The Prospects of Product Carbon Footprints in ERP Systems

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Agenda
- Motivation
- State of Research
- Current Projects
- Outlook and Open Problems

Example: CO₂-Productivity

Global GDP (in 1,000 Mrd. US$)

1950 2000 2050

5 32 145

Global CO₂ Emission (in Mrd. Tonnen)

1950 2000 2050

9 32 5-10

CO₂ Productivity (in $ GDP/kg CO₂)

0.5 1.0 15-30

1% p.a. 6% p.a.

Source: Global Insight, IPCC, WRI, McKinsey

Integration ERP und BUIS

ERP-Systeme
Supports operative business and economic targets

EMI-Systeme
Supports legal requirements and ecological targets

Integration

Economic evaluation with consideration of environmental feedback (direct & indirect)
Relevance of ecological targets in ERP-Systems

**Ecological valuesystem**
- Company acts sustainable due to conviction of the owners

**Marketing**
- Company sees competitive advantages in positioning as "green company"

**Regulative environment**
- Legal regulations force the company to report the environmental impact of products

**Riskmanagement**
- Company expects upcoming regulatory pressure and wants to evaluate the corresponding risk (i.e., introduction of carbon tax).

Carbon Footprint

<table>
<thead>
<tr>
<th>Definition and goals</th>
<th>History</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodological approach to evaluate climate impact of products</td>
<td>Term „carbon footprint“ was introduced to scientific journals in 2006</td>
<td>Easy to communicate, sexy scalar value</td>
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<tr>
<td>Volume of GHG-equivalent emissions during the lifecycle of a product (cradle to grave)</td>
<td>Standardization projects in UK, Germany</td>
<td>Covers only one single aspect of the environmental impact of a product.</td>
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<td>Compliance with ISO 14040 etc. announced</td>
<td>Controvers discussion in LCA-community.</td>
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<td>Based on hybrid LCA</td>
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<td>Unit: kg</td>
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<td>Base of several product label projects (carbon trust, thema1)</td>
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- **Motivation**
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- **Current Projects**
- **Open Problems**

Integration of EMIS and PPS-Systems

Quelle: Isenmann & Rautenstrauch 2007
Completed projects with focus on ERP-Integration

**ECO Integral**
- Development of a reference model for environmental management as part of ERP-Systems
- Detailed modelling of data and processes
- Reference model was created as blueprint for software vendors

**OPUS**
- Concepts for integrating environmental protection into order processing
- Concepts for new PPS-system, prototypical implementation on base of (small) ERP-vendor

**CARE**
- Concept for extending economic controlling by ecological key data
- One subproject about ERP/EMIS-Integration
- Essential result: specification PAS 1025

**INTUS / intebis**
- Consideration of instruments for environmental controlling
- Study of expected organizational barriers in corresponding implementation projects
- Development of suitable process model

Open problems (of mentioned projects)

- Bridging the semantic gap between ERP, EMIS and LCA-Databases is crucial for further automation
- Data collection of substance data, transportation data and process data still causes large effort
- Material master data and substance master data in current projects are strongly connected, so environmental impacts of individual lots cannot be calculated
- Environmental impacts are used only in context of life cycle assessment, they are not used on strategical or operational level

Project Ecolo. PLM (TU Darmstadt & TechniData)

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Import von ERP in BUIS (Beispiel: SAP – Umberto)

Überführung von Stoffstromnetzen in PPS-Systeme

Integration Requirements

1. IT Infrastructure
2. ERP-Processes
3. SEM Processes

Research Objectives

- Integration of product-based environmental impact into ERP-processes (show carbon footprint in sales documents; supplier collection in consideration of environmental impacts of primary products).
- Integration of product-based environmental impact into planning- and risk management processes (Implications of changed supplier structure in terms of environmental impacts of own products, evaluation of risks caused by expected legal changes, etc.)
Systemarchitecture

Current state

**Infrastructure**
- Internal pilot study using carbon footprint (cradle to gate).
- Implementation on base of SAP XI – in process
- Next step: development of prototype in cooperation with software vendors of ERP-systems, LCA-Tools and LCA product databases

**Integration of environmental impacts into ERP-Processes**
- First concepts on base of case studies
- Next step: development of a prototype based on SAP XI and SAP ECC

**Integration of SEM-Processes**
- First concepts (planning processes)
- Next step: Nächster Schritt: development of a prototype based on SAP XI and SAP ECC

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Open Problems

- How can we bridge the semantic gap between ERP system and Input Output based LCA Tool?
- How can we bridge the semantic gap between ERP system and LCA databases?
- How can we integrate environmental impacts into Enterprise Risk Management?