Conceptual modeling with business ontologies

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Conceptual modeling with business ontologies (1): In a nutshell

- Is about using (graphical) formalizations of shared concepts in the realm of businesses (e.g. new business development)
- Can e.g. be used:
  - Business design perspective:
    - to explore, understand and build innovative (e) business cases;
    - Creation of common understanding
    - Creation of thorough understanding
    - Automated analysis & evaluation
  - ICT-enabling perspective:
    - to configure complex offerings and constellations
    - to upgrade web-services to real services
    - to …
Conceptual modeling with business ontologies (2): A few examples

Conceptual modeling (1): What it is

- “A conceptual modeling approach comprises the activity of *formally defining aspects* of the physical and social world around us for the *purpose of understanding and communication*” (Mylopoulos, 1992)
- Why? Ask a plumber to make a tap.
  - You want:
  - And not:
- Example: “a real estate developer builds a house”
- Process to be performed stated in text:
  - “search a location, commission an architect, develop a plan, search a building contractor, build the house, sell the house and deliver it”
Conceptual modeling (2): UML activity diagrams

Process to be performed stated graphically in UML

Which important decision is stated by this UML activity diagram, and not by the textual version?

Conceptual modeling (3): Service blueprints

Source: Service Marketing, Lovelock 2001
Conceptual modeling (4): What we model

- We model:
  - Organization structure (“Personnel” directory)
  - Organization goal(s) (Goal-oriented requirements engineering)
  - Business processes (UML, Activity modeling)
  - Information (needs) (ER-modeling, UML, Petri-nets)
  - Multi actor business models (evalue)
eServices

- Conceptual models often come in pairs of problem-solution frames (Jackson 2001):
  - organizational structure to design authorization systems
  - business goals that give directions for new products or services
  - business processes that can be used to develop supporting information systems
  - information needs that can be used to develop supporting information systems
  - …

Business Sciences “conceptual models” (1): Value chains/systems

Business Sciences “conceptual models” (2): Business webs

Tapscott’s business webs:
- goods,
- services,
- revenues
- knowledge
- intangibles

Ontology (1): What it is

- An ontology is an *explicit* specification of a conceptualization (Gruber 1994)
- An ontology is a *formal* specification of a *shared* conceptualization (Borst 1997)
Ontology (2): How we use it

- Ontological commitment:
  - Stakeholders using conceptual models should have a shared understanding of the modeling constructs to create a common understanding of the Universe of Discourse at hand.
  - Can e.g. be done by:
    - Doing stakeholder knowledge elicitation workshops (or other elicitation techniques)
    - Using standard business textbooks and publications for knowledge elicitation (is: what a large community agrees on)
    - Testing ontology in real-life business contexts

- Formalization:
  - Not intended to be understood by business stakeholders
  - Used to resolve interpretation disputes (e.g. by facilitating parties like consultants and analysts)
  - Used by software tools for automated analysis

Examples of other business ontologies: TOVE/AIAI/REA/Osterwalder

Source: PhD thesis A. Osterwalder, Business School HEC Lausanne, forthcoming

STW: Framework on sale of digital products

- **STW Framework on the sale of digital products**
  - STW VWI 4949

- **Objectives:**
  - Framework to express business models for digital products (e³value)
  - Framework for transacting digital content

- **Duration:** Jan 1999 – Jan 2004
- **Budget:** 390 K€
- Joint effort between VUA Computer Science/Business Informatics and VUA Computer Science/Computer Systems

**Consortium:**
- VUA
- Deloitte& Touche
- NOB Interactive
- NAA
- FAPIA
- KPN-Research
- Océ
- PCM

**VUA team:**
- Andy Tanenbaum
- Rudy Weis
- Wilfred Dittmer
- Jaap Gordijn

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**Conceptual modeling with business ontologies: e³value**

- **Goal:** Exploration of innovative e-commerce ideas

- **Focus on:**
  - Creation of common understanding of innovative e-business cases
  - Evaluation of e-business case from a profit / consumer value perspective

- **Based on:**
  - *Business Sciences:* Value chain & constellation (Porter, Tapscott), Marketing & Axiology (Holbrook), Invest. analysis
  - *Information Sciences:* Conceptual modeling & (goal oriented requirements engineering (Van Lamsweerde, Loucopoulos), scenario theory (Buhr, Van der Heijden)
Conceptual modeling with business ontologies: $e^3$value in telecom (1)

- Unique selling points of $e^3$value:
  - Explains a business model just in a few pictures
  - Oversees an entire value chain/web
  - Formalized, so automated analysis & evaluation (profitability) is possible


Conceptual modeling with business ontologies: $e^3$value core concepts

Core ontology in high level UML.
RDF/S formalization & implementation available
Conceptual modeling with business ontologies: $e^3$value in telecom (2)

Conceptual modeling with business ontologies: $e^3$value in telecom (3)

**Analysis:**

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amst. Times</td>
</tr>
<tr>
<td><strong>Null scenario</strong></td>
<td>164,400</td>
</tr>
<tr>
<td>Forecast &gt;&gt; Actual</td>
<td>-28,560</td>
</tr>
<tr>
<td>Decrease in interconnection</td>
<td>164,400</td>
</tr>
<tr>
<td>Decrease in revenue sharing</td>
<td>-19,200</td>
</tr>
</tbody>
</table>
BUSMOD (1)

**BUSMOD**: Business Models in a World Characterized by Distributed Power Generation
- EU-EESD project No. NNE5-2001-00256

**Objectives**:
- Analysis of current DER characteristics and business models
- Definition of different business scenarios in a liberalized DER electrical power market
- Anticipation of future actors participating in deregulated electricity market
- Design of a business modeling methodology allowing DER business case analysis

**Duration**: April 2002 – April 2004
**Budget**: 1.7 M€
**Website**: http://busmod.e3value.com

**Consortium**:
- Iberdrola (ES)
- Labein (ES)
- VUA (NL)
- ECN (NL)
- UMIST (UK)
- SINTEF (NO)
- EnerSearch (SE)

**VUA team**:
- Vera Kartseva
- Joost Schildwacht
- Jasper Soetendal
- Hans Akkermans
- Jaap Gordijn

BUSMOD (2): Contributions

**VUA contribution**:
- Business modeling methodology for Distributed Power Generation
- Specialization of the e³value methodology:
  - DG terminology (actors, activities, value interfaces)
  - DG specific way of working and guidelines

**Other partners**:
- Explorative DG industrial projects
- DG Domain analysis
- Methodology test by four DG industrial projects
**BUSMOD (3): The making of …**

- **Domain analysis** by energy partners: Current DG scenarios
- **DG e-value project I: Renewables in Spain** (Iberdrola)
- **DG e-value project II: Autoproducer in Norway** (Sintef)
- **e-value methodology** (VUA)
- **BusMod methodology version 1 (VUA)**
- **BusMod methodology version 2 (VUA)**
- **BusMod methodology version 3 (VUA)**
- **Distributed balancing services (ECN)**
- **Local auto producer (SINTEF)**
- **Active management of distribution network (UMIST)**
- **Aggregated demand side load management (Labein, Iberdrola)**

**Legend:**
- Background material
- Methodology development
- Project
- Domain analysis

**DER in Spain: Renewable tax-based model (< 1 Jan. 2003)**

- DER now depends on government support and regulation
- Note complex implementation of DER taxes

OBELIX = Ontology-Based Electronic Integration of Complex Products & Value Chains
- EU-IST-2001-33144; budget 2.6 M€
- EUR, funding 1.5 M€
- March 2002 – Sept. 2004

Key ideas in e-business ontologies:
- Describe e-services in a component-based way, such that they become configurable
- Describe networked valuation so that one can quantify the business case & tooling for doing so (\textit{e\textsuperscript{3}value})

### Scenarios:
- Free supplier choice
- Left: Sufficient grid capacity
- Right: Grid capacity limits

DER in Spain: Various possible market scenarios (> 1 Jan 2003)

**OBELIX (1)**

**OBELIX: EU-IST-2001-33144**
http://obelix.e3value.com

**Consortium:**
- Labein (Spain)
- Free University Amsterdam (NL)
- SENA (Netherlands)
- Ontoprise (Germany)
- SINTEF (Norway)
- PTSS (Spain)
- Melhus Energi (Norway)

**VUA team:**
- Ziv Baida
- Arthur Koks
- Borys Amelayenko
- Stephan Hoekstra
- Hans Akkermans
- Jaap Gordijn
OBELIX (2): Contributions

- Contributions VUA:
  - Business ontology for configuration of e-services as components
  - Formalization of $e^3value$ & implementation of modeling environment
  - Internet radio right clearance project with $e^3value$

Services as configurable components

- Enable service *bundling*…
  - By customers
  - By service personnel
  - By software
- Support *collaborative scenarios*
  - Multiple suppliers
- Based on
  - Service marketing (Grönroos, Lovelock, Zeithaml) and Knowledge-based configuration theory (Chandrasekaran, Schreiber)
- Explorative projects
  - Event organization (PTSS, Spain)
  - Energy/Telecom/ICT bundling (SINTEF, Trønder Energi, Norway)
Top-level ontological views

- Service value: customer perspective
  - Customer needs & what he gives in return
- Service offering: supplier perspective
  - Supplier perspective: offerings
- Service process: joint perspective
  - Joint operation

Source: Ziv Baida, Hans Akkermans, and Jaap Gorda, "Serviguration: Towards Online Configurability of RealWorld Services", The 5th International Conference on Electronic Commerce, CMU, Pittsburgh, USA

Service offering ontological view

Based on various texts, e.g.:
- Service Marketing, Lovelock, 2001
- Service Marketing & Management, Grintroos, 2000
- Service Marketing Management, H. Kasper, P. van Heldeningen, and W. de Vos, 1999
Example: Room renting for conferences

Example: Bundling of room renting and catering for conferences

- Configurator should find these solutions automatically
- Other project in Energy field
In sum: Conceptual modeling with business ontologies

- To enable new (e) businesses, conceptual modeling with ontologies is key:
  - For business design, understanding and automated analysis (e³value + BusMod methodology)
  - To enable new businesses: configuration and bundling of e-services (configuration of services)
- Particular useful in multi-actor situations to design & understand:
  - Joint operations/offerings
  - Analyze value webs comprehensively
  - Telecom, Power industry, Content provisioning industry (music, news, ads,...): All multi-actor situations

Papers, tools & sites

- Papers on e³value & e-services:
- Design tool for e³value ontologies
- Homepage & project sites:
  - http://www.cs.vu.nl/~gordijn/
  - http://obelix.e³value.com
  - http://busmod.e³value.com