



## A Bridge between Industry 3.0 and 4.0

Software modelling enables companies that already have automated machinery to embark on the way to Industry 4.0. But still, how to achieve the digital transformation at business level?

### What is at issue?

Asynchronous investment cycles pose a fundamental problem to digitization. As a rule of thumb, industrial and manufacturing machinery has an investment cycle of 30 years, while the software industry has an investment cycle of 3 years and developments in computer components generally occur in even shorter cycles. The production industry must be open to current developments to be able to cope with fundamental aspects of Industry 4.0 in order to remain competitive. In addition, machines driven with outdated software systems cannot meet the safety and security standards for networked appliances. LieberLieber Software GmbH sees itself as a translator between university knowledge and the concrete demands of machine builders and users. The company offers solutions that point the way to the future while taking existing machinery into account. Its clients include large firms in the area of mechanical engineering as well as companies with 20–30-year development cycles that produce software in-house. The trailblazers are innovative sectors with short investment cycles and strict regulatory control on security, such as the automotive and aerospace industry, as well as the military sector.

### CD Laboratory for Software Engineering Integration for Flexible Automation Systems

#### Head

ao.Univ.Prof. DI Mag. Dr. Stefan Biffli, Vienna University of Technology

#### Operation

01.01.2010 – 31.12.2016

#### Commercial partners

CertiCon a.s., LieberLieber Software GmbH, logi.cals GmbH

### CD Laboratory for Model-Integrated Smart Production

#### Head

Ass.Prof. Mag. Dr. Manuel Wimmer, Vienna University of Technology

#### Operation

01.01.2017 – 31.12.2023

#### Commercial partners

CertiCon a.s., LieberLieber Software GmbH

# Three questions to ...



**Peter Lieber**  
owner and founder

## *Why is basic research so important for innovation?*

In our everyday work, we regularly come across questions that we cannot answer. Solving them requires a decent amount of research that helps us extending our knowledge. The results help us keeping our innovations that crucial step ahead of the competition.

## *What are the biggest challenges in collaborating with universities?*

Universities have different goals and different agendas than a company that has to prove itself on the market on a daily basis. When we work together, we have to try to align our goals and find a way that is beneficial to both sides.

## *What do you like most about the CD Laboratory funding scheme?*

The seven-year duration of a CD Laboratory enables us to work on long-term projects. During this time, you get to know your partners well and can try to make the best use of the strengths of both sides. This opens up possibilities you might not have envisioned at the very beginning.

## Research Question: Time Travels thanks to Software Models

Model-based software development has been taught at universities for over 20 years. Abstract models are created to describe an entire system: what are its capabilities and what should the result look like, i. e., what should be achieved in a certain context? If such a model takes into account hardware, software, and its environment, i. e., it describes the entire cyber-physical system, it can be considered as a "digital twin". Such powerful models enable experts to analyse an entire system, to see the possible effects of changes, and to make optimization possibilities tangible. The underlying programmes become more structured, more flexible and relatively easy to change – and planned changes can be tested in advance. Furthermore, modelling supports companies in checking whether certain decisions are not only technically correct, but also economically viable.

## Collaboration in the CD Laboratory

CD Laboratories enable application-oriented basic research and considerably shorten the time it takes for basic research results to enter the market. Within the first 2–5 years it is assessable which findings will be of economic value and which won't. LieberLieber Software GmbH is an SME that works close to research and that has realized that CD Laboratories represent an ideal way to obtain access to basic research while remaining flexible. The collaboration between science and the private sector is particularly valuable in the development of facilities. Software, electronics and machines must work together, and consequently the models should include the entire machines and all associated software. Working with actual problems from real clients advances research, because investigations of detailed mechanical processes offer important information and help also to improve the software.

## Results of Models and Market Communication

The goal of LieberLieber Software GmbH is to persuade even mechanical engineering firms with long development cycles that the modern way of model-driven engineering has its advantages. Collaboration with basic research improves the company's products and is further strengthening its prodigitization argument: there is a steady increase in the demand for the services of Lieber-Lieber Software GmbH. In addition, the CD Laboratory is making important contributions to the establishment of standards and the continuing unification of terminology: the company's involvement in the CD Laboratory ensures its participation in discussions and enables it to profit immediately from newly released standards. Last but not least, the CD Laboratory also offers access to the university environment and thus expands the network of skilled people with whom the company can work. Because of the first Laboratory's success, LieberLieber Software GmbH has been collaborating with the new CD Laboratory since 2017, again at the Vienna University of Technology.

## Scientific Challenge

Networks of several factories are cyber-physical systems, as is the machinery of a single company. The systems are composed of hardware and software and researchers must model them in their entirety to be able to develop them and reach the goal of providing a "digital twin". The basic understanding is developed in software engineering, a subdiscipline of informatics with many interfaces to other disciplines, such as mechanical engineering. Modelling languages are developed to formulate the questions and models are created that enable researchers to test the effects of changes. Concrete questions from companies are helpful, but the basic science behind the solutions can be published on a general level and applied to all cyber-physical systems.

## Added Value for the Company

The company has established itself as a skilled partner for mechanical engineering firms. There has been a contribution to the establishment of standards and the unification of the language and the company has benefited from early access to the information. The CD Laboratory is at the hub of a network of highly skilled people in the area. Participation in a CD Laboratory represents a challenge to an SME but each Euro is paid back twofold.