Mass Customization with Configurable Services: A Conceptual Model

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  - Theoretic background
- Configurable products
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  - Configurable services
- Four-Worlds Model for configurable services
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  - Experiences from cases
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Background

Personal
- 2000 Optiwise, Stonesoft – software development, product modeling tool
- 2001 - HUT, research projects related to product configuration, software development for configuration modeling tool, conceptual modeling
- Aiming for PhD, Master’s degree from HUT

Currently (and this lecture is based on):
- Configurable Services on the Web (ConSerWe) project
- http://www.soberit.hut.fi/ConSerWe/
- Tekes-funded, four case companies: insurance, communications, and two equipment maintenance services companies

Mass customization

Definitions:
- Mass customization (MC) can be defined as a strategy of providing even individually customized goods or services at production costs and lead-times of, or close to, large-scale mass production (Pine 1993; da Silveira et al. 2001)
- “the ability to provide your customers with anything they want profitably, any time they want it, anywhere they want it, any way they want it” (Hart 1995)
  - Idealistic definition
  - Profitability requires an “envelope of variety”, a pre-determined range of what is offered to the customer
- Pine 1993: historical development from craft production (blacksmiths) to mass production (Ford T-model) to mass customization
Mass customization vs. mass production vs. one-of-a-kind

Price/cost

High

Low

Adaptability to customer needs

Customization

mass production

mass customization

one-of-a-kind product

Adapted from Tihiinen & Soininen 1997; Svensson & Barfod 2002

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Mass customization, a viewpoint

Price/cost

High

Low

Adaptability to customer needs

Customization

complexity

correlation between added customization/complexity and cost

more customization with same cost

same customization with lower cost

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Mass customization & complexity

MC as a strategy reducing complexity

- Decreasing order taking process complexity
- Decreasing inventory’s complexity
- Decreasing product complexity
- Standardization, high commonality and modularization
- Use of configurators

- Customer pull and setup reduction
- Mass customization
- Proliferation of product variety

MC as a strategy increasing complexity

- Increasing configuration complexity
- Increasing planning and scheduling complexity
- Increasing production program complexity
- Use of flexible manufacturing systems

- Decreasing order taking process complexity
- Decreasing inventory’s complexity
- Decreasing product complexity
- Standardization, high commonality and modularization
- Configurable products

Adapted from Blecker et al. 2005, p. 60

Configurable products

- Modular, standard components
- Characteristics:
  - Pre-designed for a given range of customer requirements
  - Each delivered product individual is adapted to the needs of a customer
  - Each product individual is specified as an arrangement of pre-defined components
  - The product has a pre-designed architecture
  - No creative or innovative design is needed as a part of the sales-delivery process
- PCs, cars, hamburgers, etc.
  - Cars: www.volvocars.co.uk – click Build and Price
  - PCs: www.verkkokauppa.com – 'Pöytäkonelaskurit'
  - Does not check for incompatibilities
Mass customization with configurable products

- Specifying the product individual the customer wants
  - Often difficult and error-prone, both for supplier and customers
  - Numerous options, complex interdependencies
- Producing the specified product individual
  - Fire-fighting from specification errors, delays, iterations, rush-orders

Configurators

- Configurators are IT systems used...
  - ... to support the customer and/or sales person in eliciting customer needs and translating them into product specifications.
  - ... to model the adaptation possibilities of configurable products into configuration models, and to maintain and manage the product information embedded in the models.
- Can ensure correctness and completeness of product sales specifications (with artificial intelligence)
  - Less iterations and firefighting in production, shorter lead-time in sales, etc.
Services

- Definitions abound...
  - "A service is a process consisting of a series of a more or less intangible activities that normally, but not necessarily always, take place in interactions between the customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems" (Grönroos 2000, pp. 46)
  - "A service is a time-perishable, intangible experience performed for customer acting in the role of co-producer" (Fitzsimmons & Fitzsimmons, 2004, p. 4)
  - Or check the definition on slide 13 of Jim Spohrer’s 3.4.2006 lecture (based on Gadrey, 2002)

Goods vs. services

<table>
<thead>
<tr>
<th>Goods</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangible</td>
<td>Intangible</td>
</tr>
<tr>
<td>Homogenous</td>
<td>Heterogeneous</td>
</tr>
<tr>
<td>Production and distribution</td>
<td>Production, distribution, and</td>
</tr>
<tr>
<td>separated from consumption</td>
<td>consumption simultaneous</td>
</tr>
<tr>
<td>Nonperishable, can be kept in stock</td>
<td>Perishable, cannot be kept in stock</td>
</tr>
<tr>
<td>A thing</td>
<td>An activity or process</td>
</tr>
<tr>
<td>Core value produced in a factory</td>
<td>Core value produced in buyer-seller</td>
</tr>
<tr>
<td>Customers do not (normally)</td>
<td>interactions</td>
</tr>
<tr>
<td>participate in production</td>
<td>Customers participate in production</td>
</tr>
<tr>
<td>Transfer of ownership</td>
<td>No transfer of ownership</td>
</tr>
</tbody>
</table>

Grönroos, 2000, p. 47
24.4.2006 13

Goods dimension

“Just a car” Car Leased car Limousine service

Service dimension

Goods dimension

Physical (Goods) Car Car (Car) (Car)

Service Delivery Warranty Service contract Lease contract Travel

Configurable services

- We define configurable services as...
  - services that can be customized to individual specifications from a set of options designed to meet a pre-determined range of customer needs

- Examples:
  - Insurance agreements
  - Machinery maintenance contracts
  - Mobile, broadband etc. subscriptions
  - Traveling trips
Conceptual model

- Purpose of a conceptual model is to provide the concepts fit for describing relevant phenomena in an area of interest
- Configuration modeling language is integral to the configurator
- This model aims to provide concepts to model configurable services, used in a configurator
  - Self-service over the web
  - Consultative selling with sales and customer together

Knowledge on configurable products describes a view on

Conceptualization of knowledge on configurable products represented using

Configuration modeling language

Overview of Four-Worlds Model for Configurable Services

- Objects-of-service world: describe the recipient of service delivery and its environment
- Needs world: describe the reasons why a customer would want to buy service
- Service solutions world: what is to be delivered; agreement or contract options
- Process world: describes the delivery process and resources used in it; how and with what the service is put into practice

Adapted from Soininen 2000
Metamodel

- Meta-metamodel
  - (In this context UML itself)

- Four-worlds model metamodel
  - (this slide, uses UML)
  - concepts, relationships used in modeling

- Configuration model
  - Adaptation possibilities of a configurable product
  - ‘color of car can be one of red, blue or green’, etc.

- Configuration
  - Instances
  - Description of a product individual
  - ‘color of car is blue’

Example

- Loosely based on Tapiola’s insurance services

- Vehicle insurance
  - Objects-of-service: customer and car
  - Needs: in case of a car breakdown on the road
  - Solutions: mandatory (not modeled in UML example) and voluntary insurance, voluntary has services for car breakdowns
  - Process: process in case of car breakdown, who arranges towing, repair with budget or normal
  - (see Heiskala et al. 2005 for details)

- Configuration model and configuration shown in the following slides
Experiences from cases: modeling

- Case broadband subscriptions
  - Used information from the company’s website
    - Configuration model contains 59 types, 72 attributes, 20 parts, and 31 constraints. Quite large.
    - Self-service viewpoint
  - Information on the website can be divided to the four worlds
    - Modeling quite straightforward, felt natural to use the worlds
    - Currently the information is scattered on the website
    - Recommendations for suitable solution shown separately from the solutions, customer has to memorize them (Needs)
    - Service delivery issues, what the customer has to have in place, contact info etc. Customer has to interpret these according to the configuration choices made (Process)

Experiences from cases: modeling

- Case equipment maintenance
  - Information from interviews, company marketing and contract material
    - The model contains 28 types, 66 attributes, 22 parts, and 34 constraints. Large. Modeling again relatively easy.
    - No process world modeled because customer participation is minimal.
    - Consultative selling viewpoint used, for internal use.
    - Objects-of-service world:
      - equipment characteristics, its installation environment, use frequency etc.
    - Needs world:
      - Safety, reliable and continuous operation, criticality of the equipment, etc.
      - Not all configurable in the sense of yes/no, but a matter of degree
      - Can be used to communicate what solutions meet the needs everyone has
    - Solutions:
      - Service contracts and their options. Easy to model.
Experiences from cases: documentation and design

- Ongoing in one of our cases:
  - Analyzing their current services through the Four-Worlds Model
  - Documentation of their configurable services
    - Much of the information is currently in sales persons heads
    - E.g. what kind of a solution is best for a customer with given characteristics
    - Model seems to provide a natural way for structured thinking about the services, about their customizable aspects
  - Expected benefits (it’s really early days…)
    - Easier training of new employees, making tacit knowledge explicit, more uniform communication to customers, better understanding of own services, etc.
  - Further, the company has embarked on using the model on their own for new offerings
- In another case, Four-Worlds model used to support development of new services
  - Thinking about the customers and what they really need, are there gaps in the solutions, how they use the service (process), etc.

Conclusions

- On basis of case experiences Four-Worlds Model seems to provide...
  - a feasible way to model configurable services
  - a natural way for structured thinking about configurable services in the case companies
  - a basis for documentation and perhaps design of configurable services
- Todo:
  - Modeling methodology, guidelines, “How to”
  - Modeling tool support, better sales configurator support
Thank you!

Questions?

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ConSerWe:
http://www.soberit.hut.fi/ConSerWe/

Some readings, references

ConSerWe:
Some readings, references

Other: