

Anniversary of an Idea

Twenty Years of Continuous Success





A conversation with Dr. Herbert Hanselmann: To mark dSPACE's 20th anniversary, the company's founder and president describes how an idea became an internationally successful company.

Dr. Hanselmann, before we talk about the early days of dSPACE, could you tell us how you became interested in control engineering?

When I was 16, I read an article about cybernetics. I didn't understand everything, but the article fascinated me and sparked my interest in this subject. When I decided which subject to study at the university, I chose electrical engineering, and from there it was almost inevitable that I would specialize in control engineering. I also had a side job developing controls for the machine tools of a small neighborhood company.

What events encouraged you to found the dSPACE company?

While I was still working on finalizing my doctoral thesis at Karlsruhe University, I was approached by a distinguished researcher working at

Mercedes-Benz, Joachim Lückel. He had been granted a professorship at the University of Paderborn, with the task of setting up a completely new and novel institute.

I had really planned to go into industry, but this project was too interesting to say no. The main objective was to implement something that was known as "modern control engineering", using relatively fast mechanical systems. In other words, mechatronics. Just one small thing was missing: We didn't have any computers that were fast enough to calculate the higher-order control functions in real time.

In 1981, partly working at home like a hobbyist, I constructed an Intel kit for a fairly exotic analog-digital signal processor. You couldn't expect mechanical engineers to do the required optimal microcode program-



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ming. Therefore an automatic code generator and a couple of associated tools were quickly developed. This processor passed its first real-life test in a Mercedes bus with electronic lane keeping. After numerous further developments and successful applications, we had the idea of producing something similar commercially for worldwide use. Three colleagues, involved in this university project in different functions, and I founded dSPACE GmbH in 1987, and on January 2, 1988 we started work on developing an almost completely new toolset.

What obstacles did you face when starting the company?

The know-how was there, but the products we wanted to market still had to be developed. One year was scheduled for developing the first toolset – a year in which there

would be no sales. Fortunately, loans and subsidies were available for such cases. To obtain these, we needed more than just brilliant ideas. We had to convince people that our plans were viable. So one of the things we did was to acquire statements on our chances of success from people who were specialists in the field and seemed unbiased. The appraisal given by Professor Leonhard from Braunschweig, a world-renowned electrical drives specialist, was critical in a positive way. The gist of his conclusion was, “If they don’t try to do too many things at once, it might work.”

What products did it all begin with, and for what applications?

The hardware consisted of boards with a signal processor from Texas Instruments – which in those days still used fixed-point arithmetics – and

several I/O boards dedicated to control engineering. The software was a toolset for preparing and simulating state controllers and generating code in DSPL, a language that we defined ourselves and which we also wrote the compiler for. We placed great importance on optimal machine code: “C” was not an option.

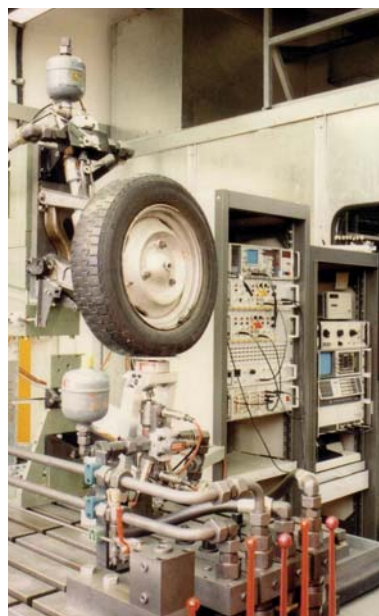
Who were the first customers?

Philips is one I remember. Their Manufacturing Technology Center had a load of unsolved control tasks, including one for wafer steppers with a positioning precision of nanometers. One particularly unexpected customer was Hilti from Liechtenstein, known all over the world as a manufacturer of high-quality rock drills. They also did an astonishing amount of mechatronics. Basically, our first customers were engineers who lacked the means to implement fast controllers quickly, just like us a few years previously.

What was the most interesting project with dSPACE tools at that time?

That’s a difficult question, there were so many, including really exotic ones like the control system for hydraulically shifted masses used as earthquake dampers at the top of skyscrapers in Japan. Walt Disney needed our equipment to control one of their theme park attractions. And a Japanese company was

The starting point for further developments: A test bench used by the University of Paderborn in the 1980s for research on mechatronic control systems. Among other things, it was the basis for the active wheel suspensions used in today’s vehicles.

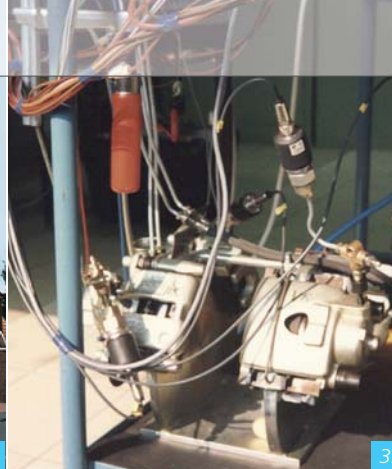




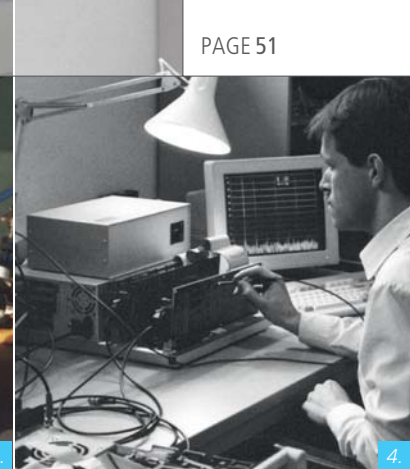
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experimenting with active noise canceling in windows for new housing construction. This is understandable, considering that in Tokyo, the highways run just a few meters away from people's living-room windows.

What was your greatest challenge?

In the starting phase, it was having enough staying power in the second year, when things progressed more slowly than the business plan said they would. The costs went according to schedule, the sales didn't. That's not unusual, as costs are simply easier to plan for. But selling the necessary numbers of a completely new kind of toolset for very special applications just takes time. This aspect is frequently underestimated. The greatest challenge of the past few years was when we had to get a whole Japanese subsidiary up and running in almost no time. With no prior warning and for reasons that were beyond our control.

What was your biggest success?

Convincing The MathWorks to cooperate with us to give Simulink, which was just being developed then, a real-time extension. There were only 6 people at dSPACE then. The MathWorks was already ten times as big and had never entered into a cooperation like that before. In the end, the project was a really important key to success for both companies.

What events and developments are you particularly pleased with?

The best thing is that we have been growing organically for so long now and have always been able to stick to our core competencies. The context has changed repeatedly. Competitors appeared on the horizon and, luckily, some of them disappeared again. Focuses have shifted. New but related fields were added. I've also heard this from customers: it's our continuity that is admired.

1. dSPACE's four founding members. From left to right: Dr. Herbert Hanselmann, Albert Schwarte, Dr. Hermann Henrichfreise and Andreas Hostmann.

2. dSPACE started out on the second floor of this building on January 2, 1988. Step by step the company expanded to fill the basement and the attic, until it moved into its own building on January 2, 1995.

3. Components of dSPACE's first HIL simulator (fixed-point processor). The photograph was taken in the customer's laboratory (Fatec) in 1989.

4. In the early 1990s, the basement was the hardware laboratory for performing tests.

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The first turn-key HIL simulator in 1995. A cable from the simulator (multiprocessor system based on the TMS320C40 DSP, Tesis model) goes from an upstairs window down to the car to test its ABS and electronic differential. The workflow: Sit in the car, start the engine, drive off (in stationary mode) and brake to activate the ABS. The Audi 8 was on loan, so it had to be chained up.



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1. *First presentation at Convergence 1990 in Detroit. Rent the computer, monitor and oscilloscope, spread out the boards and the brochures, hang up two self-made posters — ready to exhibit.*
2. *Product presentation at the American Control Conference in Boston in 1991. Professor Skelton from University of California, San Diego (UCSD) scratches his head while considering if his budget can cover a dSPACE System.*
3. *In 1992, we had to do the impossible. Our mission: to transport the demo equipment on the overcrowded Japanese subway.*
4. *One of the first product demonstrations of the Real-Time Interface (RTI) in 1992. Japan is still one of the first countries where new products are presented today.*

dSPACE has a strong position in the automotive industry. Where would this industry be without products like those from dSPACE?

No one knows. Electronics would definitely have arrived on the scene without us, but probably more slowly. I sometimes say that our tools enabled our customers to develop so many new functions for their vehicles in the 1990s that afterwards they needed hardware-in-the-loop test systems to keep up with burgeoning new developments in terms of quality. It looks like dSPACE had a clever strategy, but honestly, it wasn't strategy, things just turned out that way.

What will the automotive industry's major innovations be over the next 10 years, and how will dSPACE be involved in them?

Let me focus just on development processes. When it comes to innovations in vehicles, there are people better qualified than I am. A recurrent situation with development processes and tools is that progress made on one point generates new challenges somewhere else. Rapid control prototyping ultimately necessitated automatic production code generation. Now that this is "in the can", there are innumerable software modules and the complexity is overwhelming. New tools are emerging, and indeed they have to. For example, we have produced System-Desk as our contribution to mastering complexity. More coordination

and validation has to be front-loaded. At the moment, it all seems like a bottomless pit. And as for the time constants at which technologies like rapid control prototyping, auto-coding and HIL have spread, we're looking at an average of more than 10 years till even one essential process technology becomes established and really widespread. We will definitely not be running out of things to do any time soon.

As the company founder, you have a very special relationship with dSPACE. What role does dSPACE play in your life?

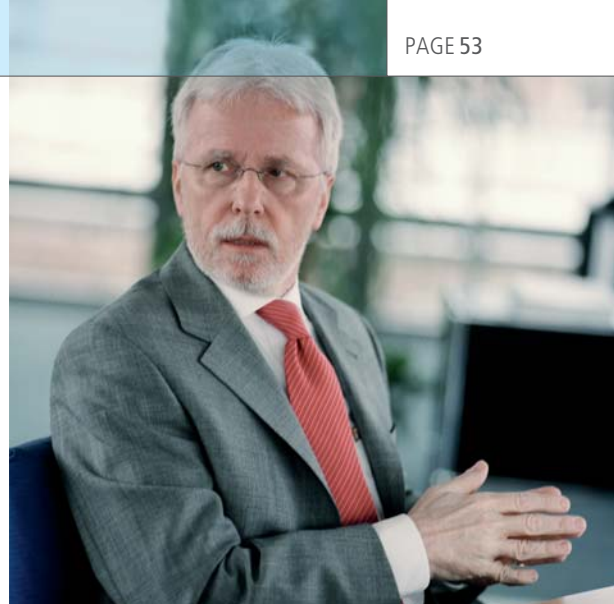
The main role of course, next to my family. A company like dSPACE, which is constantly evolving, demands my complete attention. When it leads to success, which fortunately is the case with us, that is very satisfying.

On the subject of human resources: What do you look for when hiring employees?

By far the most important thing is spirit. People only work well if they enjoy it, and they enjoy it if the tasks are challenging but solvable. An engineer without the ambition to deliver the best work possible that he or she can be proud of is not really an engineer. The important thing is intrinsic motivation, and I can safely say that dSPACE people have plenty of that.

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Are there any developments or circumstances you are dissatisfied with?

This is not a political magazine, so some topics won’t be touched. However, I’m definitely dissatisfied with the lack of suitable applicants for all the jobs that we always advertise. So far, we have invested a great deal of energy in recruitment and will continue to do so. But if there is nobody to recruit, it’s not enough. Like many other companies, we have to do our part to ensure that more young people keep to the straight and narrow and study the right subjects. This is why we set up our ProMINT initiative, with student grants, information activities, and school partnerships.

To come back to the expert opinion you mentioned before: Has dSPACE really not done too many things in the past 20 years, or how would you describe the company’s success?

In a manner of speaking we did follow Professor Leonhard’s advice. Basically, we’re still doing the same

thing. We’re connecting control engineering, software, electronics. Instead of producing custom devices, we make products that are useful to many people so that the high cost of development pays off. We haven’t wasted our time on acquisitions or peripheral activities, and we have extended our range bit by bit without abandoning the core.

How do you see the company’s future?

As long as there is enough to do, it will be a simple extrapolation, fairly linear. The tasks are growing, so we are growing too. New issues emerge, we provide the solutions. We can carry on like this for a very long time.

Are you still going to be on board in 20 years’ time?

Yes, on board something floating on the Mediterranean.

We wish you fair trade winds, now and in the future. Thank you very much for talking to us, Dr. Hanselmann. ■

1. *The AutoBox is known for its high reliability under extreme mechanical conditions. The shake test performed in 1993 shows why. Andreas Hostmann is definitely impressed.*
2. *Professor Joachim Lückel greeting the Hanselmanns at the housewarming party for our first very own office building in 1995.*
3. *Compared with the very first HIL, the systems have grown to an impressive size – since it is no longer just the ABS that is simulated, but whole vehicles with all their comfort functions and driver assistance systems. The picture shows a complete, networked HIL system – the basis for a virtual vehicle.*

