

FEATURES

BY THOMAS K. GROSE

SHADOWED BY THE PAST

Outmoded Soviet-era practices still hamper teaching and innovation in Eastern Europe.

Imagine a gasoline-powered car that offers excellent fuel efficiency and very low emissions. That's the promise of a hot new technology called HCCI, or homogenous charge compression ignition. HCCI internal-combustion engines forgo spark plugs to ignite the gasoline/air mix, relying instead on compression, like diesel engines. HCCI engines are tantalizingly close to commercial fruition, but a few hurdles must first be overcome. For instance, "controlling the combustion is a nightmare," says Csaba Tóth-Nagy, an associate professor of mechanical engineering at Hungary's Széchenyi István University. He has patented possible solutions, but finds he can't market them. Most venture capital comes from abroad — "I've not really met a Hungarian venture capitalist," Tóth-Nagy says glumly — yet he doesn't expect much help from either the government or universities in connecting with investors.

The frustration voiced by Tóth-Nagy is not uncommon among entrepreneurial engineering educators in Eastern Europe. Nearly two decades after the former Soviet Union crumbled, leaving member and satellite states to their own devices, many of these formerly communist countries are still grappling with the transition to market capitalism. Their once impressive engineering schools, no longer called upon to produce technocrats for lumbering, state-run heavy industries, are not yet geared to a 21st-century, knowledge-based economy. Many young graduates lack the skills and flexibility needed by high-tech industries. And when innovative engineers like Tóth-Nagy emerge — he did his graduate work in the United States — the money and support aren't there to turn their inventions into commercial ventures.

Although many of the region's economies expanded rapidly on being freed from the restrictions of state planning, not all of them used that newfound wealth to adequately fund engineering and science education or academic research. And those that did spend



didn't always spend wisely. The result is a patchy record. Poland and Romania have improved facilities. But Hungarian engineering schools still have too many overlapping departments and too much bureaucracy, which wastes resources. The Czech Republic, though it has one of the area's healthiest research and development budgets, is still dogged by a creaking academic infrastructure.

A Bright Spot in Estonia

There are notable exceptions to this picture. "People lump Eastern Europe as one place, but really it is not homogenous," explains Yiannis Pavlou, general manager for National Instruments, Eastern Europe, based in Budapest. "The key difference among countries is funding."

Consider Estonia. There, government funding for engineering and science remains a "high priority" and — so far — safe from cuts, even though the global recession has ravaged Estonia's economy, says Jakob Kübarsepp, academic vice rector of the Tallinn University of Technology. Moreover, the state funds several programs to help academics commercialize their research. Six years ago, it partnered with the university to open a technology park on campus, which is currently incubating around 150 high-tech hopefuls.

And then there's Bulgaria. The University of Sofia's classrooms and labs were state of the art when Orlin D. Velev earned his Ph.D. there in 1996. No more. "Now it is really starting to fall apart," says Velev, a professor of chemical and biomolecular engineering at North Carolina State University. Engineering has lost prestige in Bulgaria; smart young people have been gravitating to law and business. State support for engineering and science education has nosedived since Velev's days there, along with demand for engineers — even though, before the current slowdown, Bulgaria's market economy was booming.

Meanwhile, the twin mallets of the credit crunch and recession are pummeling the region. While no country has escaped the pain, some are faring better than others. Poland, Slovenia, and the Czech Republic are among a handful of states that may sidestep the worst of the downturn. Poland's economy may even grow 1 percent. Anemic? You bet. But, it's still growth — a rare commodity in this global slowdown. By contrast, Hungary's GDP is expected to fall by 5 percent. The outlook in Romania, Croatia, and Latvia is similarly bleak.

The extent to which the recession will affect efforts to fund, rejuvenate, and upgrade engineering education in Eastern Europe remains a hard call this early into the downward spiral. Most schools will very likely feel at least a pinch, if not an outright jolt. Romania has been spending 6 percent of GDP on higher education. But with its economy contracting, even if it sticks to that formula, there will be less money for schools. Hungarian companies pay a 1 percent tax to fund higher education. That pot of money will almost certainly shrink along with corporate revenues. Many strapped countries have responded by cutting or freezing public-sector wages, and in some cases, that includes faculty pay.



Aging Faculty ‘Time Bomb’

Despite the variance in the state of engineering education in Eastern Europe, there are issues and problems that tend to be common to all countries in the region.

The majority of schools have huge rosters of engineering faculty nearing retirement, and not all have sufficient numbers of younger professors to replace them. In Bulgaria, many engineering doctorates from Velev’s generation headed for the United States, creating a brain drain. He calls the pending retirement of older Bulgarian professors “a ticking time bomb.” In addition, European Union membership has given academics the opportunity to do research in Western Europe. Many jump at the chance. Zoltan K. Nagy, a chemical engineering senior lecturer at Britain’s Loughborough University, estimates that the top 10 percent of engineering Ph.D.’s in his native Romania head west. In Hungary, there have been some efforts to replenish teacher ranks. The Széchenyi István University has hired 30 engineering Ph.D.’s and expects to bring on board another 50 by 2011. Most of the new hires, like Tóth-Nagy, have spent time at Western universities, and their experience overseas should eventually provide payoffs for Hungary and its schools. But for now, Tóth-Nagy says, “the result is, there’s a big age gap” between the cadre of older professors and the new crop who are mainly in their 30s, with few associate professors between them.

Efforts to recruit more faculty or lure doctorates back from overseas are hurt by another, perennial issue: poor pay. In Poland, the best teachers earn extra income as industrial consultants. Even in countries like Estonia, where faculty salaries have skyrocketed in recent years, paychecks are still relatively slim. Salaries average around \$3,400 a month, about half what academics earn in neighboring Finland or Sweden.

Despite the upheaval and crummy pay, most older faculty typically still have a firm grasp of the subjects they teach and remain up to date. A bigger problem is that, because of their roots in socialist systems, few of the older generation fully understand business or

have entrepreneurial instincts. Many don't know how to write proposals and compete for grants. Because of this absence of business savvy and competitiveness, they aren't able to pass along these much-needed skills to their students. "And nowadays," says Loughborough's Nagy, "that is important."

Few Hands-on Projects

In the classroom, the approach to teaching is still heavily theoretical, though there are exceptions. Polish schools have made strides in introducing a more practical approach to engineering education. But across the region, the default teaching method remains the lecture. Though younger faculty are more open to using hands-on projects, workshops, and team assignments, by and large, these remain sparsely used pedagogical concepts. Adriana Garboan, a soon-to-graduate Romanian electrical engineering student, says she wishes she had had more practical lessons. "It is easy to forget things if you do nothing hands on," she explains.

Still, even younger academics who see the benefits of practice-based courses are loath to criticize theoretical teaching, since it's a method that has served them well. "I loved my education; it gave me a big boost into grad school," says Petia Vlahovska, a Bulgarian assistant professor of chemical engineering at Dartmouth University. But she also sees how well-equipped her American students are to solve real-world projects. "I still don't know which system is better — I suspect the truth is somewhere in between."

Eastern European teaching methods also don't prepare students for the work environment. "What is lacking is a work ethic," says National Instruments' Pavlou. Students' grades are determined by a few comprehensive exams. Compare that to the United States, where students are continually expected to deliver, be it through projects or homework — a deadline-driven system that readies them for the expectations of industry.

Most countries have signed on to the Bologna Accord — which is harmonizing degree programs across Europe — and are changing from the old, five-year undergraduate model to a three-year baccalaureate degree and two-year master's degree system. There are "teething problems," admits Agnes Toth, a professor at the Budapest Polytechnic University. For example, B.Sc. students graduate in late January, and most quickly find jobs. As a result, "we've seen a definite decline in master's level studies," Toth says. But, she reflects, "for industry, this is a good thing."

It also shows, adds Norbert Kraker, president of the International Society for Engineering Education, that "even in the recession, engineers are still in demand" in Eastern Europe. What's less clear is whether enough countries in the region fully appreciate the need to invest strongly in engineering and technical schools — and in university teachers and researchers — as a means to build sustainable, knowledge-based economies once a recovery begins. Will the severe downturn be a wakeup call? Velev, for one, hopes so. Perhaps, he says, the economic shock will help countries like Bulgaria realize that a

quick-buck economy isn't as resilient as one built on smart technologies. "In the long term, it may be a correction that's necessary."

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