Using Upper Ontology Partitions to Address Context

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Agenda

• Introduction – what we aim to achieve
• Example: slides presented at FOUST II
  – Extending Upper Ontology Partitions to Address Contextually Determined Concepts
  – FOUST II, JOWO, Bolzano, Sept 2017
• Open issues and questions from that work
• Discussion and comments
• Strategize for this Track – speakers, topics
Background

• Ontology Summit
  – 2018 Theme = Context
  – Weekly sessions
    • 3 or 4 “Tracks”
    • From early January through to the Face to Face Symposium in Spring
  – This Track: Use of Upper ontology / Partitioning in defining (one notion of) Context
Outcomes

• **This session: Strategize for this Track:**
  – Context treatments in Upper Ontology

• **Research requirements for this track**
  – Topics to cover
  – Finding speakers
Figure out:

• What we mean by this
• How to get the widest possible participation and present on these aspects of Context
  – Different upper ontologies
  – Different treatments of “Context” like partitions in various TLOs
  – Applying Context in this way, in practical problem solving
  – What else?
The Search for Context

• Context is something with a
  – What, when, how etc.
  – See Jack Ring’s slide from last week
• “Meaning is Context”
  – What does this even mean?
"The FAA predicts 400,000 to 2.3M licensed Part 107 remote pilots by 2020”
- FAA Air Traffic Organization
Policy: Order JO 7200.23
Why we Need Context

• And why we should be able to get rid of it

• Words and their meanings (Dictionary)

• Data elements semantics (Data Dictionary)
Dictionary
bank

/baŋk/

noun

1. the land alongside or sloping down to a river or lake.
   "willows lined the bank of the stream"
   synonyms: edge, side, embankment, levee, border, verge, boundary, margin, rim, fringe, fringes, flank, brink, perimeter, circumference, extremity, periphery, limit, outer limit, limits, bound, bounds; More

2. a long, high mass or mound of a particular substance.
   "a grassy bank"
   synonyms: slope, rise, incline, gradient, ramp, acclivity, tump; More

verb

1. heap (a substance) into a mass or mound.
   "the rain banked the soil up behind the gate"
   synonyms: pile (up), heap (up), stack (up), make a pile of, make a heap of, make a stack of; More

2. (with reference to an aircraft or vehicle) tilt or cause to tilt sideways in making a turn.
   "the plane banked as if to return to the airport"
   synonyms: tilt, lean, tip, slant, incline, angle, slope, list, camber, pitch, dip, cant, put/be at an angle
   "she taught him how to bank the plane"
bank

noun
noun: bank; plural noun: banks

1. a financial establishment that uses money deposited by customers for investment, pays it out when required, makes loans at interest, and exchanges currency.
   "a bank account"
   synonyms: financial institution; More

   • a stock of something available for use when required.
     "a blood bank"
     synonyms: store, reserve, accumulation, stock, stockpile, inventory, supply, pool, fund, cache, hoard, deposit; More

   • a site or receptacle where something may be deposited for recycling.
     "a paper bank"

   • the store of money or tokens held by the banker in some gambling or board games.
     noun: the bank

   • the person holding the bank in some gambling or board games; the banker.

verb
verb: bank; 3rd person present: banks; past tense: banked; past participle: banked; gerund or present participle: banking

1. deposit (money or valuables) in a bank.
   "she may have banked a cheque in the wrong account"
   synonyms: deposit, pay in; More

   • have an account at, deposit one's money with, use, be a customer of, deal with, do business with

   • have an account at a particular bank.
     "the family has banked with Coutts for generations"

   informal
   win or earn (a sum of money).
   "he banked £100,000 for a hole-in-one"

   • store (something, especially blood, tissue, or sperm) for future use.
     "the sperm is banked or held in storage for the following spring"
Data Dictionary

joint stock company

**Definition:** 1. In the UK, the original (17th century) name for a corporation in which the liability of the owners is limited to the nominal value of the stock (shares) held by them. 2. In the US, a corporation with unlimited liability for the shareholders. Investors in a US joint stock company receive stock (shares) which can be transferred, and can elect a board of directors, but are jointly-and-severally liable for company's debts and obligations. A US joint stock company cannot hold title to a real property.

In an ontology you would not see this since each data class definition reflects a different concept
Dictionaries

• The “Meaning” of something that can be said to have meaning, is highly contextually determined...

• What about the “Meaning” of a Concept
  – Clarify what we mean (sic) by Concept
  – Concepts should not have meaning, they are meaning (they are the intensional representation of some thing or things in the world)
“Meaning is Context”

• The meaning of a word or a data term is contextually dependent
• A concept is a concept
  – I would argue there is no such thing as a concept, the meaning of which is contextually determined
  – If a concept still needs context to interpret it, then it is not an adequately defined concept
• Dictionary / data dictionary: interpretation requires context
• Ontology: the concepts are all included
  – In one sense, everything in the ontology provides the context for everything else

The role of the ontology is to make the context problem go away!
Example of Upper Ontology Use

• One kind of Context: Mediating Thing
  – Example – Client data
• Presentation given at FOUST II, JOWO, Bolzano, Sept 2017
  – Use of Mediating Thing as Context for Client Data
  – Bennett, Hasse and Gilmore
• Identified some questions that would benefit from further exploration
  – Not all contexts are Mediating Things
  – Hierarchies of Mediating Things
  – Need to relate this to more formal theory of contexts
=== Start of FOUST Slides ===
Context-dependent data stores

Integration issues arise from:
- perspective / context
- terminology mismatch
Context-dependent data stores

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- perspective / context
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Business Entity

Bank perspective on Customer

CRM\textsubscript{1}, CRM\textsubscript{2}, CRM\textsubscript{3}, ..., CRM\textsubscript{n}
What is the Context?

There are various points at which the bank interacts with a given person (customer for various products).
Contextual and Non-contextual Data

Bank B

Customer ABC Data
- Full name
- Customer ID
- Purchase date
- Phone
- Address Line 1
- ...
- City
- ZIP Code

Customer DEF Data
- First name
- Family name
- Customer ID
- Drawdown date
- Credit rating
- Address
- ...

Customer GHI Data
- Name
- Customer ID
- Date of Birth
- Purchase date
- Phone
- Address Line 1
- ...
- ZIP Code

Person P
Introducing the Sowa upper level partitions
  – As adapted for FIBO
  – Not formally part of published FIBO
Specifically the “Relatives” partition (lacks a nice name)
This is one of 3 sets of partitions we use

By ‘partition’ here, we mean one of a set of mutually exclusive sets of things into which the domain of discourse may be fully divided according to some principle
  – Others are e.g. occurrent versus continuant
Upper Ontology Partitions

• **Independent** categories are characterized by monadic predicates defined in terms of some entity \( x \) by itself (including its inherent parts and properties) and not in terms of anything external to \( x \).

• **Relative** categories are characterized by dyadic predicates that relate an entity \( x \) to some external entity \( y \) that can exist independently of \( x \).

• **Mediating** categories are characterized by triadic or higher predicates that show how an entity \( x \) mediates two or more entities \((y,z,\ldots)\) and thereby establishes new relationships among them.
The ‘Relatives’ Partition

• Everything which may be defined falls into one of three categories:

  - **Independent Thing**
    - “Thing in Itself”
    - e.g. some Person

  - **Relative Thing**
    - Thing in some context
    - e.g. that person as an employee, as a customer, as a pilot...

  - **Mediating Thing**
    - Context in which the relative things are defined
    - e.g. employment, sales, aviation
Definitions: FIBO Conceptual Framework

• **Independent Thing:** a thing in its own right

• **Relative Thing:** A thing defined specifically and only in relation to some context.

• **Mediating Thing:** A thing which brings together two or more independent things into some relation, usually resulting in their being defined as Relative Things.
"played by" relationship:
That which performs the role of the "Relative Thing"
The ‘Relatives’ Partition

“In context” relationship:
Context in which the Independent Thing performs the role of the “Relative Thing”
The ‘Relatives’ Partition

- Everything which may be defined falls into one of these three categories
- In order to complete a model of business terms and definitions, all three are needed
- This extends beyond conventional ontology applications into a full and legally nuanced conceptual ontology
Extending to Products and Customers
Tying this to the Example
Migrating Kinds of Data

Independent Thing

Customer ABC Data
- Customer ID
- Purchase date
- Contact Phone

Customer DEF Data
- Customer ID
- Drawdown date
- Application Credit rating

Customer GHI Data
- Customer ID
- Purchase date

Person P Data
- First name
- Family name
- Current Credit rating
- Date of Birth
- Home Phone

Relative Things

Address
- Address Line 1
- ..
- Address Line n
- City
- State
- ZIP
Subsequent Refinement

• Actually
  – playedBy relation may sometimes be another Relative Thing
  – inContextOf is sometimes an Independent Thing

• Promoted both to Thing
  – Comparable with BFO
  – Not all contexts are “Mediating Thing”
MediatingThingasContext

• Not all relative things are relative to a thing that we would consider as a mediating thing, – but contexts always create relative things – Mediating Thing is one kind of context in that it brings together 2 or more things in defined roles or functions

• Includes business areas, process workflow, customer ad client relationships etc.
Hierarchy of Contexts: Customer

- Legal Person
- Natural Person
- Organization

Bank Client

- Retail Customer
  - Current Account Holder
  - Loan Borrower

Bank Client Relationship

- Retail Customer Relationship
  - Current Account Relationship
  - Loan Relationship
Conclusions

• Mediating Things are one kind of Context
• The context of a Relative Thing is not always a Mediating Thing
  – E.g. sides or aspects of a Thing
• Mediating Things are things which are and only are contexts
  – They bring 2 or more other things into defined (conceptual) relations and roles (Relative Things)
• Hierarchy of Mediating Thing contexts
• Everything in the ontology is the context for something
• Nothing in the ontology “needs” context to understand it – that’s what the ontology itself is for!
=== End of FOUST Slides ===
Issues Arising

• The context of a Relative Thing is not always a Mediating Thing
  – Anything may be a Context
  – Relative Thing may be an aspect or side of a thing
  – Presumably there are other things like this

• Mediating Things may be disposed in a hierarchy

• Need to relate this to more formal theory or theories of contexts
Independent Thing as Context
ISO 15944-4
Aspects of Commitments
Aspects of Commitments
Aspect of Commitments

• Commitment: as seen in the round
  – Obligation: as seen from the perspective of one party to the Commitment
  – Right: as experienced from the perspective of the other party to the Commitment

• One party’s Obligation is another party’s Right

• Both are aspects of a Commitment
  – The Commitment is the basic building block of contracts, agreements, transactions...
Other Context Treatments

• What else can be the kind of thing that is the context for some contextually determined thing (Relative Thing)?
• John has a pilot’s license
• John has sufficient flying hours logged to be current
• John (as a instance of an Independent Thing) is a pilot
Other Feedback from the Above

• How can this be tied in to formal theories of context?
  – What theories are there?
  – Do elements of these translate to upper ontology material?
  – Does any of it translate to this UO treatment?
Feedback from Today

• Further ideas and thinking from participants in the chat room...
Sessions for This Track

• Contextual matter in different Top Level Ontologies
  – E.g. Dependent Continuant in BFO
  – Other notions of Context itself?
• Different ways of dealing with Context in different ontology frameworks
• Practical applications to solve real world data problems
• Context taxonomies
• What else?
Discussion