Cost data quality considerations for eco-efficiency measures

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GreenDeLTa TC
SOUND LIFE CYCLE ANALYSES

Outline

- Data quality issues for cost data
- A pedigree matrix for managing cost data quality
- Application
- Combination with environmental impact data quality management

1. Cost data quality issues

Different financial figures by different accounting systems [Wagenhofer 1999]

Norsk Hydro, **annual earnings 1992** (m NOK)	Norwegian law **167**	US-GAAP **1,763**
SmithKline Beecham, **equity capital 1989** (m USD)	UK-GAAP **7,000**	US-GAAP **-600**
Hoechst AG, **annual earnings 1996** (m DEM)	HGB **2,114**	US-GAAP **1,090**

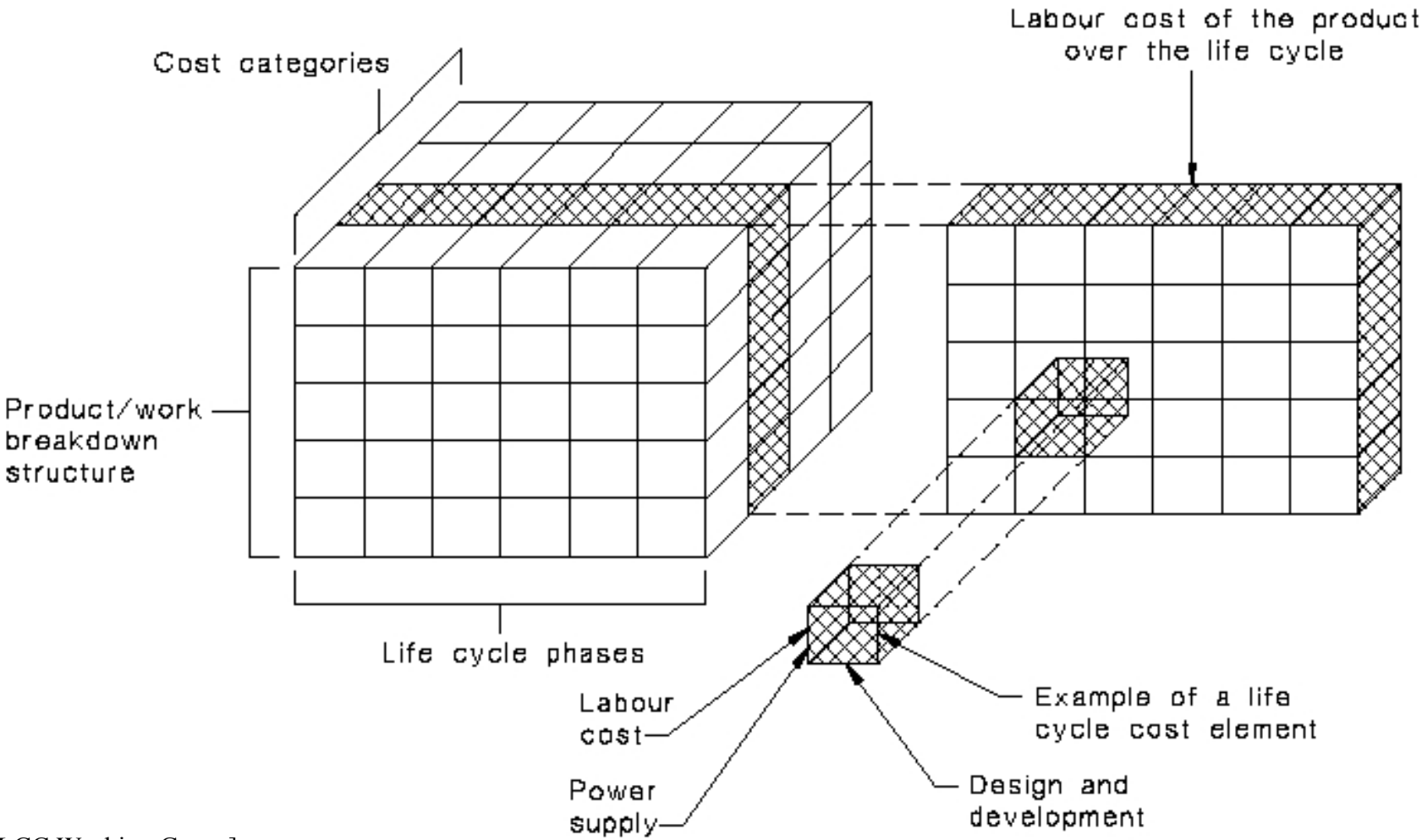
GAAP: Generally accepted accounting principles;
HGB: roughly speaking, German law for corporations

Different product costs by using two different cost methods

Product cost according to TCA and ABC	TCA	ABC
Product A		
Overhead	50.00 $	245.00 $
Direct cost	20.00 $	20.00 $
Total	**70.00 $**	**265.00 $**
Product B		
Overhead	100.00 $	79.47 $
Direct cost	40.00 $	40.00 $
Total	**140.00 $**	**119.47 $**

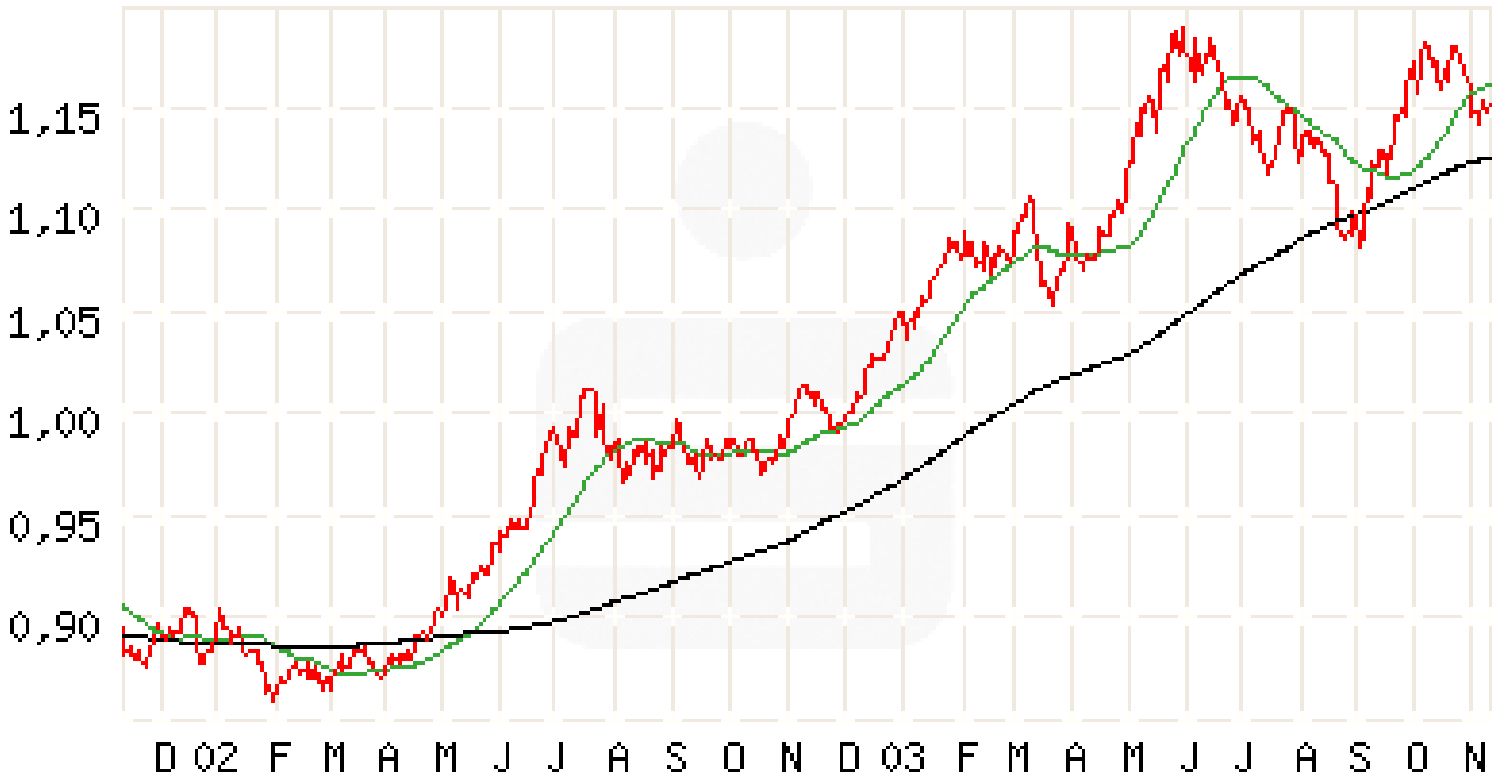
TCA: Total Cost Accounting;
ABC: Activity Based Costing
[Roztocki 1998]

Cost categories and the share of labour costs



[Setac LCC Working Group]

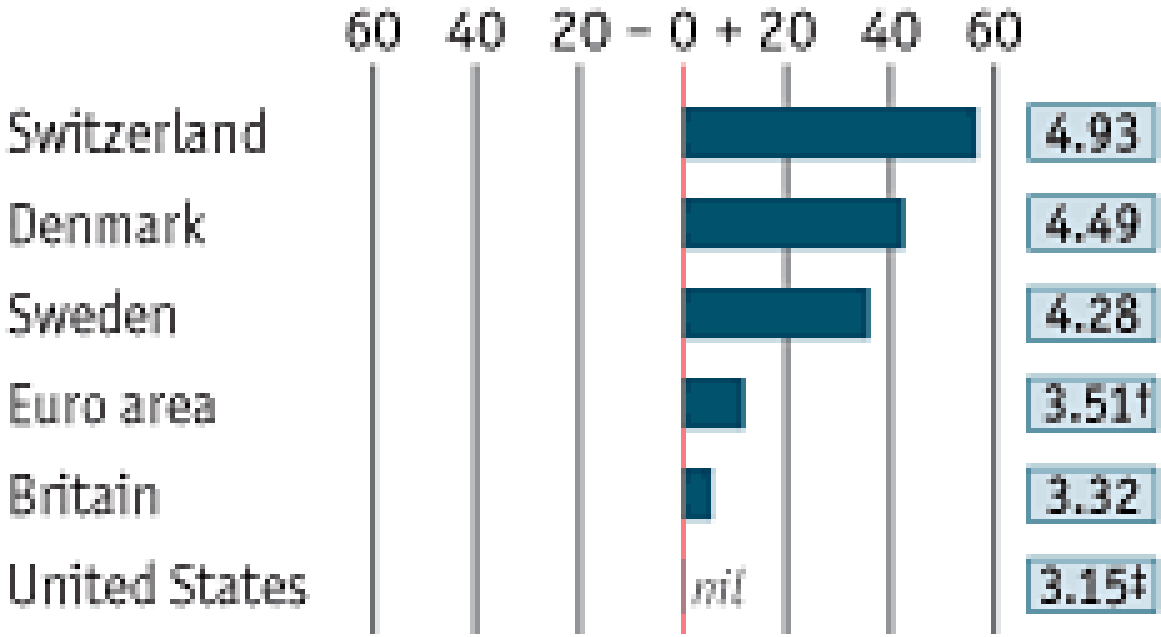
Relation Euro to USD on Spot markets from 2002 to 2003



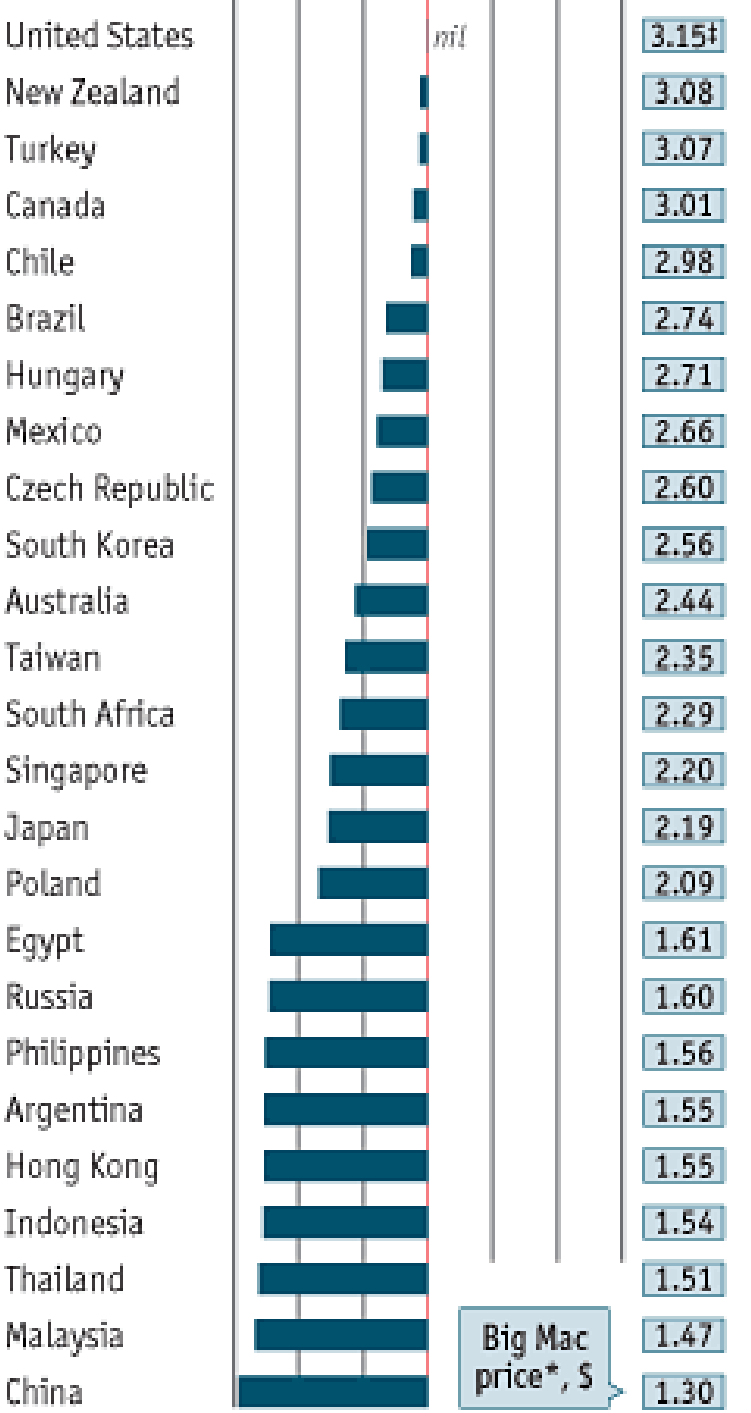
[http://finanzen.sparkasse.de]

Big Mac Index,
Local price of one Big Mac converted in USD

Local currency under/overvaluation against USD in %, as of 9th January 2006



[http://www.economist.com]



[http://www.economist.com]

Confidentiality of cost data

The profit of the producer is the amount a seller is paid for a good minus the seller's cost:

profit = price – cost

Data quality

"characteristics of data
that bear on their ability
to satisfy stated requirements"

[prEN ISO 14040]

→ Data quality is valid only in relation to requirements
(that in turn will depend on a specific application)

Cost data quality is affected by

- Definitions & common rules
- Time
- Space
- Confidentiality

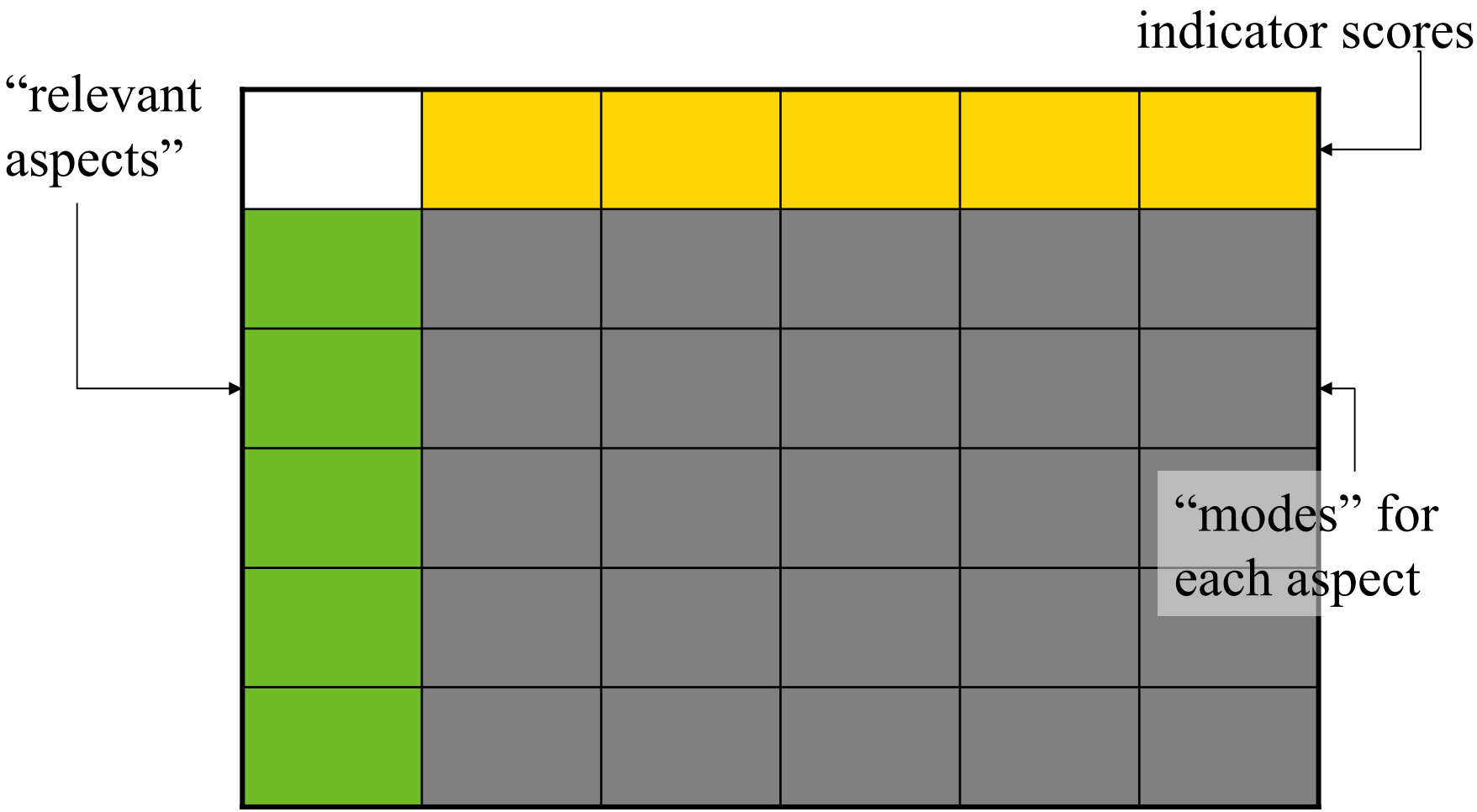
In addition, criteria that apply generally for data quality, namely

Completeness, reliability of the source, investigated object

apply for cost data as well.

2. A pedigree matrix for managing cost data quality

The pedigree matrix concept



A pedigree matrix for managing cost data quality

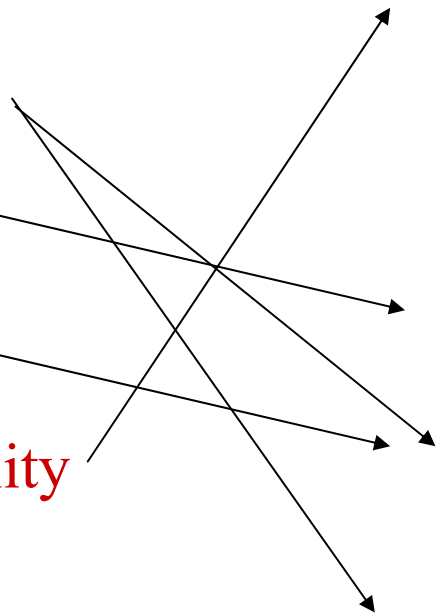
Cost-specific data quality indicators

Definitions

Time

Space

Confidentiality



Basic aspects (assessment criteria):

Reliability

Completeness

Temporal differences

Geographical differences

Further technological differences

Example: Geographical differences

Indicator score	1	2	3	4	5
Geo-graphical differences	Data from area under study, **same currency**	Average data from larger area in which the area under study is included, **same currency**	Data from area with **slightly similar cost conditions**, **same currency,** **or with similar cost conditions**, **and similar currency**	Data from area **with slightly similar cost conditions**, **different currency**	Data from unknown area or area with very **different cost conditions**

(application dependent!)

Indicator score	1	2	3	4	5
Reliability	Verified data based on measurements	Verified data partly based on assumptions or non-verified data based on measurements	Non-verified data partly based on assumptions.	Qualified estimate (e.g. by industrial expert)	Non-qualified estimate
Completeness	Representative data from a sufficient sample of sites over an adequate period to even out normal fluctuations	Representative data from a smaller number of sites but for adequate periods	Representative data from an adequate number of sites but from shorter periods	Representative data but from a smaller number of sites and shorter periods or incomplete data from an adequate number of sites and periods	Representativeness unknown or incomplete data from a smaller number of sites and/or from shorter periods
Temporal differences	Less than **0.5** years of difference to year of study	Less than **2** years difference	Less than **4** years difference	Less than **8** years difference	Age of data unknown or more than **8** years of difference
Geographical differences	Data from area under study, **same currency**	Average data from larger area in which the area under study is included, **same currency**	Data from area with slightly **similar cost conditions, same currency, or with similar cost conditions, and similar currency**	Data from area **with slightly similar cost conditions, different currency**	Data from unknown area or area with very **different cost conditions**
Further technological differences	Data from enterprises, processes, and materials under study	Data from processes and materials under study from different enterprises, **similar accounting systems**	Data from processes and materials under study but from different technology, **and/or different accounting systems**	Data on related processes or materials but same technology	Data on related processes or materials but different technology

3. Application

Result example: One dataset

Vacuum cleaner prod., Germany, 1995

JD Vacuum cle	JD Vacuum cleaner prod.	
Reliability	Reliability	2
Completeness	Completeness	3
Temporal differences	Temporal differences	3
Geographical differenc	Geographical differences	3
Further technological differences	Further technological differences	2

(Application China, 2015) (Application Denmark, 2000)

(application dependent!)

Result example: Inventory

proc_name	Reliability	Completeness	Temporal	Geographical	Further
Bereitstellen Tonmineralien	1	3	1	4	1
Betrieb_Fahrmotor	5	1	1	4	1
Betrieb_Sandwich	1	1	2	1	1
Betrieb_Teppich	1	5	1	2	2
Betriebneu	1	1	5	4	2
betriebverändert	2	2	1	3	2
Compoundieren	1	1	5	1	1
Demontage Fahrzeug	5	1	1	3	1
Deponierung_Bodenbelag	1	4	2	3	1
Deponierung_Hausmüll	5	2	5	1	2
Deponierung_Klärschlamm	3	1	2	2	2
Deponierung_Schlacke	4	1	1	1	1
Deponierung_Sonderabfall	2	3	1	5	1
DISPOSAL	1	2	2	1	3
Einsatz	4	4	4	4	3
Entsorgen EOL	3	5	4	1	1
Entsorgen EOL Teppichboden	2	4	2	1	1
Entsorgen EOL_S	1	2	1	1	1
Entsorgen_Altöl	2	1	1	5	1
Entsorgung_Fahrmotor	1	2	1	2	1
Entwurf	1	5	1	4	2
Erstellung Pflichtenheft	4	2	4	4	3
Fahrzeugindienststellung	3	5	1	4	2
Fertigung	1	1	3	4	1
Fertigung - Teppichboden	1	5	3	4	1
Fertigung_Fahrmotor	1	5	3	3	3
Fertigung_S	3	2	1	5	3
Formaldehydherstellung	2	1	1	3	4
Frist 1	3	3	3	1	5
Fristarbeiten_Fahrmotor	1	3	1	1	3
Fußboden - Einbau	4	1	1	1	2
Fußboden - Einbau - Modernisierung	1	5	3	1	3
Fußboden - Einbau - S - Modernisierung	3	1	2	1	1
Fußboden - Einbau_S	1	4	1	1	1
Hauptuntersuchung_Fahrmotor	1	4	2	1	2
Herstellen_Aceton	2	1	1	4	1
Herstellen_Aktivkohle	1	4	2	1	2
Herstellen_Benzin	1	1	1	1	1
Herstellen_Benzol	3	4	2	1	2
Herstellen_Butadienkautschuk	4	4	1	1	3
Herstellen_Cl2	5	4	1	1	3
Herstellen_Elektroblech	2	3	3	1	1
Herstellen_EPDM	5	1	2	1	3
Herstellen_Ethen	1	3	1	1	1
Herstellen_Ethylbenzol	4	2	1	1	2
Herstellen_Fettsäure	4	2	4	3	5
Herstellen_Grundreiniger	3	4	5	1	4
Herstellen_GS-45	2	1	1	1	1
Herstellen_Härter	4	4	3	2	4
Herstellen_Isolierharze	1	2	2	2	1
Herstellen_Kalkstein	4	5	5	2	1
Herstellen_Kohlebürste	2	3	3	4	5
Herstellen_Kühlschmierstoff	1	3	3	3	1

Further processing of indicator scores

- Data quality hot spots should be analysed and, if possible, cleared
- Aggregating indicator scores based on rules that are conform with goal and scope of the study is one option
- Average, maximum value, geometrical mean, (minimum value), maximum allowed scores are options for aggregation
- Based on an initial evaluation by experts, the indicator scores can be assessed in an automatic manner

4. Combination with environmental data quality management

Combining with environmental assessments

Pedigree matrix by Weidema and Wesnaes has the same basic aspects /criteria and indicator scores

options:

→ pairs on the aspect level

	env.	cost
Reliability	3	3

Combining with environmental assessments

Pedigree matrix by Weidema and Wesnaes has the same basic aspects /criteria and indicator scores

options:

→ aggregating pairs

	env.	cost
Reliability	3	3

→

env./cost
3

Combining with environmental assessments

→ aggregating cost, and environm. matrix respectively

JD Vacuum. cl.	cost	env.
Reliability	2	2
Completeness	3	3
Temporal differences	3	2
Geographical differences	3	2
Further technological differences	2	2

	cost	env.
JD Vacuum cl	3	2

Combining with environmental assessments

Pedigree matrix by Weidema and Wesnaes has the same basic aspects /criteria and indicator scores

options:

→ pairs on the aspect level

→ aggregating pairs

→ aggregating cost, and environm. matrix

→ aggregate matrix aggregates

Decision will depend on application, ongoing experiences, preferences of addressees and practitioners conducting the study.

Conclusions

- Cost data quality is affected by definitions, time and space, and confidentiality issues.
- A pedigree matrix is an interesting approach in this context, for dealing with qualitative issues in cost data quality.
- A pedigree matrix for managing cost data quality is proposed; its structure is similar to an environmental data quality matrix proposed earlier
- Combining both matrix concepts is possible and offers the chance to manage qualitative data quality issues in eco-efficiency approaches.

Thank you!

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The pedigree matrix concept

- Originating from Funtowicz & Ravetz (1990), as part of their NUSAP scheme for managing “all sorts of uncertainty”
- A pedigree expresses key components by means of a matrix. Its columns are basic aspects or “phases” and its lines qualitative “modes” of each aspect expressing different degrees of data quality or uncertainty
- Qualitative modes can be assigned to quantitative “codes” 1, 2, 3, .. . The lower the code the better.
- Pedigree matrix concept was transferred to environm. assessment by Weidema/Wesnaes in 1996

Aim of the presentation is to show how relevant data quality for cost data is,

and, further, to propose a pedigree matrix for managing data quality issues for cost data.

This is done in the context of eco-efficiency, i.e. in a combinated assessment of environmental impacts and costs.