

Approaches to Providing Context in Knowledge Representation Structures

Barbara H. Kwaśnik
School of Information Studies
Syracuse University, Syracuse, NY, USA
bkwasnik@syr.edu

International UDC Seminar in Classification and Ontology
The Hague, September 19, 2011

Why we create knowledge-representation structures

The endeavor of creating knowledge-representation structures aims to:

- Represent both explicit and implicit knowledge;
- Contextualize that knowledge so that the meaning is clear;
- Use the structures to communicate; and
- Do this by showing relationships in a useful way.

Contextualization

- Can be confusing to describe
- Can refer to design or customization for a particular context (thereby reflecting that context) and also
- Refers to a strategy in knowledge representation of providing meaning by viewing or understanding something in a particular context.

Context and warrant

One way to construe context in knowledge structures is to view it through the lens of “warrant.”

As Clare Beghtol (1986) explained

...the warrant of a classification system can be thought of as the authority a classificationist invokes to first justify and subsequently to verify decisions about what class/concepts should appear in the schedules...

She outlined several kinds of warrant: literary, scientific, educational, and cultural.

In other words...

- Invoking warrant means that the resulting classification should be seen as reflecting the entities and relationships of the community applying such warrant.
- For example, a university library collects works to support its mission. To the extent that the knowledge structure used to describe and organize such works harmonizes with the mission, all is well.

Things are shifting rapidly

- Traditional knowledge structures assumed a certain stability.
- Yes, we want our systems to be flexible and agile in the face of change, but it takes more than a willing attitude.
- I'll try to give a few examples of how the representational challenges are daunting, especially when considered from the perspective of contextualization.

Two cases

- My university, Syracuse University, as a classification problem, seen in the light of a shifting higher-education landscape that makes older contexts no longer sufficient.
- “Living together” as a concept full of contextual nuance, making it very difficult to represent with sufficient richness.

Schools and Colleges at SU

- Architecture
- Arts and Sciences
- Citizenship and Public Affairs
- Education
- Engineering and Computer Science
- Information Studies
- Law
- Management
- Public Communications
- Sport and Human Dynamics (formerly Human Ecology)
- Visual and Performing Arts

Mergers, changes, shifts

- School of Social Work -> Human Ecology -> Sport and Human Dynamics
- Computer Science: Where is its home?
- Arts and Sciences *vs.* Visual and Performing Arts *vs.* Public Communication
- School of Information Studies – “A Faculty of One”

The courses

- If you consider the courses to be the entities within the framework of the colleges and schools, then you begin to see the challenge.
- Traditional curricula, and traditional academic accounting, fostered silos – or fiefdoms.
- Three contextual changes make it not so easy to fit the curriculum into traditional academic categories:
 - The challenge to canonical views
 - The necessity to link to practice; and
 - The call for integration.

Different ways of handling the classificatory challenge

- **Cross Listing (and Cross Teaching)**
 - “Leonardo da Vinci: Artist and Engineer”
- **Integration:**
 - “Ethics” – across the curriculum
- **Distinction:**
 - The case of “girl education”
- **Mapping Knowledge to Practice**
 - The case of Forensic Science

Ethics across the curriculum

- In response to the Chancellor's mandate for "facing the community" and "scholarship in action," topics such as ethics now appear in several dozen courses. Among them:

Some courses dealing with ethics

Ethical Aspects of Engineering and Computer Science

Industrial Design: Philosophy and Ethics

Editorial Ethics and the Business of Magazines

Estate Planning

Museum Studies

Ethics of Advocacy (in the *Public Relations Dept.*)

Bioethics: Technology/Science/Human Rights (*in the
Philosophy Dept.*)

Ethics of the Health Professions (*in the Religion Dept.*)

Classificatory questions to ask

- What is the essence of this course?
- Is the consideration ethics the core of the course or is it secondary?
- Is the course *about* ethics *per se*, or is does it use ethical instances among many others?

In the context of a university, why does this matter?

- Intellectual ownership: Who assumes care for the concept of ethics in these courses?
- Who teaches the course – a person expert in ethics or in the subject area of the course?
- The tension between depth and “knowing a little.”
- Can there be economies in teaching ethics centrally? (Generally the answer is “no”).
- How can a Department of Ethics add value and itself be valued in such diffusion?

Does integration have unexpected consequences?

- Good on us that “ethics” is now integrated across the curriculum, but does this weaken the perception of ethics as a disciplinary focus in its own right?
- The integration of management, research methods, information technology and “new media”, among others ensures that they are now “contextualized” in many courses across the curriculum. But, where is their home and does it matter?
- In other words, how can integrated subjects be represented more truly in our curriculum representations?

Ontological commitments

In her 1997 article on definitional approaches for classification, Elaine Svenonius introduces the notion of ontological commitments:

Different approaches to definition make different ontological commitments... [Assumption] that the hierarchical structures ... represent an isomorphic model of the real world. The linguistic approach assumes ... knowledge of language use. Ontological commitment... bears on the degree to which thesauri and classifications are able to represent knowledge of the reality (p. 13).

“Girls’ Education”

- In Public Policy, this concept is used to compactly describe a phenomenon that is of use in building economic models of developing countries – in essence, just another variable among many other modeling variables.
- In Education, this describes the cognitive and social impacts of the process of educating girls.

Representing ontological commitments

- The disambiguation of the concept in this case is totally dependent on understanding the ontological commitments of the two domains.
- What should a student expect of a course titled: “*Girls’ Education in the Developing World*”? How could the ontological commitment intended in this course be better represented?

Forensic Science: complexity of mapping

- There are many examples, though, of successful blends of ontological commitments: Archival Studies, Physical Education, Environmental Studies, and so on.
- I'll present the example of Forensic Science -- the use of science to help solve crimes – because it produces so many ontological intersections. In Forensic Science several academic worlds are called upon to support a specified set of professional practice.

A selection of courses in the Forensic Science curriculum

Forensic Anthropology

Human Osteology

Forensic Entomology

Forensic Chemical Analysis

Forensic Linguistics

Forensic Evidence

Forensic Psychology

These courses are then mapped

- The Forensics student's program of study is not based on the supporting and contributing disciplines, however, but rather on a prescribed sequence of professional practice:

Identification of crime →

Collection of evidence (autopsy, traces) →

Analysis of evidence →

Support of the preparation of a legal case

What, when, and where

- There is not, as far as I can tell, a fundamental issue with conflicting ontological commitments.
- What is needed here is a mapping of the particular parts of, say, entomology, that bear on the forensic approach.
 - Which part of entomological knowledge is important to learn?
 - When does this knowledge get invoked?
 - Which part of the forensic process requires it?

The challenge

- The modern university is an exciting place with many opportunities for extending knowledge in a number of directions.
- The fragmentation of “knowledge” and “practice,” however, does not encourage integration.
- At the same time students (and scholars, too) are increasingly satisfied with dabbling, or at the other extreme, profound specialization.

“Living together”

- A subject exceptionally rich in contextual nuance. It is a cultural, legal, and personal phenomenon.
- The warrant and ontological commitments are exquisitely dependent on the domain in which the subject is being invoked.
- Often, the *meaning* is created not from any surface understanding of people sharing a dwelling, although that may be important, but from the significance of the activity *vis à vis* the rest of society.

Dewey Decimal Classification (22nd) – Under “Culture”

- 306 Culture and institutions
- 306.8 Marriage and family
- 306.84 Types of marriage and relationships
- 306.841 Cohabitation [formerly 306.735]**
- 306.842 Marriage by number of spouses
- 306.843 Interreligious marriage
- 306.845 Intercultural marriage
- 306.846 Interracial marriage
- 306.848 Same-sex marriage

DDC22 seems to capture the modern sense

- Note first, the concept has been moved here under marriages and relationships.
- The co-location is neutral and general – could apply to any culture. It's not judgmental.
- Seems to draw its warrant from anthropology and sociology.

From a classification point of view...

- Achieving ontological neutrality requires that the defining criteria for categories are perhaps atheoretical – a reliance on observables only, without implications of what the classification means.
- DDC has many instances of such neutral, key-like, placements. For example, baseball falls under “games in which a ball is hit by a bat” – placing it in a category with a rather diverse set of games.
- One can speculate that classifying baseball using some theory of games might not meet with consensus.

DDC2 – Under “Customs”

390 Customs, etiquette & folklore

391-394 Customs

392 Customs of life cycle and domestic life

[including chaperonage]

392.1 Customs of birth, puberty, majority

392.3 Customs relating to dwelling places and domestic arts

392.4 Courtship and engagement customs

392.5 Wedding and marriage customs

392.6 Customs of sexual relations

A gentle, detached interpretation

- Here we see “living together” as one of many customs dealing with courtship, weddings, dwellings, and phases of the life cycle.
- Again, a detached, almost anthropological view – no hint of “living in sin.” Treated as a fact of life, with no comment implied.
- Does not dip into the legal or religious ontological commitments.
- Does such neutrality constitute admirable restraint or a classificatory gap?

HQ803.5 in LCC:

A dysfunctional neighborhood

- HQ 803 Temporary marriage. Trial marriage.
Companionate marriage
- HQ 803.5 **Unmarried couples. Cohabitation**
(HQ 804) Breach of promise
[see Class K] (i.e., has been moved)
- HQ 805 Desertion
- HQ 806 Adultery
- HQ 809-809.3) Family violence [see HV6626
Divorce

HQ800s:

A classificatory muddle?

- Are these outdated ontological commitments? Two classes have already been moved out: *Breach of promise* and *Family violence*.
- We see a classificatory muddle. Whose view of living together is this?
- Does the warrant once used to establish this class continue to create a useful collocation of subjects?

BX1795

- Within the religion section we find BX1795, which is dedicated to works on the Catholic viewpoint on several dozen subjects.
- A quirky “A to Z” shelisting convention of the LCC produces subjects arranged in alphabetical order contextualized by nothing at all, except that the Catholic Church has an opinion about them. Here’s the section where *cohabitation* falls:

U got ontological commitment?

BX1795.B84 Bullying

BX1795.C35 Capitalism

BX1795.C48 Childbirth

BX1795.C58 Civil rights

BX1795.C64 Cohabitation

BX1795.C67 Communication

BX1795.C68 Compulsive behavior

BX1795.C69 Controversies

BX1795.C85 Culture

Cohabitation in Jewish Law:

Impediments to marriage

KBM 544.2 Consanguinity and affinity.

Incest...KBM 544.6 Bigamy

KBM 544.7 Adultery

Performance of marriage

KBM 546.16 Consummation. Bi'ah

KBM 546.17 Irregular and de facto marriages.

Unmarried cohabitation. Concubinage.

Pilegish. Common law marriages

KBM546.18 Validity and effect of civil marriages

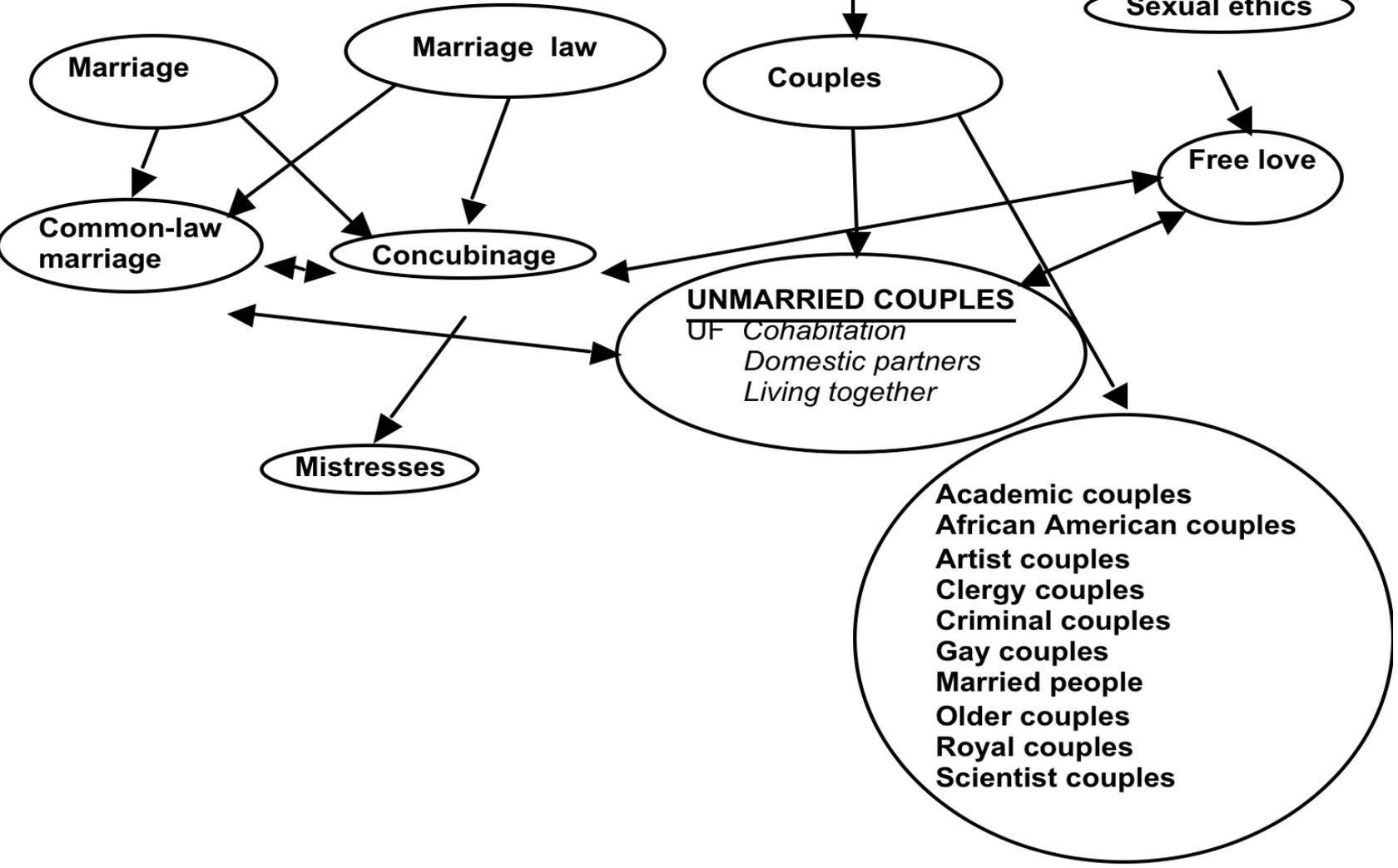
KBM546.2 Interfaith marriage. Marriage to non-Jews

Ontological commitment crystal clear

- Logic made clear by strong system of headings and relationships.
- Ontological commitment is to Jewish religious law, and that's all.
- Deals with legalities and not morals or social norms.

Interpersonal relations

Sexual ethics



Just another kind of couple:

“Unmarried couples” is the term used in LCSH (used for *cohabitation, domestic partners, and living together*). As such it joins this enumerated list of kinds of couples:

Academic couples

Artist couples

Criminal couples

Married people

Royal couples

African-American couples

Clergy couples

Gay couples

Older couples

Scientist couples

But the neighborhood can change abruptly

- In one easy step, the term “*unmarried couples*” is linked to “*free love*” and from there into the land of “*sexual ethics.*”
- In two easy steps, we find “*concubinage,*” “*mistresses,*” and “*common-law marriage.*”

Why is it this way?

- You can see the representation is incomplete, and selective.
- It's interesting to see what is included, and what isn't.
- The LCSH is a mishmash of terms and relationships built up incrementally. The choice of entities is based on literary warrant. The choice of relationships is based on....?

A bit of an ontological mess

- From a classification point of view, the core concept is not very well differentiated by its linkages and relationships.
- The hierarchical relationships are fairly well communicated but very inconsistent
- The related-term relationships are unspecified. We don't know how or why the subject of *unmarried couples* is linked to *free love* and *common-law marriage*.

Conclusion

- The examples I've presented are typical in that they assume a certain stability. They are built using schemes meant to endure, rather than flexible and adaptive structures.
- The schemes change, but still have difficulty in capturing situated meaning.

What we need

- The ability to represent the changing and various ontological commitments of concept such as *cohabitation*;
- A way of mapping the particular professional warrant brought to bear on subjects of blended ontological commitments, such as Forensic Science.
- We should have a way of understanding the scope of situated subjects, such as *girls' education*.

Representing context

- In short, what is needed is a way of reflecting the rich dimensionality of subjects as they change over time and reveal different facets in the light of particular contexts.
- In this way, our knowledge structures will be better able to represent, contextualize, and communicate.

References

Beghtol, C. (1986). Semantic validity: concepts of warrant in bibliographic classification systems. *Library Resources & Technical Services*. 30, pp. 109-25.

Dewey Decimal Classification. Edition 22. (2003). Available at:
<http://connexion.oclc.org/>.

Library of Congress Authorities. Accessed 5 March 2011. Available at:
<http://authorities.loc.gov>

Library of Congress Classification. Accessed April 5, 2011 through Classification Web <http://classificationweb.net/> Available from the Cataloging Distribution Service, Library of Congress Bibliographic Products and Services.

Svenonius, E. (1997). Definitional approaches in the design of classification and thesauri and their implications for retrieval and automatic classification. In: *Knowledge Organization for Information Retrieval*. Edited by L.C. McIlwaine. The Hague, Netherlands: International Federation for Information and Documentation (no.716), pp. 12-16.

Questions?

