1 Gearheads Get No Respect

Look around you. Unless you're in an antique shop, almost any manufactured object you see was created by a mechanical engineer using computer-aided design (CAD) software. Like a cowboy and his horse, object creators and their three-dimensional (3D) CAD tools are almost inseparable today, so much so that after a long week working on CAD at the office, many will head straight to the basement after dinner on Friday to dive right back into CAD, working all weekend long on their hobby projects.

They are driven by a specific kind of intelligence and a particular passion. Much more than just a job, mechanical engineering is a calling that summons many of us in the sandbox. When asked what got them started, one gearhead after another will tell you something like: "I took apart every toy I got until they gave me LEGO. Then I started putting things together and never stopped."

It's good they have that passion driving them, because if it was all about glory, no one would pursue a career in mechanical engineering.

You see these engineers' accomplishments everywhere, in innovations that drive economic growth and make the world a safer, greener, and more efficient place. But compared with the stars of other professions, such as architecture or design or medicine, mechanical engineers mostly toil away in quiet obscurity. It has always been rare to see an engineer profiled in the media (except perhaps in *Popular Mechanics*). In recent post–industrial

age decades, gearheads have moved even further from the limelight than ever. After all, manufacturing is so twentieth century.

This isn't to say that mechanical engineers sit around moaning about how they get no respect—that's for lawyers. Who needs recognition when you were in one of the world's most stable professions anyway? No one with a mechanical engineering degree was ever short of a job.

That began to change in the 1990s, as shifts in industrial activity led to the emergence of rust belts—first in the United States, Europe, and the former Soviet Union and later in Japan. With less opportunity available close to home, mechanical engineers began to feel a need to look over the horizon for work. Fortunately, the development of CAD around the same time began to make it possible for engineering work to be done remotely.

But where do you go to find engineering work on the other side of the globe? And how do you make contact with like-minded engineers around the corner and across the world?

Love at First Sight

In my own case, the call summoning me to mechanical engineering did not come until I was in high school. I was in tenth grade when, like a young cowboy, I saw my first horse. It was 1998 when I first set my eyes on a 3D CAD program, which was then still a recent innovation. It was love at first sight.

In a single moment, CAD brought my fascination with information technology (fueled by an aptitude for math and physics) together with my delight in tinkering with physical objects, propelling me toward a career in mechanical engineering.

For the next 10 years I was happy to do nothing else. But fascination begins to wear thin once you find yourself endlessly tweaking the same set of variables. Instead of building the Ferraris and spaceships of my dreams, five years into my career as a professional engineer I woke up one day to the dull reality of a routine job. Trapped in a tiny market and bored, I hit the wall. So I decided to write an app to get me over the wall . . . and this is what happened.

Getting over the Wall

I'm from Estonia, the tiny Baltic country that Stalin swallowed like a single shot of vodka—and tried to digest with a decades-long campaign of Russification. Escape from the Soviet empire seemed like an unlikely dream, so as kids growing up in Tallinn, we just watched the West with envy via secret antennas tuned into Finnish television stations 70 kilometers across the Baltic in Helsinki. I learned English by watching James Bond movies with English subtitles. We used to practice lines like "shaken not stirred."

Miracle of miracles, though, as the Soviet Union disintegrated after the Berlin Wall fell in 1989, we managed to regain our independence in 1991. I was nine years old when our little nation of 1.4 million people started over from zero as a capitalist society. It was almost like the beginning of a game of Monopoly, when the bank deals out the same amount of money to each player. Each man, woman, and child in Estonia was allowed to convert 1,500 rubles for 150 kroon, our newly minted currency. This amount was equal to only a day's blue-collar wage in Finland, but it was like magic to hold our own money.

Having wages much lower than Finland was actually convenient because Helsinki—one hour from Tallinn by ferry—was

in the midst of an economic boom as it joined the European Union and Nokia emerged as the global leader in GSM mobile telephony. Even better, because Estonian is perhaps as close to Finnish as Spanish is to Portuguese, we can easily understand what the Finns are on about. (Don't worry if you can't understand the Finns, you're not missing much.)

So overnight Estonia became Finland's Mexico, a low-cost outsourcing platform right next door. That created opportunity for people in Estonia with a wide range of industrial skills, but engineers were in short supply. And given how quickly technology was changing, recent engineering graduates had a huge advantage, especially those with information technology (IT) knowledge.

To tell you this will make me sound like grandfather recounting how tough life was during the war, but to catch up with the West in IT, we really had to work at it. When I was a child, all we had was a very expensive dial-up connection to the Internet, so my father used to strictly limit my time online to just half an hour each day. Not all bad, it forced me to learn as much as I could in the short time I had.

In any case, I was working part-time as an apprentice before I finished engineering school. As soon as I received my diploma, I started to work full-time with Saku Metall, Estonia's largest door maker and a key subcontractor for Kone, the Finnish elevator maker. By age 24, I was promoted to head of the IT department and made responsible for automating a wide range of engineering functions. It was a fun challenge and an exciting time.

Across town, meanwhile, my friends were developing Skype—the Internet-based telephony system that is Estonia's greatest contribution to human civilization, at least so far.

Engineers in our small city with just 400,000 people were doing outsourced work for clients all around the world.

If we got any respect, though, it was kind of backhanded. The *Dilbert* comic by Scott Adams continues to make fun of outsource engineers in "Elbonia," apparently a corruption of our country's name. In response, let me paraphrase Lynyrd Skynyrd: "I hope Scott Adams will remember, an Elbonian man don't need him around anyhow."

All the same, by 2008 I was bored with making doors and eager to play in a bigger league. So with a friend I set about creating a simple website aimed at offering 3D CAD service to clients around the world. The idea was that customers could upload rough design drawings to our site, which would then automatically generate a price quote.

Not knowing anything at all about business, we promised whatever we could think of that might attract customers. Maybe "satisfaction or your money back" was not a bad idea. But "24-hour turnaround" is a foolish promise to make if clients don't actually need it that fast. We lost a lot of sleep as a result. Our pricing was even dumber because we had absolutely no idea what things cost in the West—such as how much people are willing to pay for a cappuccino at Starbucks. So we offered to do CAD simple drawings for just $25 each.

To emphasize our speedy service, we called it GrabCAD.

The day the site went live in November 2009, we bought a $20 Google ad and sat watching our computer screens like a pair of ice fishermen looking down their hole in the lake. It took an entire week for the first order to come in: rough drawings of an ATV wheelbarrow from a man in Texas. We spent 12 hours frantically working on the CAD file, and for our efforts we got $55.

Three months later, you can imagine my family's reaction when I quit my day job, one week before the birth of my first daughter. Luckily my wife, Laura, supported me then, and every step of the way since. Meanwhile, my parents, my friends, and my colleagues all lined up to tell me one after the other that I was irresponsible and immature, if not clinically insane.

Perhaps I am. But whatever else I might be, I'm stubborn.

The GrabCAD vision began to evolve. We were fixated by the idea that we were building a service business, yet we realized that we were not going to get very far by staying up all night every night doing the work ourselves. Nor did we have the resources to hire a roomful of full-time CAD designers . We scratched our heads trying to think up new ways to create a scalable marketplace by attracting freelancers and moonlighters whose services we could sell to clients.

It was almost as an afterthought that in August 2010 we added what has turned out to be the magic feature that has grown our community into a million engineers and designers: an online place where CAD practitioners could share their designs.

Within a month we had almost 1,000 engineers using our site, and a vision began to form in my head: an online community that would give engineers easy access to sophisticated tools and allow them to collaborate seamlessly—and how all of this would revolutionize the making of physical objects.

Beware of getting a big idea.

Because 95 percent of our users were in the United States, I began to think, "Why am I here in Estonia if all the users are American?" Or, as Toyota engineers say, "*genchi genbutsu*"—don't rely on second-hand data; go straight to the source. In any event,

I really wanted to go America because it's the Mecca of CAD. I persuaded my wife to let me take a chunk of our meager savings and managed to get a three-month tourist visa for the United States. In October 2010, I flew to America with my family.

What I Discovered in America

When I arrived I was 28 years old, I had just $3,000 in my pocket (which was supposed to last us three months), and I didn't know a soul. At least I could speak almost enough English to explain the ideas that were bouncing around in my head.

Where should I go in such a big country? Of course, for anyone in IT it is *de rigueur* to make a pilgrimage to the holy Silicon Valley, but where else? I decided on Boston because it is the epicenter of the CAD industry and home to the legendary Massachusetts Institute of Technology (MIT). That's why I resolved to spend six weeks on each coast.

If you believe the conventional wisdom, Silicon Valley is supposed to be a freewheeling culture with no hierarchy, a place where your ideas matter and your pedigree doesn't. Boston, by contrast, is seen (at least from California) as "all uptight and Eastern," filled with preppies like the Winklevoss brothers of Facebook fame and open only to people with Ivy League degrees. I had none of this baggage when I arrived in Boston; no preconceived ideas. So after installing the family in a cheap motel in Framingham, 20 miles out in the suburbs, I just began contacting people out of the blue.

In Europe, if you try reaching out to people without an introduction or any sort of impressive credentials usually they don't even bother to reply. So in Boston I was delighted to find

that even very busy and important people would respond to a cold call from a random Estonian by saying, "Please come and see me tomorrow."

When we met, they listened with kind interest and usually offered to introduce me to others. In this way, doors opened to me everywhere I went. I met many of the top players in the CAD industry and was able to visit MIT's amazing Media Lab.

I'm happy to report that several of the Bostonians I met in those first six weeks are still with me today, as friends and business associates. So don't ever try to tell me that Boston is a cold and snobbish place.

Silicon Valley was a completely different experience. It would not be fair to tar everyone I met with the same brush, but I encountered a lot of what felt like superficial bonhomie. To get ahead in California you have to come across as friendly and open, even if you're not. And because a lot of people are into their own "trips," they are not really interested in yours—at least until you are a "somebody." So you meet people who look over your shoulder as you talk, and what you say goes in one ear and out the other.

Maybe it was just because I was talking about hardware, physical objects, and manufactured goods. In 2010, hardware was deeply uncool in Silicon Valley and no one really wanted to know about it. The attitude was different in Boston perhaps because, with MIT and the CAD industry, physical stuff never stopped mattering there.

All the same, attitudes in Silicon Valley have changed dramatically in just three years as the maker's movement has become fashionable. Now every South of Market hipster has a riff about how 3D printers are going to change the world.

Perhaps we should give them all pocket protectors, the ultimate gearhead fashion accessory.

The end of 2010 was, however, about the worst time in history to talk about manufacturing in America. Two years after Lehman collapsed, the U.S. economy was still on hold and the mood was glum. General Motors and Chrysler had declared bankruptcy a year earlier, and engineering work was sliding offshore to China along with manufacturing.

As a consequence, mechanical engineers in places such as Michigan were desperately unemployed and unable to move because, with mortgages underwater, their houses were unsellable. All across the country, anyone who had an engineering job was clinging to it, no matter how boring—but maybe longing for something more.

Thinking about the plight of these people—many of them brilliant and highly experienced—brought home the truth that it was not just me in far-off Estonia who felt constrained by the circumstances of my location. Something was missing in the lives of mechanical engineers everywhere.

Not that any of this mattered to the venture capitalists I talked to about funding GrabCAD, at least not until I said the magic words: *social media*. Then they leaned forward in their chairs to listen. Hardware was nowhere, but social media was the flavor of the day. Social media for engineers? Why not?

Executive Takeaways

- Forget what people say about low-hanging fruit; aim high. Go beyond your comfort zone. Go in the opposite direction from the crowd if you want to find truly new opportunities.

- Don't automatically believe the conventional wisdom when you get there. People told me Boston was cold and snobbish.
- If you are trying to foster entrepreneurship in your organization, think about this: Would you take a meeting with a random Estonian who cold-called you?