

# Accounting and Information Systems – 22C28000

**Data as the new oil & XBRL as a digital artefact**

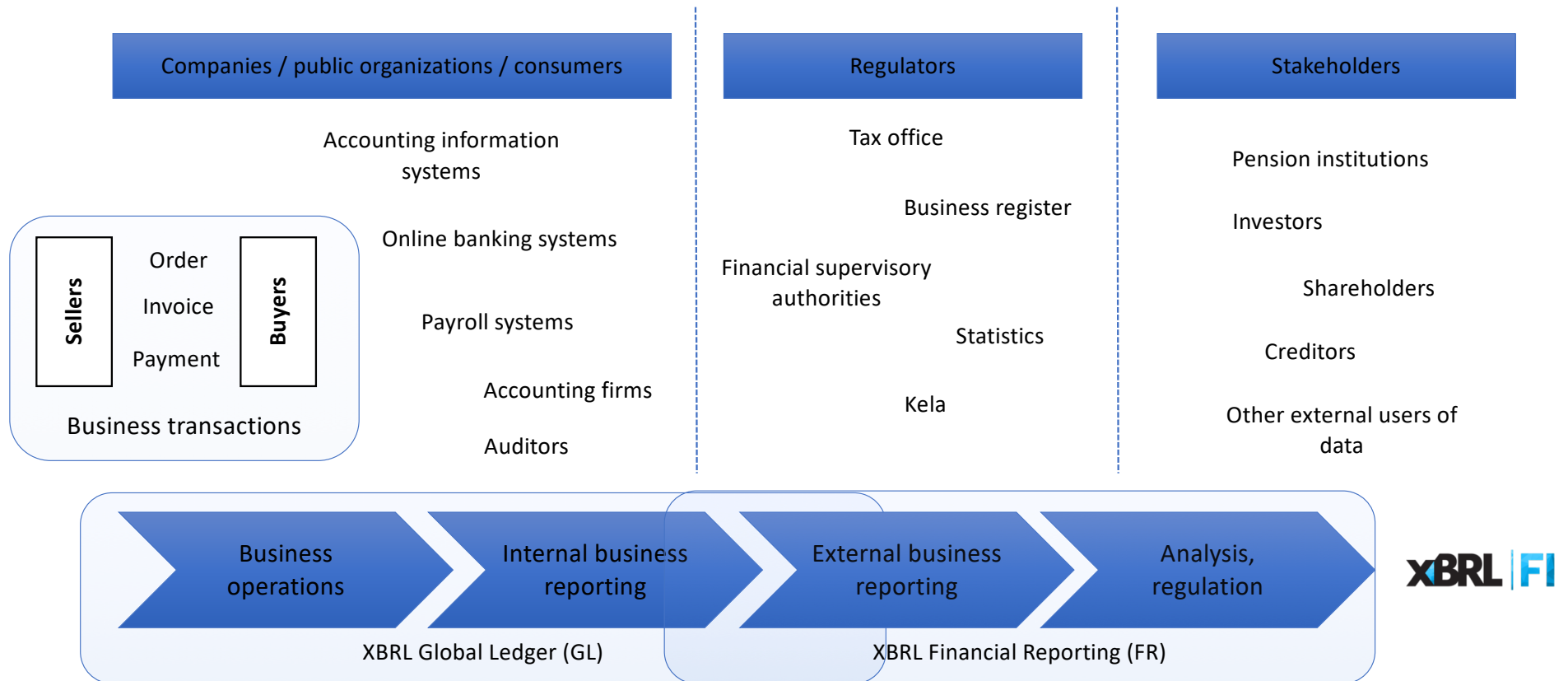
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Chairman, XBRL Finland

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# XBRL and financial value chain



# Agenda

1. Generating value from data
2. XBRL as a digital artefact containing highly structured data

1. Generating value from data

# Data as the new oil

Regulating the internet giants  
The world's most valuable resource is  
no longer oil, but data

The data economy demands a new approach to antitrust rules

The Economist 6.5.2017

APR 13, 2017 @ 02:22 PM 5,459

The Little Black Book of Billionaire Secrets

What Will We Do When The World's Data Hits 163  
Zettabytes In 2025?

Forbes 13.4.2017

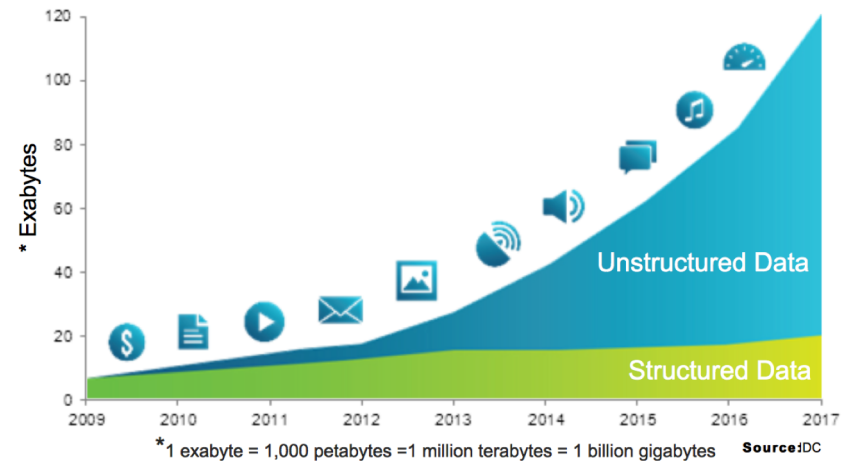
## Structured vs. Unstructured Data

Structured data is far easier for Big Data programs to digest, while the myriad formats of unstructured data creates a greater challenge. Yet both types of data play a key role in effective data analysis.

Datamation 3.8.2017

## Data Growth

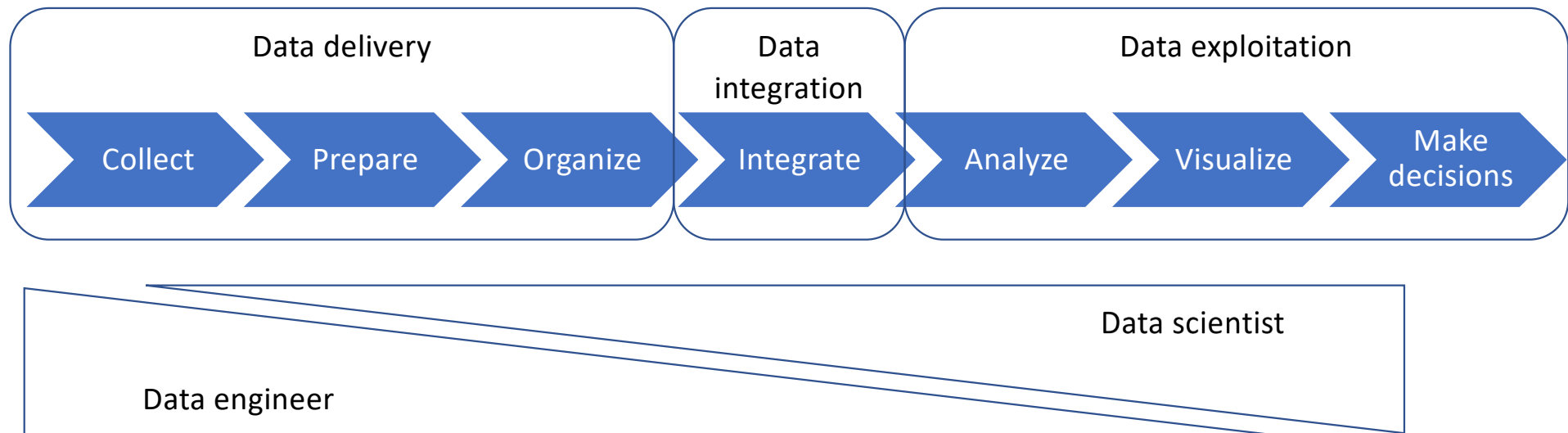
Problem - Traditional and Legacy Storage Designed for Transactional, Not Unstructured Data



# Defining data

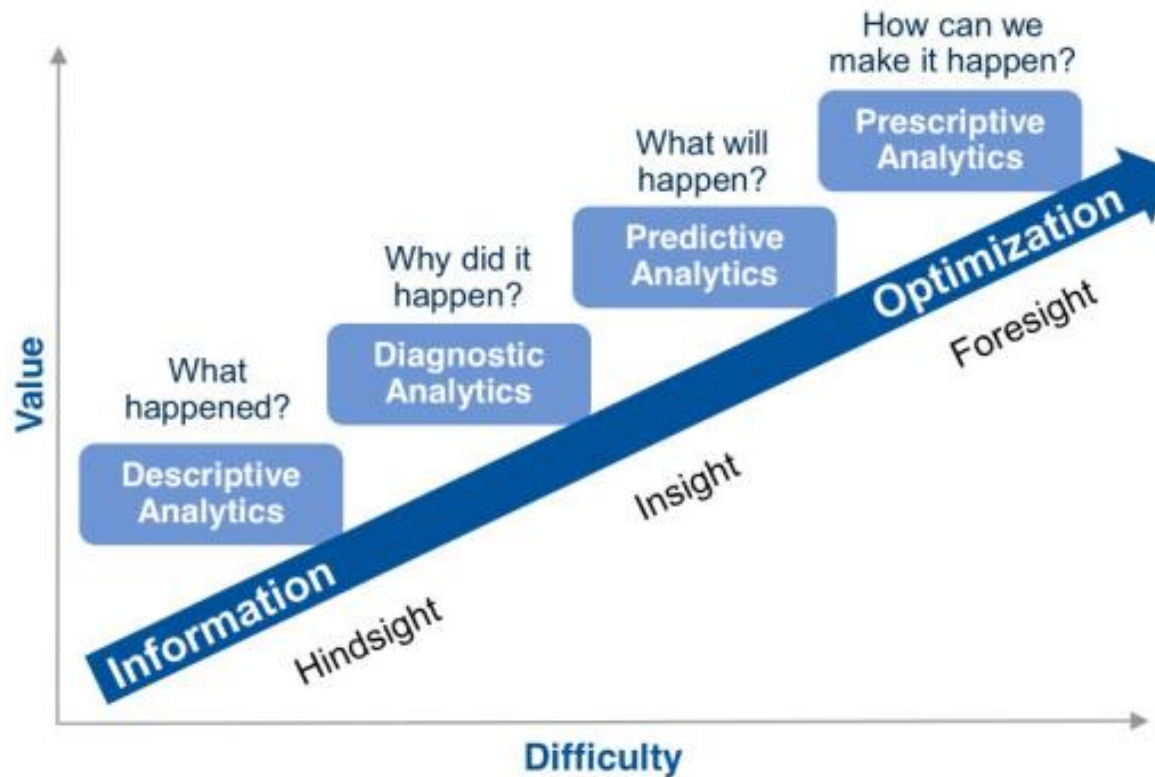
- In computational systems, data are the coded invariances (an expression whose value does not change during program execution)
- In human discourse, data are that which is stated

# Steps towards successful data exploitation



Source: CEMS KONE case group 2016

# From descriptive to prescriptive analytics





# Experimentation vs. approved business case

- Experimentation
  - Case XBRL Denmark: "We have lots of XBRL data, let's use it to optimize something!"
- Approved business case
  - "We need to optimize our weekly production plan for Q3, what kinds of data do we need?"

# Data and human judgment

- Data does not provide you with
  - Choice of type of approach (e.g. decision trees, rule-based machine learning, neural networks)
  - Objectives and trade-offs between conflicting objectives
  - Placing penalties for false positives and false negatives in predictive analytics
  - Sanity checks of algorithm output

→ Some human judgement is always required!

# From data value to business value

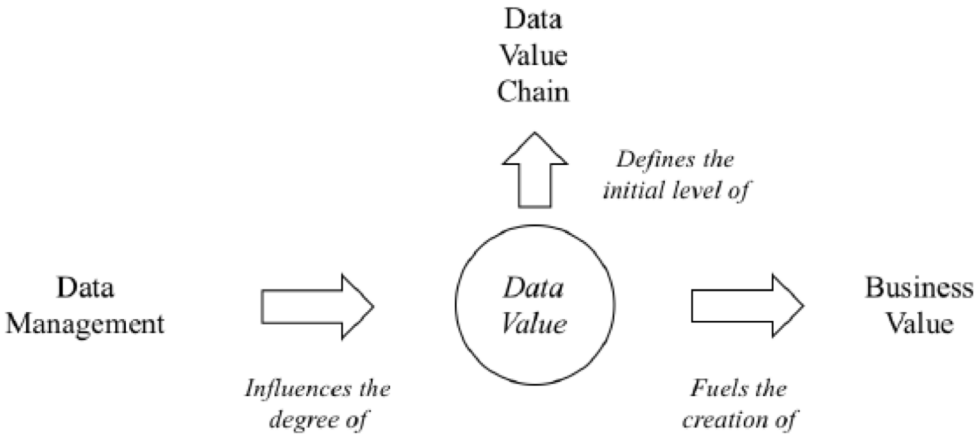


Fig. 3. Relationship of data value and research streams

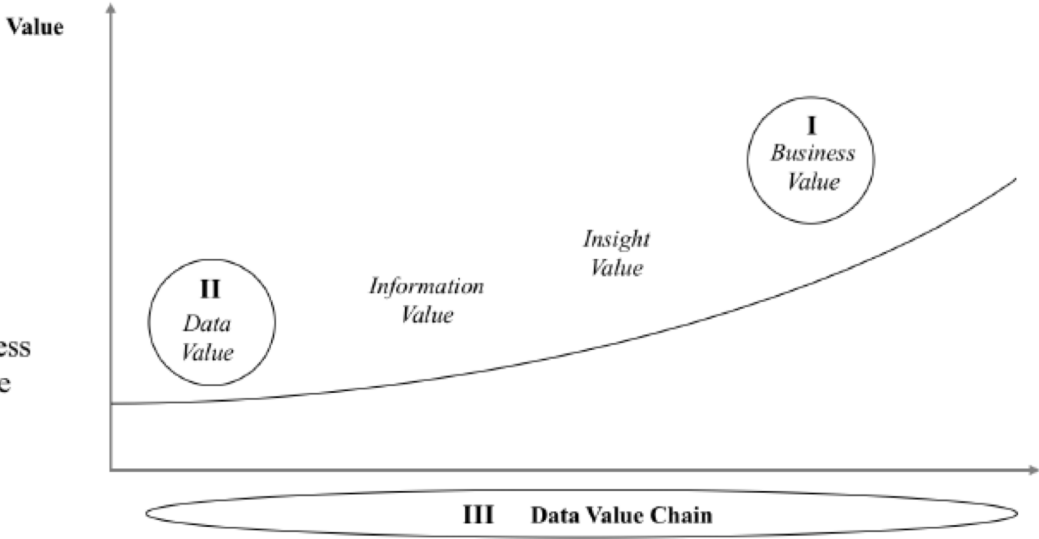
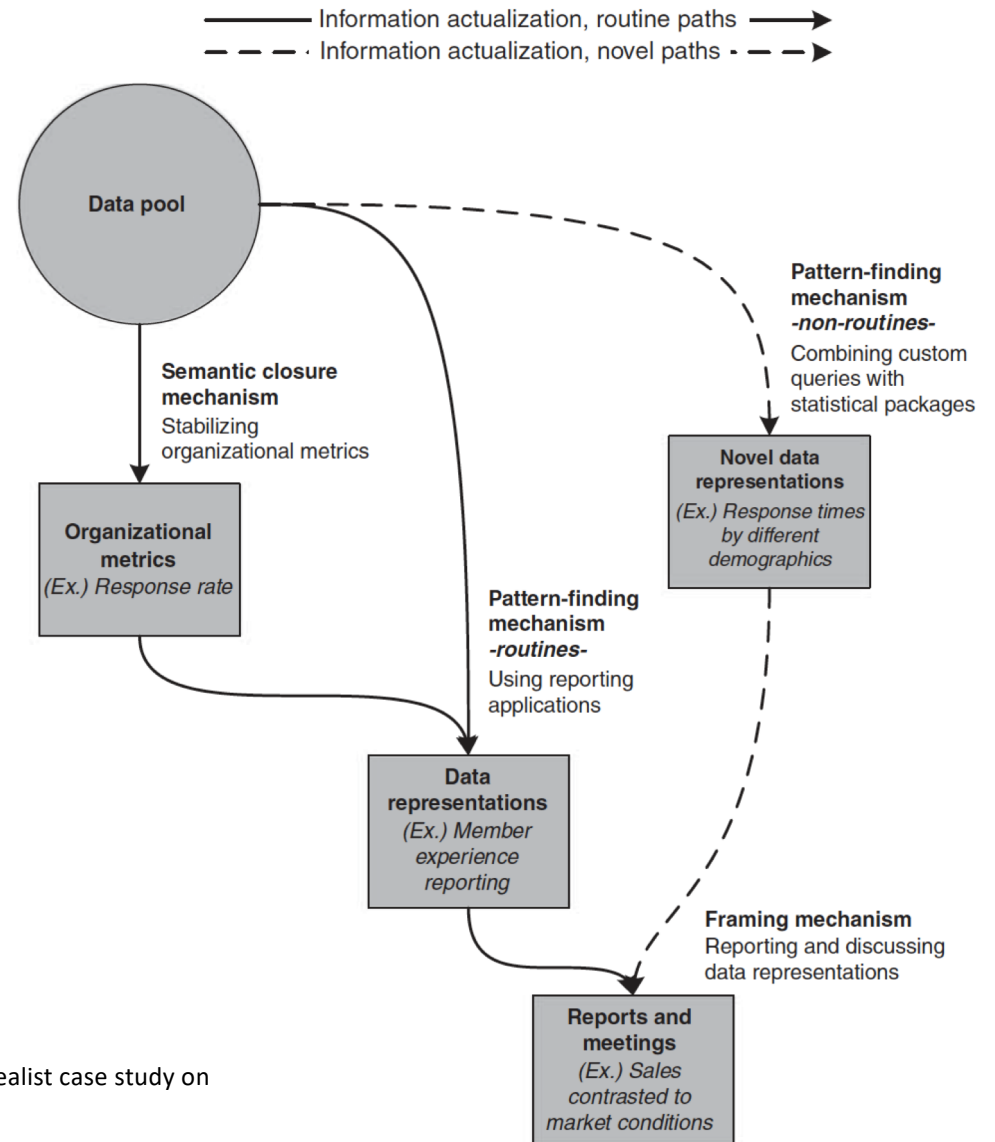


Fig. 2. Research streams on data value

Enders, T. (2018). Exploring the Value of Data – A Research Agenda. In Lecture Notes in Business Information Processing

# Mechanisms for creating value from data

- "Semantic closure mechanism" means a stable way to interpret the data for a specific purpose
- Human operator can query, tabulate and visualize the data, thus activating the "pattern finding mechanism"
  - Routines vs. experiments
- "Framing mechanism" means the way in which the metrics and patterns observed in the data are brought to bear upon daily operations, sensemaking



Aaltonen, A., & Tempini, N. (2014). Everything counts in large amounts: a critical realist case study on data-based production. *Journal of Information Technology*, 29(1), 97-110.

2. XBRL as a digital artefact  
containing highly structured data

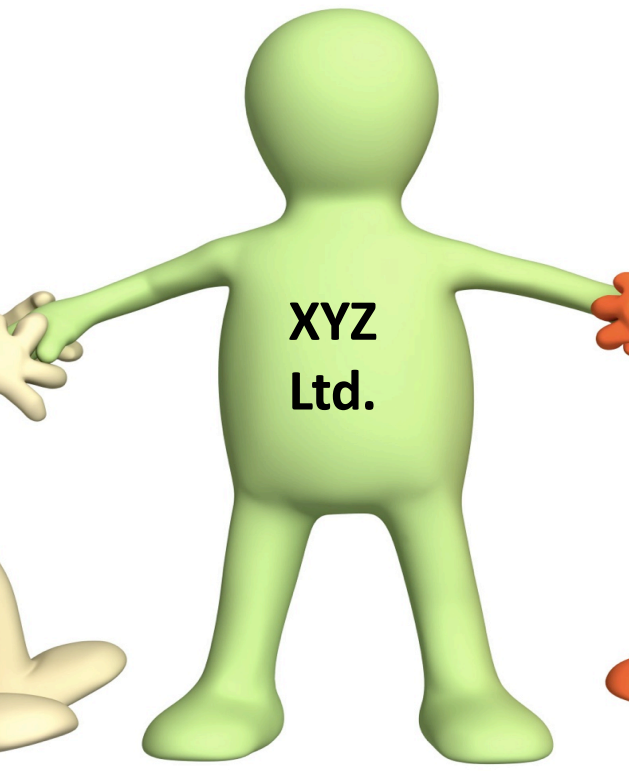
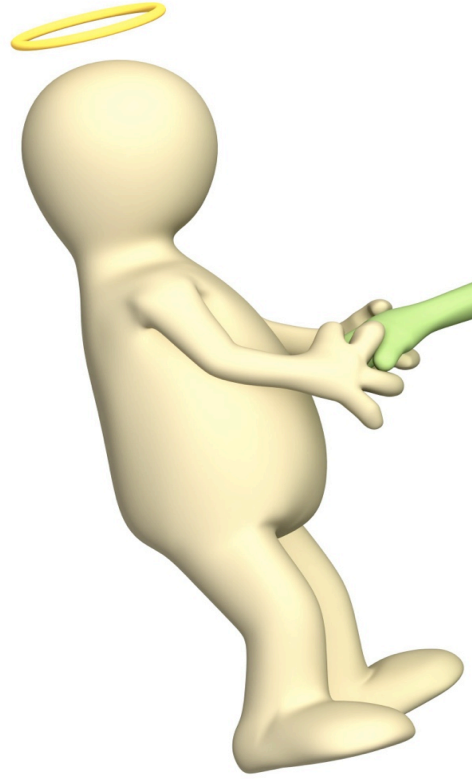
# Kallinikos et al. (2013) literature review of properties of digital artifacts

Decomposability	Sensibility	Transfigurability	Largely unstable	Transferability
Adaptability	Communicability	Distributedness	Unbounded	Numerical representation
Traceability	Memorizability	Interactivity	Resisting reification	Modularity
Interoperability	Associability	Non-rivalry in use	Leverage adaptability	Automation
Programmability	Editability	Infinite expansibility	Ease of mastery	Variability
Addressability	Openness	Recombinability	Accessibility	Transcoding

# Kallinikos et al. (2013)

- Compared to physical artifacts, digital artifacts qua objects are editable, interactive, open, and distributed; these properties lead them to have ambivalent ontology, being perpetually in the making (Kallinikos et al., 2013).
- Archiving the web
  - Provenance (origin and history of the document) and authenticity (preservation of original object) are challenged by the attributes of digital artifacts
  - Freezing content at a given time, taking snapshots: one can visit a search engine's front page archived in 1990s but cannot make a search query
- Searching the web
  - Reflexive adjustments between ranking methods and website owners' actions are catalyzed by search engine optimization consultants, who make inferences about secret ranking algorithms and provide suggestions for content producers accordingly
  - The way search engines mediate digital artefacts is not controlled by established professional practices and is inherently unstable

**XML**



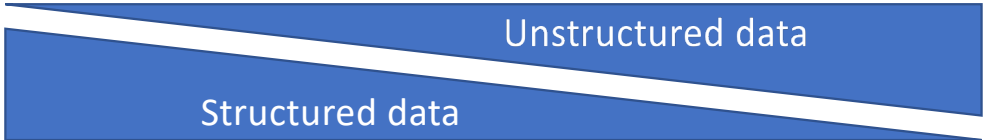
**PDF**



# Structured data

- Characteristics of structured data
  - Semantic meaning of data elements
    - What the data actually means/measures
    - Data type (numeric, currency, alphabetic, name, date, address)
  - Data model
    - Conceptual model (e.g. SBR/XBRL taxonomy structure) -> logical model (e.g. XBRL taxonomy with linkbases)  
-> physical schema (e.g. XBRL data elements)
  - Easily entered, stored, queried and analyzed
    - Machine-readability
- Examples of structured data
  - XML-based e-invoicing formats
  - XBRL-based financial reporting

# Digital artifact



Digital artifact contains primarily structured data

CONCEPT

Digital artifact contains primarily unstructured data

Artifact is rich with meta-data, rendering it machine-readable

OPERATIONALIZATION

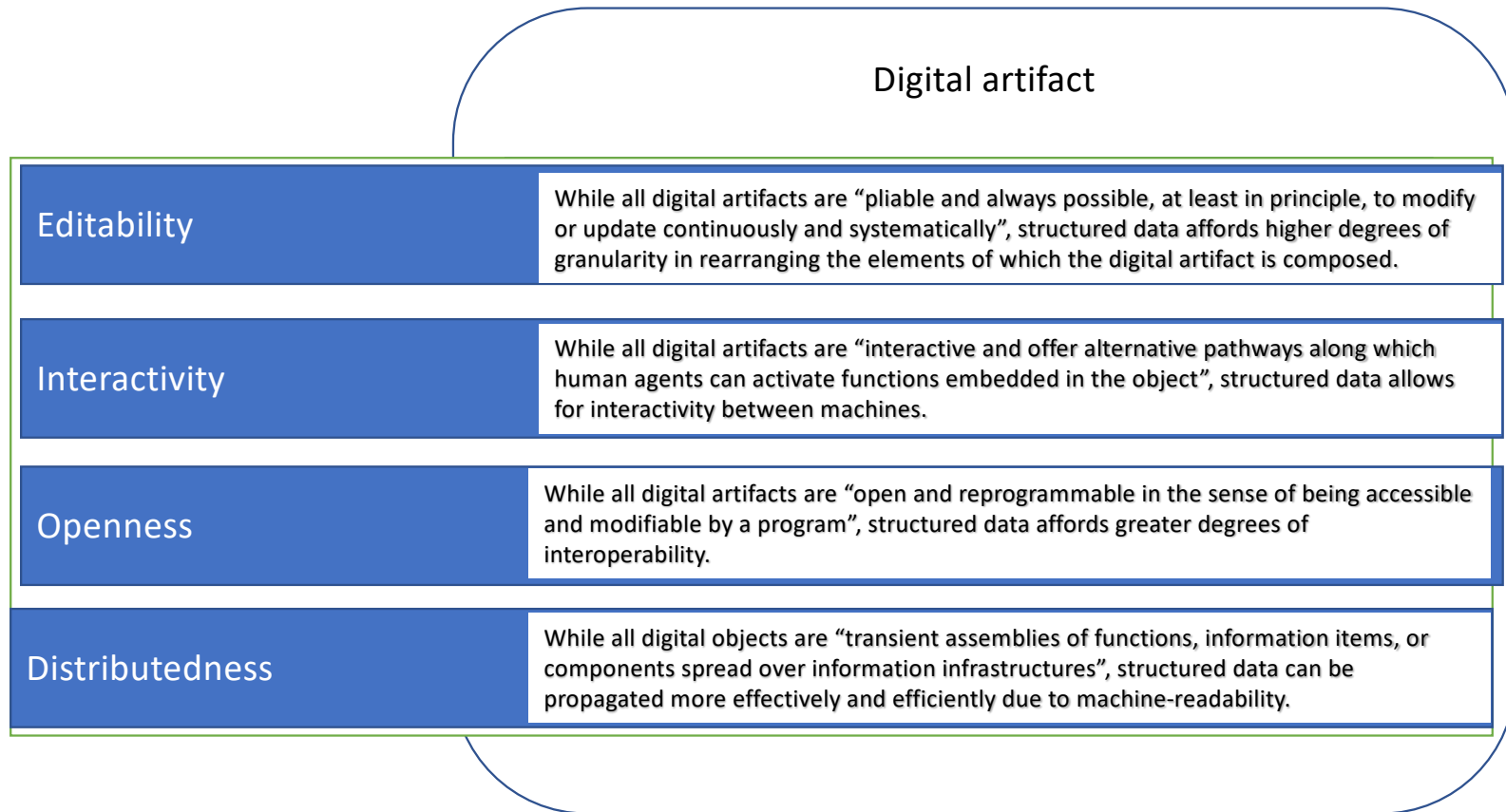
Artifact contains limited amount of meta-data

XBRL-tagged financial report

EXAMPLE

Financial report in pdf-format

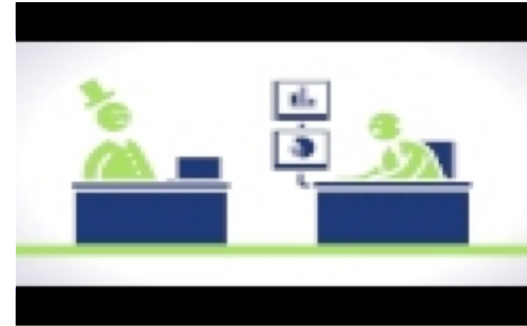
# Key constructs



# XBRL explained



<https://www.youtube.com/watch?v=YlgTN2k375s&nohtml5=False>



<https://www.youtube.com/watch?v=YIjWVAh42Vk>



<https://www.youtube.com/watch?v=zTyhOvE79DQ>

# XBRL basics

- eXtensible Business Reporting Language provides an identifying tag for each individual item of data (instead of treating financial information as a block of text - as in a standard internet page or a printed document)
  - XBRL allows information modeling and the expression of semantic meaning commonly required in business reporting
  - For example, company net profit has its own unique tag
- XBRL tags enable automated processing of business information by computer software, cutting out laborious and costly processes of manual re-entry and comparison
- Computers can treat XBRL data “intelligently”: they can recognise the information in an XBRL document, select it, analyse it, store it, exchange it with other computers and present it automatically in a variety of ways for users
  - XBRL greatly increases the speed of handling of financial data, reduces the chance of error and permits automatic checking of information.
- XBRL (eXtensible Business Reporting Language) is a freely available, market-driven, open, and global standard for exchanging business information
- XBRL is XML-based and the XBRL Specification is developed and published by XBRL International, Inc. (XII)

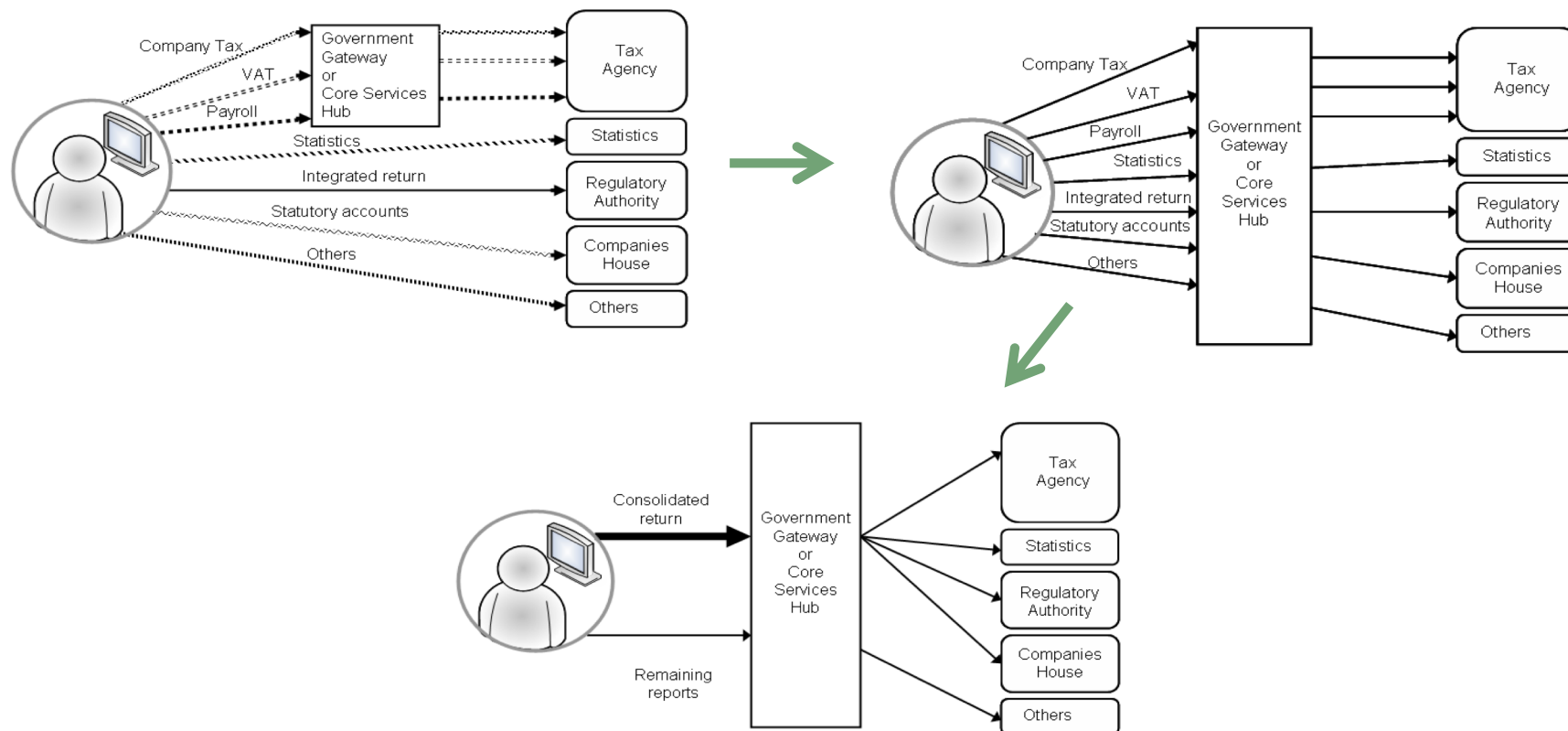
# XBRL taxonomy

- Taxonomy schema
  - Contains data elements (or concepts in XBRL terms)
- Linkbases
  - Definition linkbase
  - Label linkbase
  - Calculation linkbase
  - Reference linkbase
  - Presentation linkbase
  - Formula linkbase

# XML vs. XBRL

- Both XML and XBRL attach a semantic meaning of the data being transmitted, in XBRL, however, this semantic meaning is defined in standardized format
- XBRL distinguishes between data elements and their relationships. The relationships are defined in separate linkbases, which makes software development is easier.
- XML contains only hierarchical relationships between the data elements. In XBRL, many relationships can be defined with the help of the linkbases in a more exact way than in XML.
- XBRL linkbases (formula, calculation) enable instance validation.
- Reference linkbase can be used to include references to accounting law, which, again, helps in software development.

# Standard Business Reporting



Source: OECD 2009, FORUM ON TAX ADMINISTRATION: TAXPAYER SERVICES SUB-GROUP  
Guidance note Standard Business Reporting



# Standard Business Reporting programs

- Standard Business Reporting programs to reduce administrative burden across the globe
  - Finland
    - <http://www.raportointikoodisto.fi/> and [www.xbrl.fi](http://www.xbrl.fi)
  - Netherlands
    - <http://www.sbr-nl.nl/english/>
  - Australia
    - <http://www.sbr.gov.au/>
  - Similar projects in New Zealand and UK
- Technical platform to implement SBR is XBRL (eXtensible Business Reporting Language)

# Finnish implementation - XBRL

- Started with plans for Standard Business Reporting (SBR) in 2011
- Voluntary iXBRL filing for SMEs initiated in April 2019
  - See Fennoa presentation, minutes 29:20-52:20 from this video:  
<https://www.youtube.com/watch?v=bCpVC7MIqGg>
  - Taxonomy available at [www.xbrl.fi](http://www.xbrl.fi)
  - Free of charge software such as Arelle can be used to experiment with the taxonomy
- Mandatory filing for listed companies in 2020 (ESEF ESMA mandate)
- Municipality reporting in 2020

# XBRL Finland - members

## Public



## Private



## Academics / Associations



Taloushallintoliitto



# Thank you! What to read more?

- Research results and teaching cases at:
  - [www.rte.fi](http://www.rte.fi)
- Updates on projects on structured data (XBRL) at:
  - [www.xbrl.fi](http://www.xbrl.fi)
- Government steering group on RTE at:
  - <https://vm.fi/hanke?tunnus=VM101:00/2017>
- Estonian Real-Time Economy initiative at:
  - <https://www.itl.ee/index.php?page=418>
- Nordic Smart Government program at:
  - <https://nordicsmartgovernment.org/>
- Contact: Esko Penttinen, [esko.penttinen@aalto.fi](mailto:esko.penttinen@aalto.fi)