

## **Progress of Discrete Event Simulation in manufacturing and logistics**

Prof. Dr.-Ing. Bernd Noche

Discrete event simulation is a powerful mean for the support of the planning and operation of manufacturing and logistic systems. Their importance is growing though European industry is not yet fully aware of the relevance of simulation.

The United States of America are leading in the process of evolving the technology of simulation. They are organising the most important simulation conferences (e.g. Winter simulation conference) and in the research field they are persecuting an ambitious research program (e.g. IMTI – Integrated Manufacturing Technology Initiative) which is accompanied by leading companies, especially in the field of the production of military equipment and aircraft industry. The situation in Europe is completely different. At present there is no decisive commitment of these industries to simulation, their application and the development of software. Major trends are supported mainly by the automotive industry which is merely applying software than funding the developments. The chances, however, of European industry lie in their strong application of simulation models for challenging task. Large and complex models can be found in a variety of application fields, from chemical plants or mail distribution units to production facilities and supply chain networks.

Research, however, is still part of the development strategies of the vendors, a general guided industrial and governmental development concept is missing. This situation is alarming since most of the vendors are small companies which are unable to invest in long term oriented software products. The uncertainty of industry decisions and attitudes as well as the lack of standardisation of models, interfaces and basic data acquisition makes every high volume invest decision of vendors to an explosive high risk event.

But there are good chances for European industry to benefit from their strong and challenging applications. Through many branches and through different company sizes in different stages of product life cycles simulation technology is acknowledged and applied. Why isn't it possible to use simulation everywhere and as a general tool for investment decisions and optimisation of daily operations?

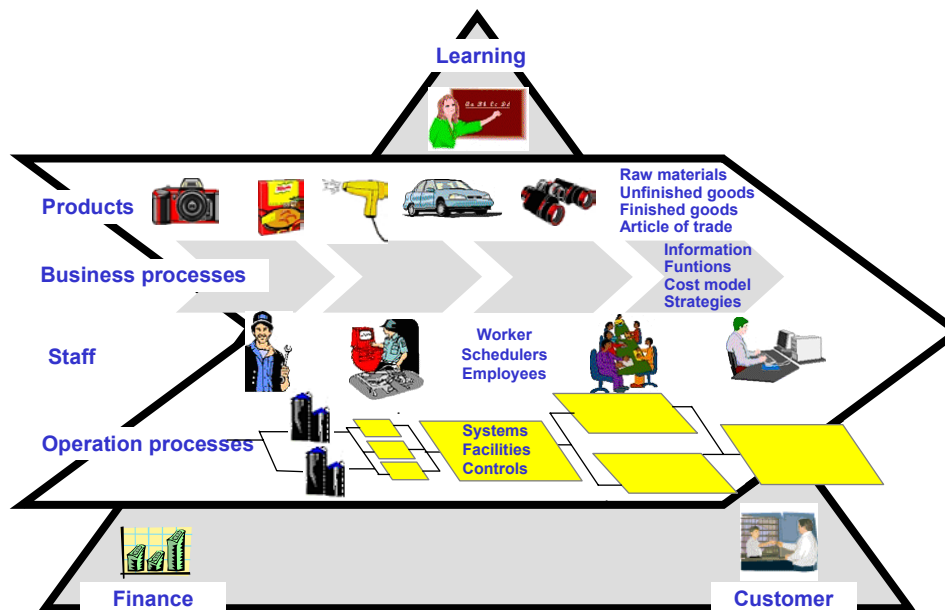
It is difficult to fancy all obstacles and provisos. But some of them may be:

- The technology is still too complicated and expensive
- Simulation people have to be experts in the technology
- The integration of the simulation tools into general application software is still very limited
- Adaption of simulation to knowledge domains is poor
- New application fields seem to be too risky
- The benefit of simulation is not credible enough and convincing
- Data for feeding models is difficult to acquire
- Large models need much time for modelling and simulating
- The modelling and result interpreting is not standardized
- Result generation and explication of effects is often intransparent
- Control strategies are hard to be developed and implemented

And additionally project expenses and times for project developments are shortened, simulation technology, however, is seen as a delaying factor. The challenge is to find new ways and solutions for strengthening the application of simulation in Europe. Therefore a roadmap has to be developed which addresses the following activities:

- Identify major needs and causes of impediment
- Form interest groups for the elaboration of suggestions for improvement
- Establish platforms of vendors and customers with common interests
- Find relevant funding for the most important developments
- Try to publish success stories and define standards
- Spread the knowledge to vendors and simulation users
- Establish a permanent information concept proving benefits and cost reductions

The list of measures may be larger and must be elaborated more detailed. In a preliminary stage, however, a European common understanding of the needs and benefits of simulation has to be established which finally leads to improvements. It has to be ensured that these improvements are really increasing the acceptance of simulation. Thus, the market of the technology will be enlarged leading to a reasonable return on investment of the efforts.



**Fig. 1:** Environment for the development of simulation technology in manufacturing and logistics

The figure illustrates the environment in which simulation will progress:

- Customer: direct fulfilment to customer needs and demands
- Finance: aspect which has to be elaborated more clearly showing directly cost/benefit ratios
- Learning: improving tools and spreading the simulation technology

The simulation technology will progress if it is possible to focus more precise on the elements of the logistic chain: Processes on the operation and business level, organisational aspects with control strategies for personnel and resource allocation and products which have to reach in time.



The improvements may be funded either by research programs or investments of vendors or large customers. These investments, however, should comply with general goals defined by appropriate working groups and made available to the simulation community by dissemination or direct access.