XEBR – The XBRL European Business Register

Generating an OWL Ontology from the XEBR Taxonomy (v7.0)

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XEBR: What is This ?

- international standard for financial reporting: XBRL
  - XBRL = *eXtensible Business Reporting Language*
  - free and open standard
  - makes use of usual XML technologies
  - describes important financial information for one full year
- structure of XBRL document is the same for each jurisdiction
- **but**
  - namespace and tag names differ
  - some of the tags in one jurisdiction do not exist in another one
- circumvent these issues (in part): XEBR
  - XEBR = *Xbrl European Business Register*
  - core taxonomy (interlingua) for all XBRL jurisdictions
  - information that is shared by all jurisdictions
  - canonical names

XEBR: MS Excl V7 Specification

XBRL

Taxonomy Europe: xEBR

Row	Ver	xEBR tag	Level 0	Level 1	Level 2	Level 3	Level 4	xEBR type
3	V1	Key Balance Sheet Figures [Report]	KEY BALANCE SHEET FIGURES [Report]					role
4	V1	Assets [Presentation]	Assets [Presentation]					abstract
5	V5	Subscribed Capital Unpaid [Presentation]		Subscribed capital unpaid [Presentation]				abstract
6	V5	Subscribed Capital Unpaid [Total]			Subscribed capital unpaid [Total]			monetary
7	V1	Fixed Assets [Presentation]		Fixed assets [Presentation]				abstract
8	V3	Intangible Fixed Assets [Presentation]			Intangible fixed assets [Presentation]			abstract
9	V4	Formation Preliminary Expenses				Formation (preliminary) expenses		monetary
10	V4	Other Intangible Fixed Assets				Other intangible fixed assets		monetary
11	V3	Intangible Fixed Assets [Total]				Intangible fixed assets [Total]		monetary
12	V3	Tangible Fixed Assets [Presentation]			Tangible fixed assets [Presentation]			abstract
13	V1	Property Plant And Equipment [Presentation]				Property, plant, and equipment [Presentation]		abstract
14	V1	Land And Buildings					Land and buildings	monetary
15	V1	Plant And Machinery					Plant and machinery	monetary
16	V1	Furniture Fixtures And Equipment					Furniture, fixtures, and equipment	monetary
17	V1	Other Property Plant And Equipment					Other property, plant, and equipment	monetary
18	V4	Other Fixtures					Other fixtures	monetary
19	V1	Property Plant And Equipment [Total]					Property, plant, and equipment [Total]	monetary
20	V4	Payments On Account And Assets In Construction				Payments on account and assets in construction		monetary
21	V1	Other Tangible Fixed Assets				Other tangible fixed assets		monetary
22	V2	Tangible Fixed Assets [Total]				Tangible fixed assets [Total]		monetary
23	V2	Financial Fixed Assets [Presentation]			Financial fixed assets [Presentation]			abstract
24	V2	Affiliated Enterprises				Affiliated enterprises		monetary
25	V2	Other Financial Assets				Other financial assets		monetary
26	V3	Financial Fixed Assets [Total]				Financial fixed assets [Total]		monetary
27	V1	Fixed Assets [Total]			Fixed assets [Total]			monetary
28	V2	Current Assets [Presentation]		Current assets [Presentation]				abstract
29	V1	Amounts Receivable [Presentation]			Amounts receivable [Presentation]			abstract
30	V2	Amounts Receivable After More Than One Year				Amounts receivable after more than one year		monetary
31	V2	Amounts Receivable Within One Year				Amounts receivable within one year		monetary
32	V4	Trade Debtors					Trade debtors	monetary
33	V4	Other Debtors					Other debtors	monetary
34	V1	Amounts Receivable [Total]				Amounts receivable [Total]		monetary
35	V1	Stocks [Presentation]			Stocks [Presentation]			abstract
36	V1	Stock Raw Materials And Consumables				Stock Raw materials and consumables		monetary
37	V1	Work In Progress				Work in progress		monetary
38	V4	Payments On Account				Payments on account		monetary
39	V1	Other Stocks				Other stocks		monetary
40	V1	Stocks [Total]				Stocks [Total]		monetary
41	V4	Current Investments [Presentation]			Current investments [Presentation]			monetary
42	V4	Current Investments [Total]				Current investments [Total]		monetary
43	V1	Liquid Assets [Presentation]			Liquid assets [Presentation]			abstract
44	V5	Cash At Bank And In Hand [Presentation]				Cash at bank and in hand [Presentation]		abstract
45	V5	Cash At Bank And In Hand [Total]					Cash at bank and in hand [Total]	monetary
46	V1	Liquid Assets [Total]				Liquid assets [Total]		monetary
47	V1	Deferred Charges And Accrued Income [Presentation]			Deferred charges and accrued income [Presentation]			abstract
48	V1	Deferred Charges And Accrued Income [Total]				Deferred charges and accrued income [Total]		monetary
49	V1	Current Assets [Total]			Current assets [Total]			monetary
50	V1	Assets [Total]		Assets [Total]				monetary
51	V1	Equity And Liabilities [Presentation]	Equity and Liabilities [Presentation]					abstract
52	V1	Equity [Presentation]		Equity [Presentation]				abstract
53	V1	Capital			Capital			monetary
54	V4	Share Premium Account			Share premium account			monetary
55	V4	Revaluation Reserve			Revaluation reserve			monetary
56	V1	Reserves			Reserves			monetary

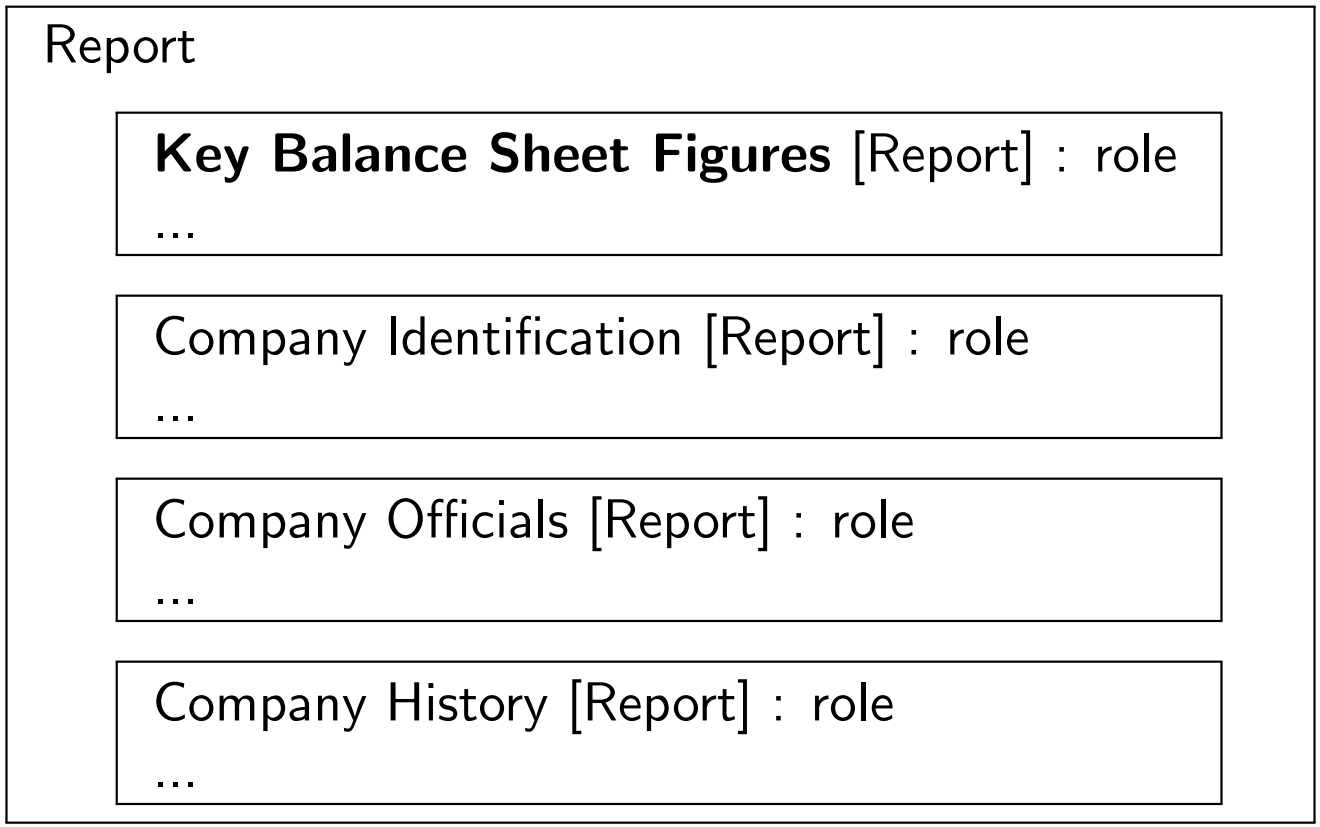
XEBR: From a Taxonomy to an Ontology

- taxonomy is a tree, expressing meronymy
  usually **not** hyponymy !
- hyponymy would also pose technical problems in OWL
  see slide below
- every XEBR concept in the specification comes with
  - tag (XEBR concept) $\rightarrow$ OWL class or property
  - (multilingual) label
  - XEBR type
    - role: tag $\rightarrow$ OWL property
    - abstract, tuple: tag $\rightarrow$ OWL class
    - monetary, string, uri, boolean, date: tag $\rightarrow$ OWL property

XEBR: From a Taxonomy to an Ontology, Cont.

- meronymy can **not** be expressed intensionally for all reports
  - OWL's TBox axiom constructors: $\sqsubseteq$ and $\equiv$
  - no constructor for parthood
  - solution: property `partOf` for extensional specification (ABox):
    $\texttt{partOf} \subseteq \texttt{xebr:Class} \times \texttt{xebr:Class}$
  - **but**: introduces a great number of unnecessary container objects over and over again during ontology population
- solution: meta-model `partOf` as a TBox axiom constructor
  - $\texttt{partOf} \subseteq \texttt{owl:Class} \times \texttt{owl:Class}$
  - no longer OWL-DL, but still RDF, accessible through SPARQL
  - requires property `belongsTo` to link concrete data (e.g., financial numbers) in the ABox to a specific XEBR report

XEBR: Report Structure



access four main parts of a report through properties, e.g.,

$\texttt{hasKeyBalanceSheetFigures} \subseteq \texttt{Report} \times \texttt{KeyBalanceSheetFigures}$

XEBR: Report Structure, Cont.

0 **Key Balance Sheet Figures** [Report] : role
- 1 Assets [Presentation] : abstract
  - 2 Subscribed Capital Unpaid [Presentation] : abstract
    - 3 Subscribed Capital Unpaid [Total] : monetary
  - 4 Fixed Assets [Presentation] : abstract
    - 5 Intangible Fixed Assets [Presentation] : abstract
      - 6 Formation Preliminary Expenses : monetary
      - 7 Other Intangible Fixed Assets : monetary
      - 8 Intangible Fixed Assets [Total] : monetary
    - 9 Tangible Fixed Assets [Presentation] : abstract

...

TBox: $1 \sqsubseteq 0$, 2 `partOf` 1 , 4 `partOf` 1 , ...

RBox: 5 has 6 monetrary , 5 has 7 monetrary , ...

aggregation: $8 = 6 + 7$, ...

XEBR: Problems With Hyponymy

- hyponymy would lead to the "inheritance" of properties
- example:

Tangible fixed assets [Presentation]	abstract
Property, plant, and equipment [Presentation]	abstract
Land and buildings	monetary
Plant and machinery	monetary
Furniture, fixtures, and equipment	monetary
Other property, plant, and equipment	monetary
Other fixtures	monetary
Property, plant, and equipment [Total]	monetary
Payments on account and assets in construction	monetary
Other tangible fixed assets	monetary
Tangible fixed assets [Total]	monetary

- `hasTangibleFixedAssets` defined on `TangibleFixedAssets` would also be valid for `PropertyPlantAndEquipment`, assuming `PropertyPlantAndEquipment` $\sqsubseteq$ `TangibleFixedAssets`
- solution: name those "total" properties the same: `hasTotal`
- but: other properties are still being inherited, e.g., `hasOtherTangibleFixedAssets`
- solution: local cardinality ($= 0$) restriction defined on classes
- more serious problem: entailment (universal instantiation) + querying (SPARQL): more than 1 value
- `SELECT ?t WHERE {?p rdf:type xebr:TangibleFixedAssets. ?p xebr:hasTotal ?t}`