

# Development of a new simulation game for teaching material flow management in higher education

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## Requirements on teaching material flow management

### "hard skills"

basic knowledge and methodical background

production techniques

environment & sustainability

networked systems & modelling

cost accounting & controlling

management techniques

special methods & tools

### "soft skills"

important competences

problem solution competence

decision competence

action competence

communication competence

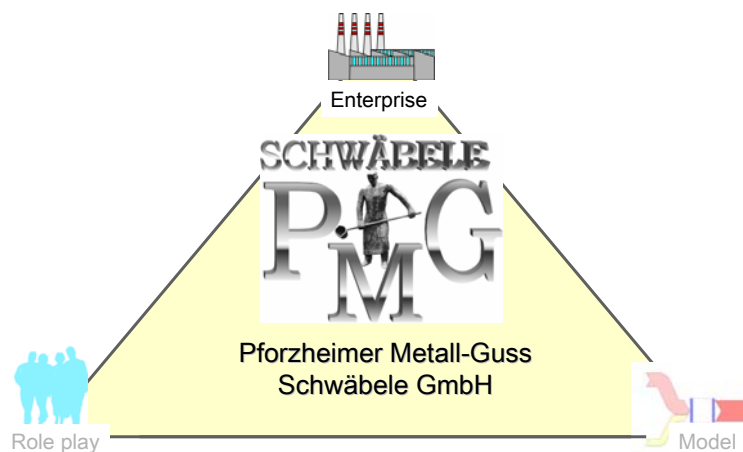
Can be trained by lectures!

Requires active teaching forms!

## Introducing the game: Key data, characteristics and aim

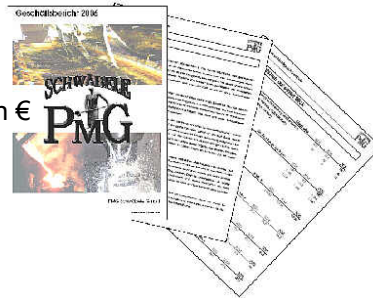
- Target group: (currently) students of economics and/or engineering
  - Duration: one semester with seven half-day events, thereof four rounds
  - Language: currently only German
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- Result-open simulation game organized as a project
  - Unknown parameters (unlike conventional simulation games)
  - Completely paper-based with free choice of applied tools and methods
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- Aim: optimization of a production site under the view of the material flow management

## Introducing the game: The virtual enterprise



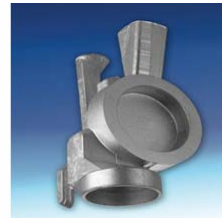
## Introducing the game: The virtual enterprise II

- Middle-sized automobile supplier from Southern Germany
- Traditional family business with a strongly hierarchical organization
- Parent plant in Germany with sales offices in Detroit/Michigan (USA) and China
- 780 employees at the parent plant
- Sales volume in 2006: approx. 170 million €
- Return in 2006: approx. 15 million €

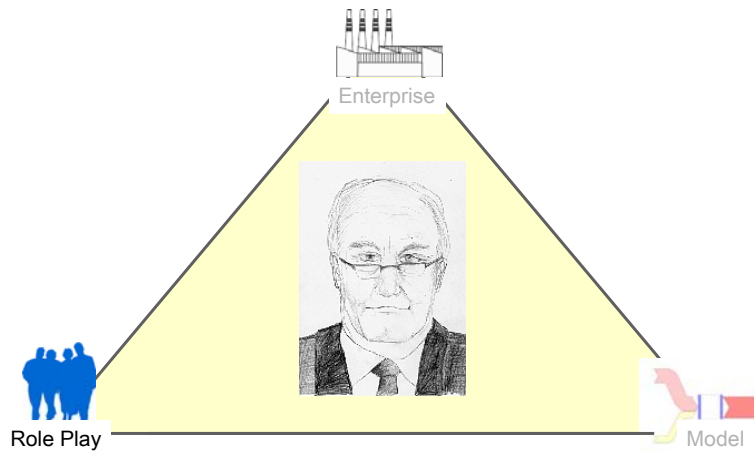


## Introducing the game: Range of products and processes

- Engine blocks from iron sand casting
- Parts from aluminium pressure casting (e.g. cylinder)
- Nickel-plated parts from aluminium pressure casting



## Introducing the game: The role play



## Introducing the game: Roles & conflict of goals

- Especially for training of communication competence
- Roles represent different perceptions in the enterprise supported by shared and role-specific data
- Conflict of roles through conflict of goals → role-specific and contrary key figures which must be optimized



CEO



Production



Controlling

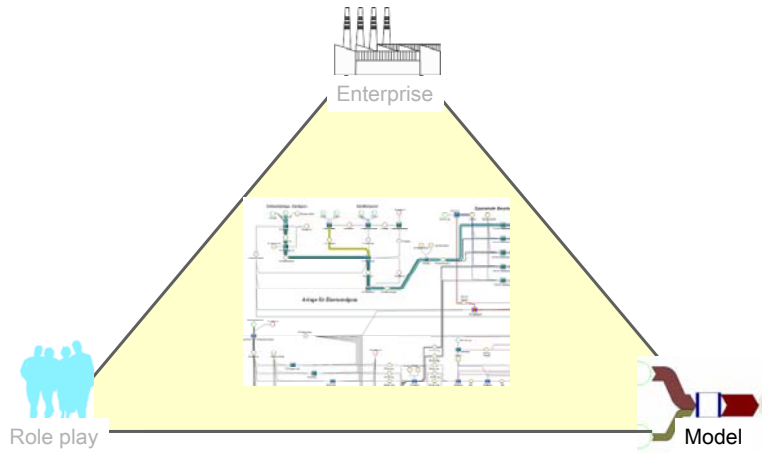


Materials  
administration

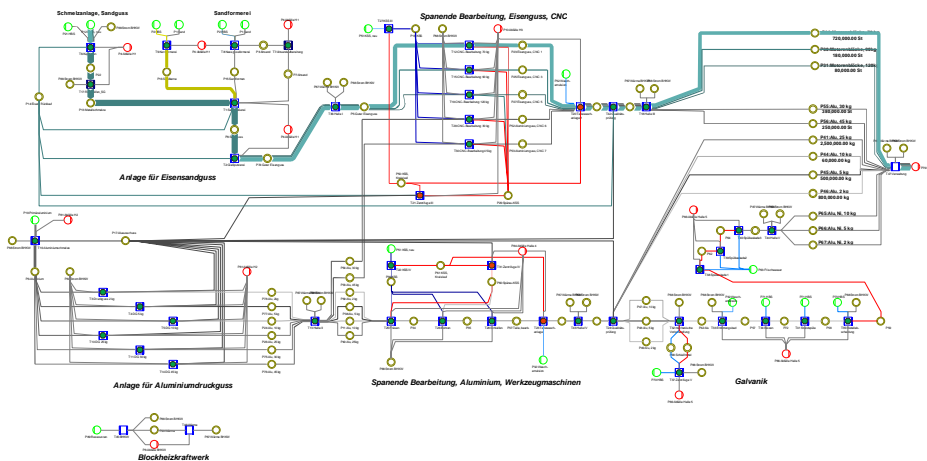


Environment  
protection

## Introducing the game: The model in the background



## Introducing the game: The model in the background II



## Introducing the game: The model in the background III

- Mapping of the production structures and inefficiencies based on the material and energy flows
- Mapping of material costs and internal transfer prices
- Parameterized processes with regard to optimization possibilities
- Functions: data supplier and simulation of optimization actions
- Available data: material flow data, cost data, capacity utilisation, formulations, quality and error statistics etc.

i.e. all data in the simulation game are available in any way over the material flow model.

## Introducing the Game: Practical Appliace



## Experiences after the practical test

- Very deep comprehension of material flow management, technical processes and analysis methods at the end of the simulation game
- High engagement of the students during the rounds
- Almost all implemented inefficiencies identified + inefficiencies which were not originally intended



The simulation game is suitable in a high extent to transfer the basic knowledge as well as the application of material flow management also in not technology-oriented study paths.

# Thank you for your attention!

<http://umwelt.hs-pforzheim.de/lehre/planspiel/>