Accounting for Service Value – an Ontological Approach

Hans Weigand, Paul Johannesson, Maria Bergholtz

pajo.maria@dsv.su.se
Problem definition

- Services are used in a use process, outside or at the border of the company
- Service execution builds on large fixed capacity
- Cost strategy does not work. Focus on Joint Productivity Gain
- Measuring service performance (total cost of customer, value of a customer)
- Service resource planning
Contribution of this paper

• A service accounting framework based on the REA business ontology
• Definitions of key service accounting concepts such as total service delivery costs and value-in-use.
• A unified data model (unified for services and resources)
What is a service?

- "Service is a process" (GDL vs SDL) (service science)
- "Service is a resource" (economics)
- "Service is a commitment" (Guarino)
- "Service is an interface" (computer science)
Basic REA concepts
Service process pattern

X: exchange duality
C: conversion duality
Data model
### Service accounting meters

<table>
<thead>
<tr>
<th>METER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>$U_{r,x} = \sum_{e \in x} \text{amount}(e) \times #\text{period}(e) \times CP_r$</td>
<td>Resource use costs, summarizing over all stock flow events $e$ in the process $x$ where $e$ uses resource $R$</td>
</tr>
<tr>
<td>$DC_{s,x} = \sum_{e: \text{support} \in x} \text{value}(e) = (\text{duality}) \sum_r(U_{r,x}) + R_X - P_X$</td>
<td>Total service delivery cost of a service instance $S$ supported by process $x$, including consumed resources and costs of waste disposal.</td>
</tr>
<tr>
<td>where $R_X = \sum_{e: \text{consume} \in x} \text{amount}(e) \times CP_{resource}(e)$</td>
<td></td>
</tr>
<tr>
<td>$P_X = \sum_{e: \text{produce} \in x} \text{amount}(e) \times CP_{resource}(e)$</td>
<td></td>
</tr>
<tr>
<td>$DC_X = \sum_{x: \text{support}(s) \in x} DC_{s,x}$</td>
<td>Total service delivery cost of a service instance $S$</td>
</tr>
<tr>
<td>$DC_{s',p} = \sum_{s': \text{support} \in s'} (DC_s) + D_{s',p}$</td>
<td>Total service delivery cost for all service instances $S$ of $S'$ in period $P$, including depreciation of initial investment</td>
</tr>
<tr>
<td>$AC_{s,p} = DC_{s',p} / N$</td>
<td>Average service support cost in period $P$, where $N$ is number of service instances (contracts) in $P$</td>
</tr>
<tr>
<td>$VU_{s,CU} = SR_s - \sum_r(U_{r,y}) + R_y - P_y$</td>
<td>Value-in-use of $S$ for customer $CU$ defined as service revenue minus all costs, where $y$ is the customer process. $U,R,P$ - analogous to above</td>
</tr>
</tbody>
</table>
Online game case - e3value model
Application of pattern to online game case

- **Cost per unit for MONEY M1**: N/A
  - Current level: 2K
  - Unit: $

- **Cost per unit for Electricity E1**: $15
  - Current level: 55
  - Unit: KWatt

- **Cost per unit for HARDWARE HW1**: $5
  - Current level: 1024
  - Unit: Mbyte

- **Cost per unit for Heat H1**: $100
  - Current level: 10000
  - Unit: KiloJoule

- **Cost per unit for Personell P1**: $75
  - Current level: 3
  - Unit: N/A

- **Cost per unit for Use usePersonell**: $75
  - Current level: 3
  - Unit: N/A

- **Cost per unit for Support supportPersonell**: $15
  - Current level: 55
  - Unit: KWatt

- **Cost per unit for Support supportCust**: N/A
  - Current level: N/A
  - Unit: N/A

- **Cost per unit for Support supportDownload**: Derived
  - Current level: 2K
  - Unit: N/A

- **Cost per unit for PRODUCE produceHeat1**: $100
  - Current level: 10000
  - Unit: KiloJoule

- **Cost per unit for PRODUCE produceHeat2**: $100
  - Current level: 10000
  - Unit: KiloJoule
Computing value in use

\[ V_{UD1,C1} = SR_{D1} - (\sum_r(U_{r,y}) + R_p - P_p) \]

\( SR_{D1} \) is assumed to be 200.

\( \sum_r(U_{r,y}) = 1 \times 75 \times 1 = 75 \) (based on personnel cost per unit, in class Personnel, and amount, in class UsePersonnel and the length of the time period (#period, in this case assumed to be 1) in class UsePersonell)

\( R_p = 1 \times 15 = 55 \) (based on electricity amount and electricity cost per unit)

\( P_p = 1 \times 100 = 100 \) (based on heat amount and heat cost per unit)

Thus, \( V_{UD1,C1} = 200 - (75 + 55 - 100) = 170 \)
Conclusions

- We have presented a Service Accounting framework based on the REA business ontology.
- Services are represented as REA resources.
- There is not one “service process”. Services are realized by 3 processes: the service delivery process, the service exchange process, and the service usage process.
- Based on the service ontology, it is possible to define essential indicators – in particular, meters such as value-in-use and total-cost-of-delivery.

Future work:
- Working out a full set of balances and performance indicators, as well as policies
- Design of an ESP (Enterprise Service Planning) system