Block III: Capita Selecta:
Value modeling and …

- Goal modeling
- eService Bundle modeling
- Control modeling

Further information on $e^3$value and goal modeling

- Jaap Gordijn, Michael Petit, Roel Wieringa, "Understanding business strategies of networked value constellations using goal and value modeling", forthcoming, RE'06.

Block III.A
Value modeling and Goal modeling

Michael Petit

Value modeling and eService bundling

- Value objects may be anything that is (perceived to be) of economic value
- Often, value objects are themselves complex and composed of many different elements
- Key example: services and service bundles that are (electronically) offered to the market, possibly by a multi-actor value constellation
- Extension to $e^3$value: modeling services as component-based value objects
  - (e)Service ontology
  - Automatic configuration of service bundles

An example:
Energy services
What are services?

- Definitions from management science literature:
  - Kotler: … any act or performance that one party can offer to another that is essentially intangible …
  - Grönroos: … activities … of a more or less intangible nature that normally … take place in interactions between customer and service employees and/or physical resources and/or systems of the service provider, which are provided as solutions to customer problems
  - Lovelock, Booms, Bitner: 7P/8P model for services: 4P’s of product marketing + Process, People, Physical evidence for intangibles
  - So, services are fundamentally different from products
- Gives key concepts to build service ontology

Issues in eService modeling

Service Ontology:
- Must properly represent (business research) consensus on service management/marketing
  - This is remote from Web Service literature!
- And enable automatic service bundle composition, also on the Web
  - Component-based
  - Customer needs and requirements
  - Intrinsic constraints between service components
  - Knowledge-based reasoning algorithms

e³service modeling constructs (1)

- Main service ontology modules:
  - Service offering view (supply-side)
    - Service inputs/outcomes are typed
  - Service value view (customer)

e³service modeling constructs (2)

- Service elements
  - Atomic building blocks: smallest element that still represents a service
  - Input and outcome ports/interfaces
  - Underlying notions: service is transformation of something into (more) economic or social value

Figure 1. Service element

e³service modeling constructs (3)

- Service elements
  - Composed from elements based on business rules

Figure 2. Service bundle

e³service modeling constructs (4)

- Service dependencies
  - Business rules / constraints in ontology whether or not service elements can “go together”
**e³service bundle configuration (1)**

- Bundling by knowledge-based configuration algorithm
- Such that combinatorial explosion is managed by:
  - Respecting service element dependencies as constraints
  - Constraints from proper input/outcome links and types in chain/network of service elements
  - Set of customer needs and requirements

**e³service bundle configuration (2)**

- Computed output = set of feasible service bundles

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**eService bundling and Value modeling**

- *e³service – e³value* interaction:
  - service bundles are sophisticated value objects that influence business model
- After *e³service* service bundling step:
  - redesign of *e³value* networked business model
  - and re-analysis of economic feasibility for all actors

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**eService Bundling Industry Example**

- Value webs for innovative services in smart power networks (FENIX EU-IP)
- Imbalance in real-time demand-supply match of power grid is very costly
  - (and can even become critical for security of supply)
- Commercial aggregation of many small power production and consumption units (DER)

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**Distributed Balancing Services in Intelligent Power Networks (1)**

- => Significant business case for DBS services

**Distributed Balancing Services in Intelligent Power Networks (2)**

- Virtual Power Plant Concept
- Distributed Control by eMarket technologies
Distributed Balancing Services in Intelligent Power Networks (3)

- DBS service field tests of smart power
- Commercial aggregation and eMarket technology
- Automatic imbalance reduction in real time
- Result > 40% imbalance reduction
  - Commercialization underway

Further information on $e^3$value and eService modeling


What are controls? (1)

- Measures to prevent, detect or correct opportunistic behavior of actors
- Needed because a lack of trust exists

This research has been conducted with Vera Kartseva, Yao-Hua Tan and Joris Hulstijn (all Vrije Universiteit Amsterdam). I used parts of their slides and joint papers.
This work is partly sponsored by Freeband/FRUX, a nationally funded research program (www.freeband.nl) in The Netherlands.

What are controls? (2)

- Intra-organizational controls
  - Focus on opportunistic behavior of own employees
  - Traditionally the field of (EDF)-auditing
    - Other regional disciplines (due to laws): NL – Starreveld
    - COSA/COBIT
  - Principles for design:
    - segregation of duties, conflicts of interests, decentralization and supervision and review. Example: a cashier and ticket inspector at the cinema
  - Design process: Single authority for decision taking

What are controls? (3)

- Inter-organizational controls
  - Focus on opportunistic behavior of enterprises
  - Based on auditing field (intra-organization controls) but also other disciplines such as contract drafting (terms of delivery) and trade procedures
  - Principles for design:
    - As with intra-organizational controls
    - Design for trade procedures (e.g. Lee & Bons), terminology such as testifying, witnessing.
    - Examples: Letter of Credit / Bill of Lading procedure, Escrow procedure, PayPal, TTP services, etc.
  - Design process: no single authority for decision taking, negotiation, contract drafting
Why $e^3$ value modeling for inter-organizational controls?

- Control mechanisms are themselves commercial services that can provisioned by various enterprises in a network.
- Controls themselves have inherent value-aspects, e.g. a Bill of Lading (a control!) is a tradable document.
- $e^3$ value modeling is grounded in Transaction Cost Economics (Williamson), which studies safeguards against opportunistic behavior in contract relationships.

Using $e^3$ value modeling for designing inter-organizational controls

1. Understand the context
   - Construct an $e^3$ value model as a statement of an ideal world: no frauds.
2. Analyze the control problem(s)
   - Construct an $e^3$ control model as a statement of a sub-ideal world: fraudulent behavior (construction of 'counter example')
3. Design a control mechanism addressing the control problem
   - Patterns can be used to revise the ideal $e^3$ value model and/or to add business processes, both representing the control.
4. Analyze the revised ideal $e^3$ value model for control problems (step 2 again)
   - Remaining, unsolved, problems
   - "Second order" problems: is the control itself sensitive to fraudulent behavior.

Example: An escrow service

- A control mechanism to guarantee payment for a transaction.
- Provisioned by e.g. a notary or a bank.
  - Buyer transfers money to escrow provider.
  - Escrow provider notifies seller to ship the product.
  - Escrow provider verifies delivery of goods using carrier information.
  - Buyer inspects goods.
  - Escrow provider transfers money to seller.

1. Understand the context: construct an $e^3$ value model
   - Buyer and seller trust each other fully.
   - Both use a carrier for transportation.
   - Key principle in $e^3$ value is economic reciprocity.

2. Analyze the control problem: construct an $e^3$ control model
   - $e^3$ control relaxes the economic reciprocity constraint of $e^3$ value.
   - $e^3$ control shows sub-ideal scenarios and penalties.

3. Design a control mechanism addressing the control problem (1)

Control problem P1: the buyer does not trust the seller about delivery.
Control solution: Pre-execution.
3. Design a control mechanism addressing the control problem (2)

Control problem P2: The seller does not trust the buyer about payment
Control solution: Pre-execution? TTP (Escrow service provider)

4. Design a control mechanism addressing the control problem

Control problem P3: The seller does not trust the buyer about receiving the goods
Solution: Receipt

Use of control patterns in designing inter-organizational controls

- Use the idea of patterns (from construction and computer science) to relate control problems to control solutions
- A (control) pattern is described by:
  - A name (to be used for pattern selection)
  - A context
  - A problem
  - Forces (influencing solution selection, e.g. based on various levels of trust)
  - A solution(s)

Towards a library of control patterns

- (Pre-execution)
- Receipt
- Contracting
- Certification/accreditation
- Physical protection
- Credit
- Reconciliation
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A pre-execution pattern

- PA does not trust CA
In sum: inter-organizational control modeling with \( e^3 \text{value} \)

- Use \( e^3 \text{value} \) to understand a networked value constellation from an ideal perspective
  - Focus on economic reciprocity, main purpose is business development
- Use \( e^3 \text{control} \) to understand a networked value constellation from a sub-ideal perspective
  - Focus on controls, main purpose is control development
- Business (CxO's, marketers) & control (accountants, auditors) development are different things and people with different concerns; do not mix them up!

Further information on \( e^3 \text{control} \)

- See [www.cs.vu.nl/~gordijn/research.htm](http://www.cs.vu.nl/~gordijn/research.htm)
- For a more complex example on using \( e^3 \text{value} \) and \( e^3 \text{control} \) modeling for analyzing controls see
  - V. Kartseva, J. Gordijn, Y.-H. Tan, “Inter-Organisational Controls as Value Objects in Network Organisations” (available via the web)

Take home message

- Before embarking on an IS development track for multi-enterprise information systems supporting IT-enabled value propositions:
- You’d better first explore the constellation of enterprises from an economic perspective
- And understand why the multi-enterprise IS is needed from a business point of view in the first place.
- You can use \( e^3 \text{value} \) to do so

Thanks for your attention!