	Government Elections, Military, Law, Taxes...
	Business & Economy B2B, Finance, Shopping, Jobs...
News & Media Full Coverage, Newspapers, TV...	**Education** College and University, K-12...
Entertainment Movies, Music, Humor, Cool Links ...	**Arts & Humanities** Literature, Photography ...
Recreation & Sports Sports, Travel, Autos, Outdoors...	
Regional Countries, Regions, US States ...	

Figure 1b. **Yahoo Classification. Home. Meaningful arrangement**

Home > Health

Categories

Alternative Medicine (480) Business to Business@ Chats and Forums (52) Children's Health (153) Conferences (19) Death and Dying@ Dentistry@ Disabilities@ Diseases and Conditions (7392) Education (39) Emergency Services (236) Employment (108) Environmental Health (194) First Aid (14) Fitness (166) General Health (81) Health Administration (65) Health Care (356) Health Sciences (26) Hospitals and Medical Centers (38) Institutes (34) Law@ Long Term Care (116) Medicine (4955)	Men's Health (30) Mental Health (682) Midwifery (60) News and Media (201) Nursing (431) Nutrition (207) Organizations (21) Pet Health@ Pharmacy (1096) Procedures and Therapies (292) Public Health and Safety (740) Reference (93) Reproductive Health (659) Senior Health (79) Sexuality@ Shopping and Services@ Teen Health (13) Traditional Medicine (179) Travel Health and Medicine (16) Web Directories (50) Weight Issues (77) Women's Health (153) Workplace (6

Figure 2a. **Yahoo classification. Health.**

Home > Health

Categories

Reference
Reference (93)
Web Directories (50)
News and Media (201)
Chats and Forums (52)

Health Sciences Fields
Health Sciences (26)
Medicine (4955)
Dentistry@
Nursing (431)
Midwifery (60)
Pharmacy (1096)

Traditional Medicine (179)
Alternative Medicine (480)

Individual health condition
Diseases and Conditions (7392)
Disabilities@
Fitness (166)
Nutrition (207)
Weight Issues (77)
Reproductive Health (659)
Sexuality@
Death and Dying@
Mental Health (682)

Procedures and Therapies (292)

Health by place
General Health (81)
Public Health and Safety (740)
Environmental Health (194)
Workplace (6)
Travel Health and Medicine (16)

Health by population group
Children's Health (153)
Teen Health (13)
Women's Health (153)
Men's Health (30)
Senior Health (79)
Pet Health@

Health Care (356)
Emergency Services (236)
First Aid (14)
Long Term Care (116)

Health care organization
Hospitals and Medical Centers (38)
Institutes (34)
Organizations (21)
Conferences (19)
Health Administration (65)

Shopping and Services@
Business to Business@
Law@

Education (39)
Employment (108)

Figure 2b. **Yahoo classification. Health. Meaningful arrangement**.

<art genres>
- academic art
- amateur art
- apocalyptic art
- art brut
- children's art
- commercial art
- community art
  - SN Includes art undertaken in conjunction with particular communities, often socially deprived, usually with the idea of producing an effect or inspiring response specifically within those communities, with no reference to widely established standards. For art intended to beautify or enrich public places, use **public art**.
- computer art
- court art
- crafts
- cybernetic art
- didactic art
- dissident art
- ethnic art
- fantastic art
- figurative art
- folk art
- funerary art
- naive art
- nonrepresentational art
- primitive art
- public art
  - SN Use for art whose purpose is to beautify and enrich public places. For art undertaken in conjunction with particular communities, usually to produce an effect or inspire response specifically within those communities, use **community art**.
- rock art
  - cave art
- serial art
- sofa art
- street art

a. **Original alphabetical sequence**

art genres

art genres by content or other intrinsic characteristics

- figurative art
  - fantastic art
  - apocalyptic art
- nonrepresentational art
- cybernetic art
- serial art
- crafts

art genres by standard

- academic art
- folk art
- dissident art

art genres by type of artist or origin

- amateur art
- naive art
- art brut
- children's art
- computer art
- ethnic art
- primitive art

art genres by audience, purpose, or display context

- sofa art
- court art
- public art
  - SN Art whose purpose is to beautify and enrich public places.
  - community art
    - SN Public art undertaken in conjunction with particular communities, often socially deprived, usually with the idea of producing an effect or inspiring response specifically within those communities, with no reference to widely established standards.
  - street art
- rock art
  - cave art [prehistoric, esp. paleolithic]
- didactic art
- commercial art
- funerary art

b. **Suggested meaningful sequence**

Figure 3. **Example from the Art and Architecture Thesaurus**

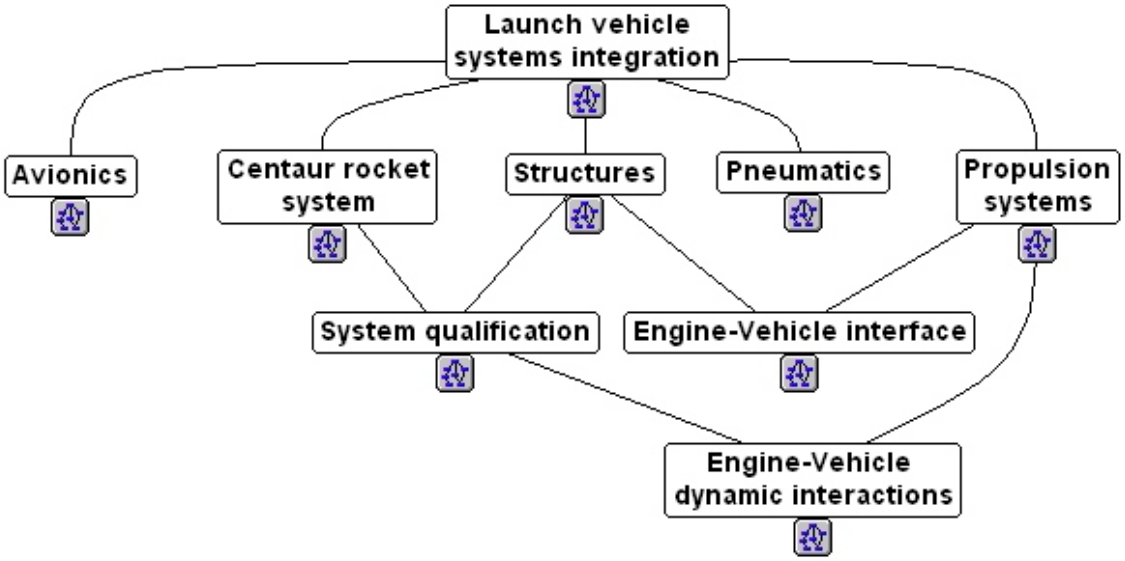

Figure 4a. **Overview concept map**

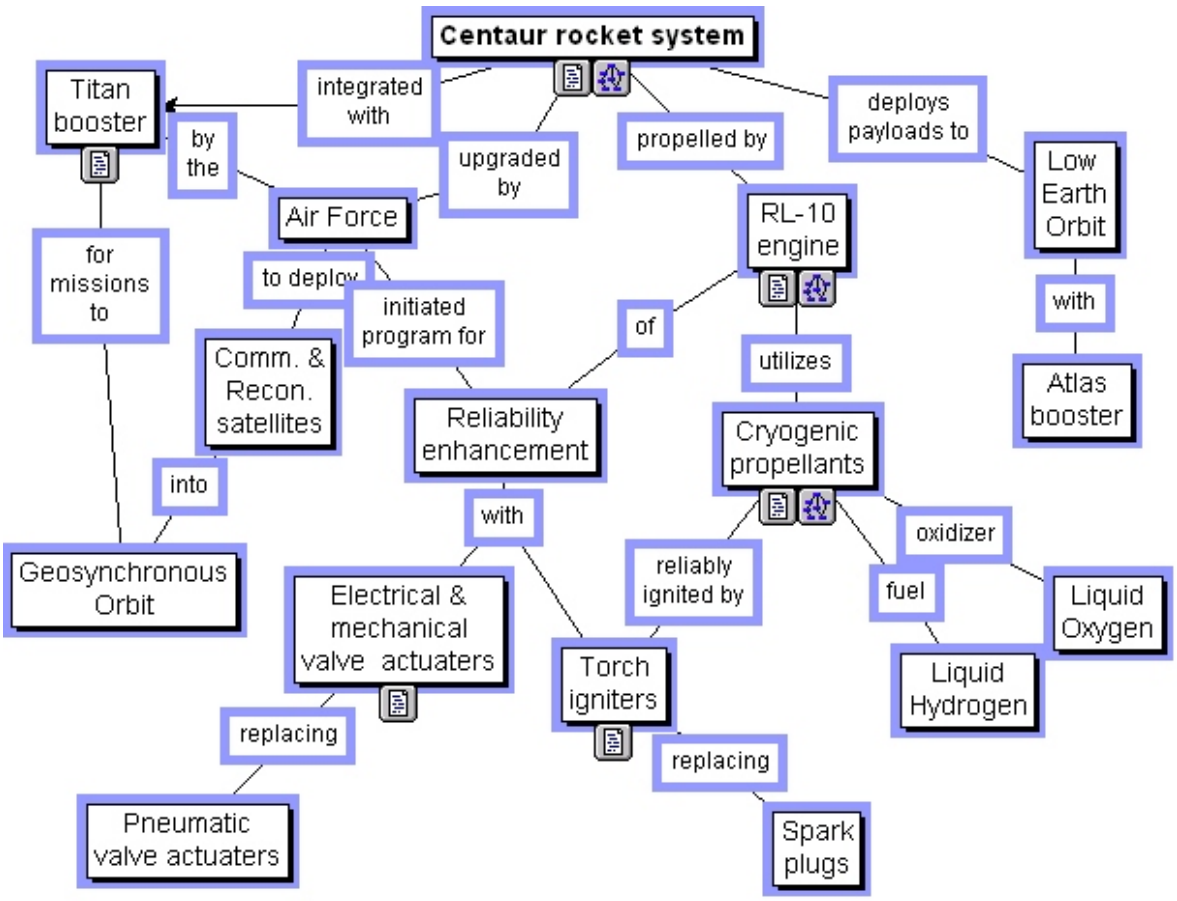

Figure 4b. **Detailed concept map.**

What do I need to know first?
Where in the world?
How is it measured?
I want to try it
Related phenomena
Are scientists sure?
Please explain deeper

Figure 5. **Some link types used in an online geology text**

telecommuting	
is narrower concept of	labor new ways of working and living
is broader concept of	mobile telecommuting alternating telecommuting
is instrumental for	organizing work effectively
causes	flexible work time energy conservation
is beneficial for	virtual organizations combining family and work
is detrimental to	face-to-face contacts
by instruments	telecommuting workplaces online technology

Figure 6. **Thesaurus entry with typed relationships**

CONIGRAVE KM abstract 1049

Conigrave KM, Saunders JB, Reznik RB. Predictive capacity of the AUDIT questionnaire for alcohol related harm. Addiction 90 (1995) 1479-1485.

'**AUDIT can predict a range of harmful consequences of alcohol consumption**'

Background

Drinking problems often are not recognized. Early diagnosis is important for early prevention measures. In 1989, the WHO published a brief 10-item screening questionnaire, the Alcohol Disorders Identification Test (AUDIT) specifically designed for early identification of problem drinkers. This study examined the ability of the AUDIT questionnaire to predict which subjects experience medical or social harm from their drinking.

Methods

350 patients who attended a hospital emergency ward in 1984-1985 underwent a comprehensive assessment of medical history, alcohol use, dependence and related problems in an interview schedule; the AUDIT questions were interspersed among other items. 250 subjects were interviewed again after 2-3 years. Interviewers were blind to the results of the initial assessment. AUDIT was examined for its ability to predict a number of end-points including alcohol-related medical disorders, health care utilization, social problems and hazardous drinking at the time of follow-up.

Results

Of those who scored 8 or more on AUDIT at the initial interview, 61% experienced alcohol-related social problems compared with 10% of those with lower scores. They also reported more frequently alcohol-related medical disorders and hospitalization. The AUDIT score was a better predictor of social problems and of hypertension than laboratory markers. Its ability to predict other alcohol-related illnesses was similar to the laboratory tests.

Conclusions

AUDIT is a brief and convenient questionnaire which can readily be incorporated into the standard medical history. It can predict a range of harmful consequences of alcohol consumption. AUDIT should prove a valuable tool in screening for hazardous and harmful alcohol use so that intervention can be provided to those at particular risk of adverse consequences.

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Adapted from *Alcohol Research*

Figure 7. **An extended abstract shown in a document template**