Block III: Capita Selecta:
Value modeling and …

- Goal modeling
- eService Bundle modeling
- Control modeling

1

Block III.A

Value modeling and Goal modeling

Michael Petit

2

Further information on *e³value* and goal modeling

- Jaap Gordijn, Michael Petit, Roel Wieringa, "Understanding business strategies of networked value constellations using goal and value modeling", forthcoming, RE'06.
- Jaap Gordijn, Eric Yu, Bas van der Raadt, "e-Service Design Using i* and *e3value* Modeling", IEEE Software, May/June 2006, pp 26-33.
- Bas van der Raadt, Jaap Gordijn, Eric Yu, "Exploring Web Services Ideas from a Business Value Perspective", Proceedings of the 2005 13th IEEE International Conference on Requirements Engineering (RE'05), Joanne Atlee and Colette Roland (eds.), pp 53-62, IEEE CS, 2005.

3

Block III.B

Value modeling and eService Bundling

Hans Akkermans

4

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 e3value: modeling services as component-based value objects
  - (e)Service ontology
  - Automatic configuration of service bundles

5

An example:
Energy services

6

1

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)
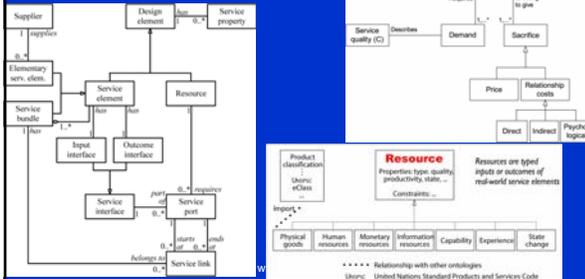
e³service modeling constructs (2)

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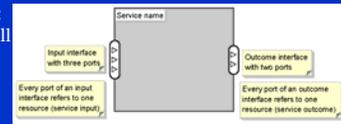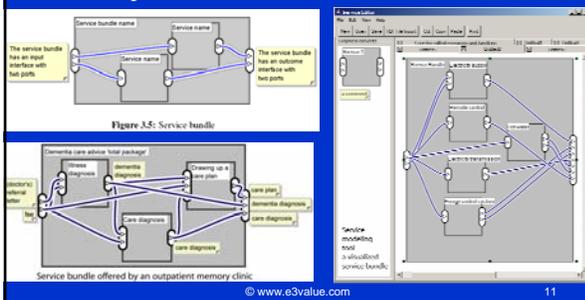 - Underlying notions: service is transformation of something into (more) economic or social value

Figure 3.3: Service element

e³service modeling constructs (3)

- Service elements
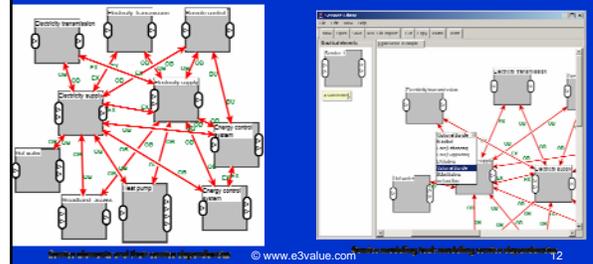 - Composed from elements based on business rules

Figure 3.5: Service bundle

Service bundle offered by an outpatient memory clinic

e³service modeling constructs (4)

- Service dependencies
 - Business rules / constraints in ontology whether or not service elements can "go together"

2

$e^3service$ 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

© www.e3value.com
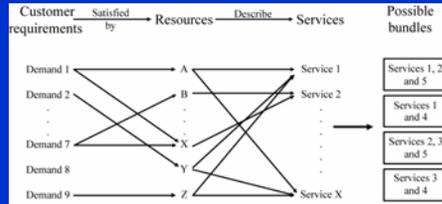
13

$e^3service$ bundle configuration (2)

- Computed output = set of feasible service bundles

© www
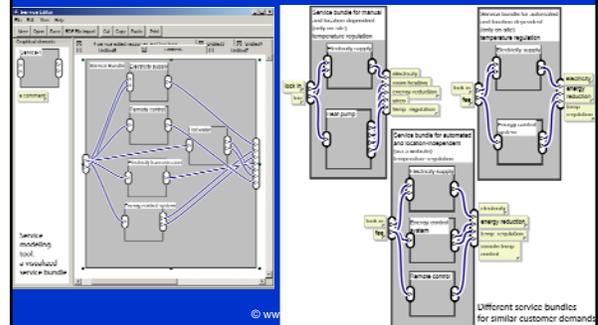
eService bundling and Value modeling

- $e^3service$ – e^3value interaction:
  - service bundles are sophisticated value objects that influence business model
- After $e^3service$ service bundling step:
  - redesign of e^3value networked business model
  - and re-analysis of economic feasibility for all actors

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15

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)
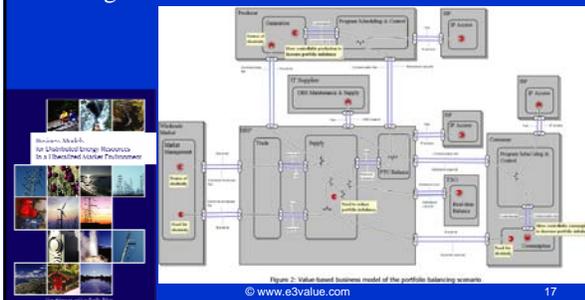- Commercial aggregation of many small power production and consumption units (DER)

'… a step towards the future of electricity networks'

www.e3value.com

16

Distributed Balancing Services in Intelligent Power Networks (1)

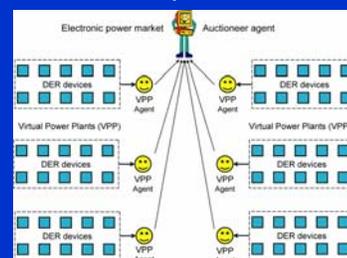- => Significant business case for DBS services

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17

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

- Virtual Power Plant Concept
- Distributed Control by eMarket technologies

18

3

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
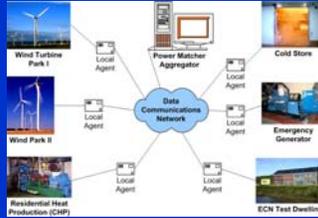
19

Further information on *e³value* and eService modeling

- Hans Akkermans, Ziv Baida, Jaap Gordijn, Nieves Pena, Ander Altuna, and Inaki Laresgoiti: "Value Webs: Ontology-Based Bundling of Real-World Services", IEEE Intelligent Systems, July/August 2004, pp. 57-66.
- Ziv Baida, Jaap Gordijn, Hans Akkermans, Hanne Saele, and Andrei Morch: "Finding e-Service Offerings by Computer-Supported Customer Need Reasoning", Int. J. e-Business Research, Vol. 1, No. 3, pp. 91-112, 2005 [and see Ziv Baida's PhD Thesis, May 2006]
- Jaap Gordijn, Eric Yu, Bas van der Raadt: "e-Service Design Using i* and *e3value* Modeling", IEEE Software, May/June 2006, pp 26-33.

20

Block III.C

Value modeling and inter-organizational control modeling

Jaap Gordijn

21

What are *controls*? (1)

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

22

What are *controls*? (2)

- Intra-organizational controls
  - Focus on opportunistic behavior of own employees
  - Traditionally the field of (EDP)-auditing
    - Often 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

23

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

24

4

Why *e³value* 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

- *e³value* modeling is grounded in Transaction Cost Economics (Williamson), which studies safeguards against opportunistic behavior in contract relationships

25

Using *e³value* modeling for *designing* inter-organizational controls

1. Understand the context
   - Construct an *e³value* model as a statement of an ideal world: no frauds
2. Analyze the control problem(s)
   - Construct an *e³control* 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 *e³value* model and/or to add business processes, both representing the control
4. Analyze the revised ideal *e³value* model for control problems (step 2 again)
   - Remaining, unsolved, problems
   - "second order" problems: is the control itself sensitive to fraudulent behavior

26

## 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
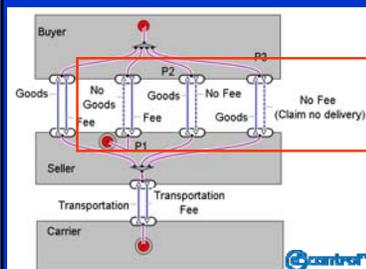
27

1. Understand the context: construct an *e³value* model
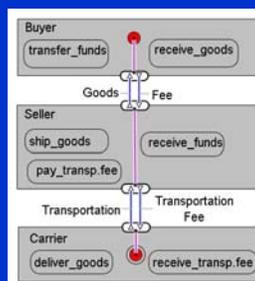
- Buyer and seller trust each other fully
- Both use a carrier for transportation

- Key principle in *e³value* is economic reciprocity

28

2. Analyze the control problem: construct an *e³control* model

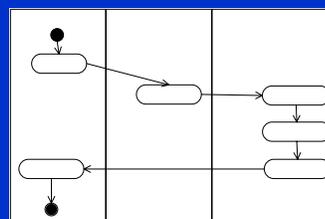- *e³control* relaxes the economic reciprocity constraint of *e³value*
- *e³control* shows sub-ideal scenarios and penalties

29

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

Control problem P1: the buyer does not trust the seller about delivery
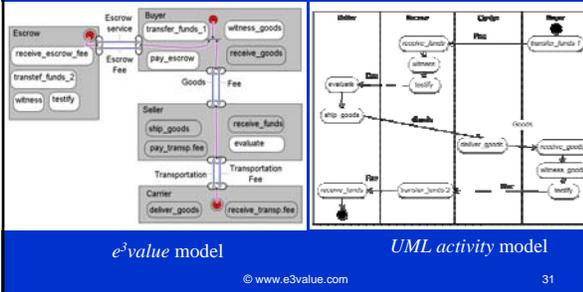Control solution: Pre-execution

30

5

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)

e³value model   *UML activity* model

31

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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

32
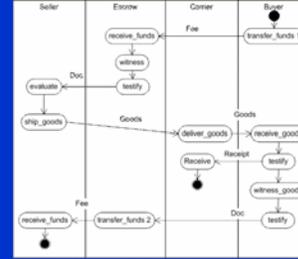
Use of *control patterns* in designing inter-organizational controls

- 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)

33

Use of *control patterns* in designing inter-organizational controls

- Patterns should be based on accepted and agreed design knowledge
  – Theory on intra/inter-organizational controls, case studies & best practices
- Context: ideal behavior of enterprises shown by an *e³value* model
- Problem: sub-ideal behavior of enterprises shown by an *e³control* model
- Solution(s): a revised *e³value* model and/or a process model (e.g. a UML activity diagram)

34

A *pre-execution* pattern

- PA does not trust CA
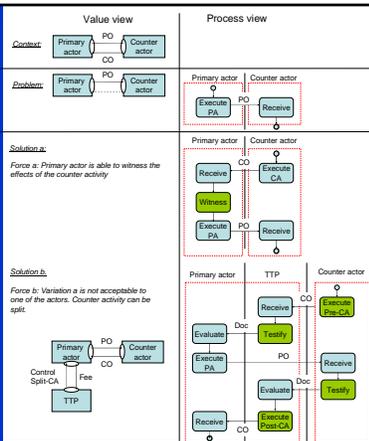
Towards a library of *control* patterns

- (Pre-execution)
- Receipt
- Contracting
- Certification/accreditation
- Physical protection
- Credit
- Reconciliation
- …

36

In sum: inter-organizational control modeling with *e³value*

- Use *e³value* to understand a networked value constellation from an ideal perspective
  - Focus on economic reciprocity, main purpose is business development
- Use *e³control* to understand a networked value constellation from a sub-ideal perspective
  - Focus on controls, main purpose is control development
- Business (CxO's, marketeers) & control (accountants, auditors) development are different things and people with different concerns; do not mix them up!

37

Further information on *e³control*

- See www.cs.vu.nl/~gordijn/research.htm
- For a more complex example on using *e³value* and *e³control* 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)
  - V. Kartseva, J. Gordijn, Y.-H. Tan, "Towards a Modelling Tool for Designing Control Mechanisms in Network Organisations", International Journal of Electronic Commerce (M.E. Sharpe), Winter 2005–6, Vol. 10, No. 2, pp. 57–84

38

Take home message

- Before embarking on a 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 *e³value* to do so

39

Thanks for your attention!

40