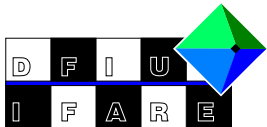

Presentation of the Institute for Industrial Production (IIP) and the French-German Institute for Environmental Research (DFIU)

**Kick-Off Meeting „EDUKALIBRE”:
LIBRE SOFTWARE METHODS FOR E-EDUCATION
Universidad de Juan Carlos, Madrid, Spain
30 - 31 October, 2003**

**Dr. Jutta Geldermann, Martin Treitz, Prof. Dr. Otto Rentz
French-German Institute for Environmental Research (DFIU)
University of Karlsruhe (TH), Hertzstr. 16, D-76187 Karlsruhe, Germany
Tel:+49-721-608.4583 Fax:+49-721-758909
<http://www-dfiu.wiwi.uni-karlsruhe.de/>**



Presentation of the IIP and DFIU (Director: Prof.Dr.rer.nat. O. Rentz)

Institut für Industriebetriebslehre und Industrielle Produktion (IIP)

Founded in 1982:

Institut für Fertigungswirtschaft und
Arbeitswissenschaft

Deutsch-Französisches Institut für Umweltforschung (DFIU)

Founded in 1991:

- Part Institute Karlsruhe
- Part Institute Straßburg

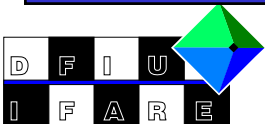
Employees: about 40 (Industrial engineers, Chemical engineers, Mechanical engineers, Civil engineers, Computer scientists, ...)

Working groups:

- Analysis of energy systems
- Emission inventory of heavy metals
- Waste management in the building sector
- Process engineering models
- Emission reduction strategies
- Environment integrated production management

International clients: European Union, UN-ECE, OECD, etc.

National clients: from Industry and Ministries etc.



The Institute for Industrial Production is a Research Institute and offers Teaching for Business Engineering Students

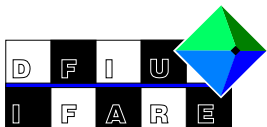
Background of the IIP

The University of Karlsruhe (TH) was **founded in 1825**, following the model of the École Polytechnique in Paris and thus the oldest technical university in Germany. The **12 faculties** offer about **40 study courses** for its **16,000 students**. About **3500 professors, research assistants and technical staff** work at the University.

The Faculty of the **Sciences of Economics** is the youngest faculty of the University of Karlsruhe while at the same time having a long tradition. It has been founded in 1972 by dividing the former Faculty of Humanities and Economics that used to be responsible for the education of economists with technical orientation. Today the **faculty is the biggest school for business engineers in Germany**.



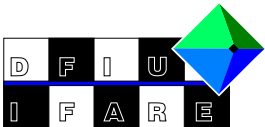
The Institute for Industrial Production (IIP) (founded 1982) is responsible for the education of business engineers with courses on **Production Management** with an **focus on Environmental issues**.



DFIU/IFARE is a joint effort of the French government, the Regional Council of Alsace and the State of Baden-Württemberg

Aims and Main Research Areas of the DFIU/IFARE

- The DFIU/IFARE aims at supporting transboundary co-operation in the field of **environmental research**, in order to:
 - × provide scientific support to environmental policy making
 - × produce readily applicable scientific information for decision makers
 - × confronted with environmental issues
 - × initiate co-operation with international organisations (EU, Council of Europe, UN, OECD, ...)
- Working field/main research activities of **DFIU/IFARE Karlsruhe**:
 - × Waste management in the construction sector
 - × Mass and energy flow management in SME
 - × Environmental integrated production management
 - × Emissions and multimedia environmental management
 - × Strategies against air pollution by photooxidants
 - × Energy Systems and the Environment
- Working field/main research activities of **DFIU/IFARE Strasbourg**:
 - × protection of ground-water and soils against infiltrated hydrocarbons and derivatives
 - × health impact of atmospheric pollutants, farming practices and the environment
 - × micro-organisms and biodegradation in the natural environment
 - × environmental legislation



The Research Team „Technique Assessment“ is one of 6 Research Teams at the IIP / DFIU

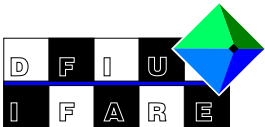
Research Team: Technique Assessment

■ Team:

- × Dr. Jutta Geldermann
- × Dipl.-Geoökol. Hannes Schollenberger
- × Dipl.-Wi.-Ing. Martin Treitz
- × M.S. Kejing Zhang

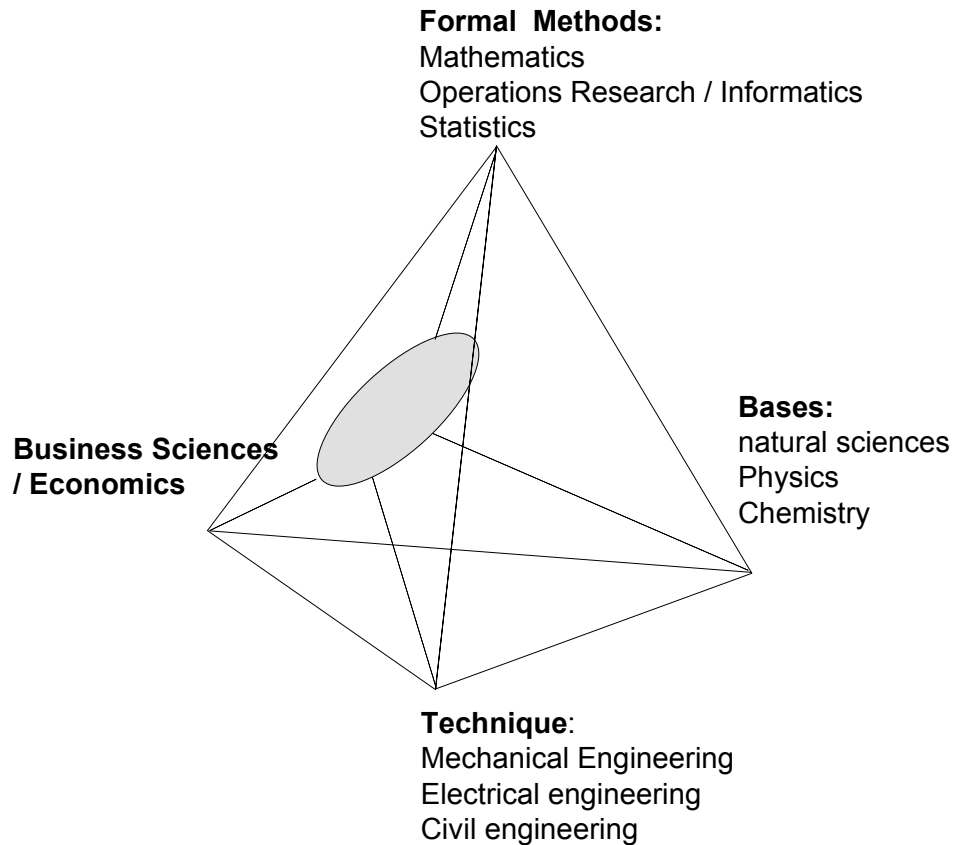
■ Main Research Fields:

- × Strategies against air pollution by photooxidants
 - Evaluation of the consequences of legislative regulations: EU-"Solvent Directive, NEC-Directive, IPPC-Directive etc.
 - A minimum cost approach for the reduction of air pollution by photooxidants in Europe
 - Techno-economic data base for stationary emission sources of VOC and NO_x
- × Mass and energy flow management in small and medium-sized enterprises: Vehicle Refinishing
- × Determination of Best Available Techniques (BAT): Installations for the surface treatment using organic solvents
- × Application of Operations Research
- × Multicriteria Decision Support for Environmental Control Strategies



Industrial Engineering as an Interdisciplinary Study of Technique and Business Science

Teaching Background (1/4)



Industrial Engineering

■ **New Techniques :**

- × Technique development
- × R & D:
 - applications engineering
 - Diffusion of new techniques and products

■ **„Technological competitive edge“:**

- × New products for the market
- × Better / more economic processes
- × Innovations / technology transfer
- × International technology transfer

■ **Technology assessment**

- × technological impact assessment
- × management ratios

Industrial Production is covered from long-term, strategic Planning to tactical, operational Planning

Teaching Background (2/4)

■ Industrial Production / Material and Energy Flows in the Economy I (IP1)

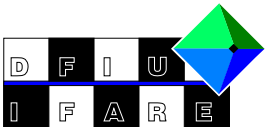
- × production management and system theory
- × strategic management in industrial production
- × industrial research and development
- × location planning
- × industrial logistics and reverse logistics
- × transport and stock-keeping

■ Planning of Plants and Equipment (IP2)

- × layout planning for production plants
- × estimation of investments and costs for plants and equipment
- × determination of the optimal capacity under economic and technical aspects
- × maintenance and control of plants and equipment
- × retirement and disposal of plants and equipment
- × integrated management information systems for the planning of industrial installations

■ Computer aided PPC and Process Simulation

- × Objectives of operational production management
- × production planning and control systems (PPC-systems) and Enterprise Resource Planning (ERP)
- × process simulation software (e.g. Aspen Plus)



Focus on Environmental Management considering Material and Energy Flows for Industrial Production Planning

Teaching Background (3/4)

■ Material and Energy Flows in the Economy II

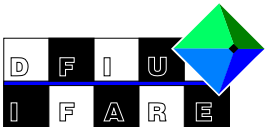
- × mass and energy flow management within and inter enterprises
- × Planning and controlling of processes concerning material and energy transformations
- × organisational internalisation, environmental controlling, environmental audit, environmental management information systems and the development and use of decision analysis

■ Material and Energy Flows in the Economy III

- × emission credit systems, allowance trading systems, quota systems, taxes
- × material and energy flow management for political decision support
- × decision support systems for the development of emission reduction strategies
- × case studies from the Institute's research projects

■ Emissions into the Environment

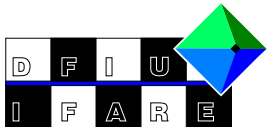
- × major sources of air pollution and pollutant formation mechanisms
- × acidification, eutrophication, ozone depletion, tropospheric ozone formation and climate change
- × Primary and secondary emission control measures
- × waste management, the collection, treatment, recycling and disposal of waste



Student Research Projects round out the Teaching Concept of Business Engineering at the University of Karlsruhe

Teaching Background (4/4)

- Each student has to do 3 research projects (seminars) during his studies within the last two years
- 12-15 students per seminar
- Independent work or group work during a term
- Topic announcements and organisational first meeting at the end of the preceding semester (July and February)
- First research meeting in October and April at the start of the semester
- Assistance during the whole term
- All day long exercise in January and June (8:00 am - 5:00 pm)
- 20 min presentation + discussion of the results
- Written paper of about 20 pages per person (groups are welcome)



The Investigation of the Coating Process of PVC-parts leads to an extensive Data Collection for various Production Scenarios

Business Game (1/5)



automated coating of mobi

coating of mobile phones



plastic beads of car-doors



manual HVLP-spray gun

coating robot



coating line

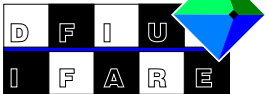
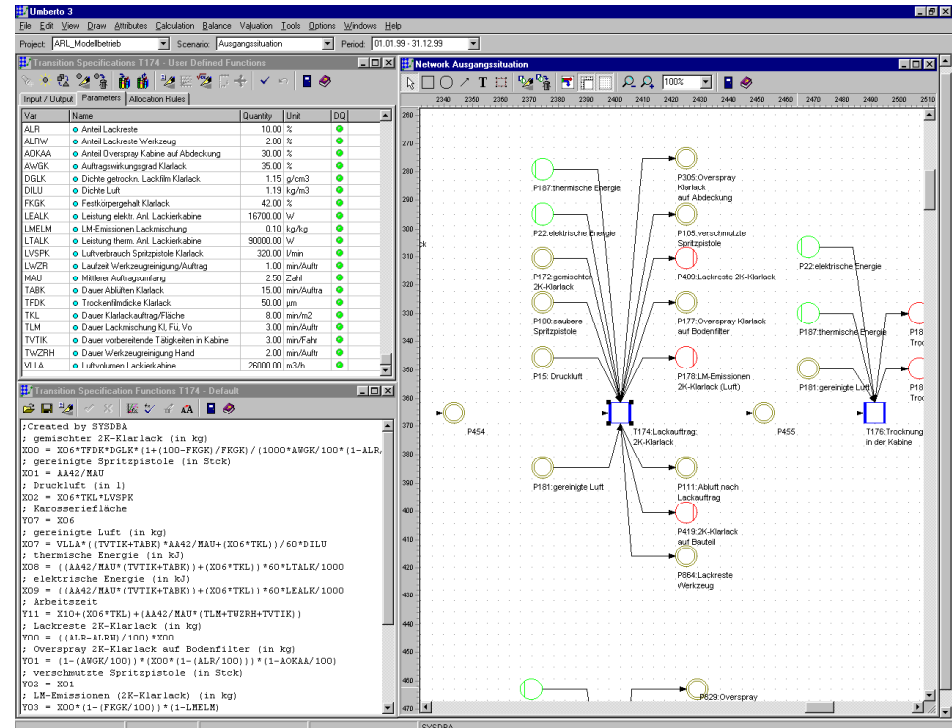
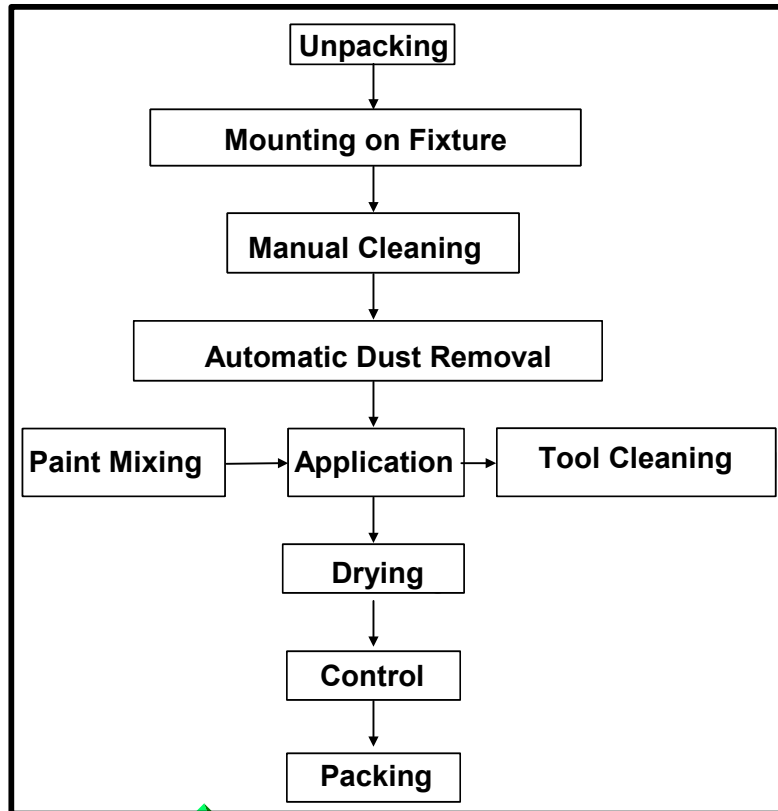


automotive trim

Evaluation and Mapping of the Production Process is the Starting Point for Mass and Energy Balances

Business Game (2/5)

- Mapping and Building a Model of the Production Processes
- Generating Mass and Energy Balances
- Practical Application mostly via LCA Software (e.g. Umberto)

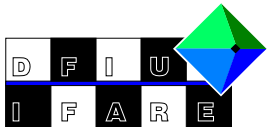


Selected results of the investigated scenarios for paint application on PVC-parts

Business Game (3/5)

Scenario		Resources		Waste		Emissions	Primary measures		Waste gas cleaning
No.	Short description	Paint	Diluting solvent	Paint sludges	Operating costs (€/a)	Solvent emission	Operating Costs (€)	Investment (€)	Operating costs (€/a)
0	(Manual coating)	0	0	0	0	0	0	0	0
1	Robot	-45%	-45%	-60%	0%	-42%	-43%	200,000	0
2A	TI on drier	0%	0%	0%	0%	-3%	0%	350,000	255,000
2B	Adsorption on spraying cabin	0%	0%	0%	0%	-60%	0%	500,000	50,000
2C	Thermal Incineration on spraying cabin	0%	0%	0%	0%	-60%	0%	750,000	20,000
2D	Biofilter on spraying cabin	0%	0%	0%	0%	-72%	0%	350,000	40,000
2E	Scenario 2D +1	-45%	-45%	-60%	0%	-81%	-43%	550,000	40,000
3A	Water based coat	+6%	+ 6%	0%	-75%	-78%	+2%	25,000	0
3B	Scenario 3A+1	-41%	-41%	-60%	-75%	-87%	-44%	225,000	0

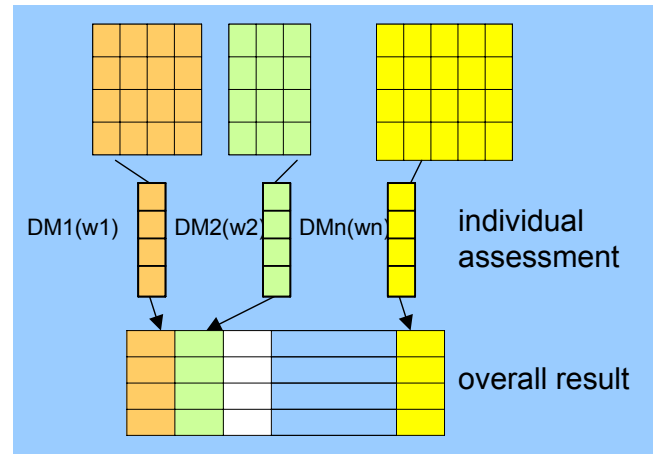
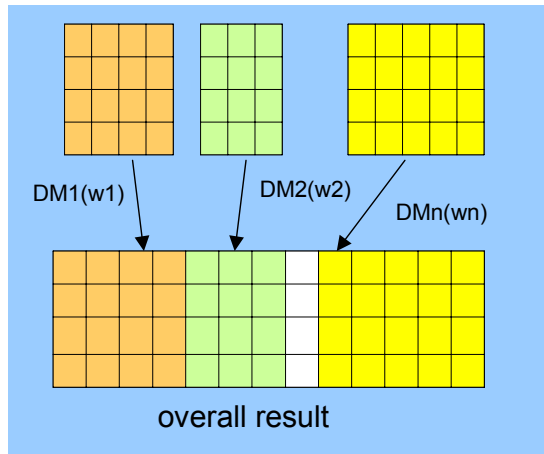
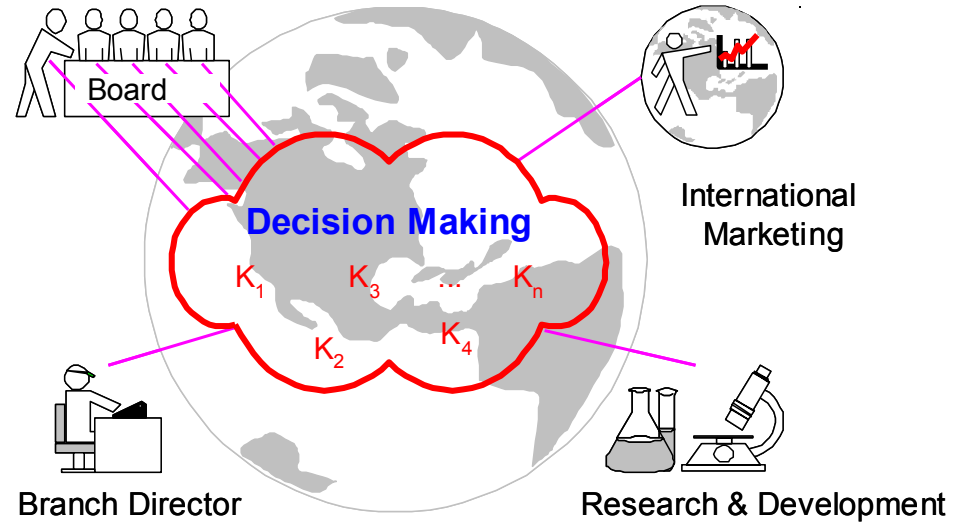
*TI: Thermal Incineration



Role play and Operations Research

Business Game (4/5)

- Collecting of criteria: brainstorming
- Selecting of criteria for the assessment
- Gathering of data for the attributes of the chosen criteria
- Calculating the weighting vectors
- Asserting the allocation of votes (weight of the decision maker in the group)
- Evaluating the decision tables



Planning and Co-ordination of Group Decisions via Integration of Communication Structures in Supply Chains

Business Game (5/5)

