Jun 10th 2010

"AN EIGHT-YEAR-OLD today sees the internet with about as much fascination as you see the toilet," says Dean Kamen, an inventor and entrepreneur. "To kids, they're the same. Nothing magical, nothing exciting, just there when they need it. That's how quickly technology changes—and it isn't just moving fast, it's moving at an accelerating rate."

Mr Kamen knows all about speed. Over 40 frantic years of inventing, he has amassed more than 440 patents worldwide, saved thousands of lives and created at least one cultural icon—the balancing Segway scooter. Now he is turning his attention to nurturing the next generation of innovators. "I'm helping to create an army of kids that is going to build industries you and I won't understand," he says. "In 10 or 20 years, one of these kids is going to cure cancer or make an engine that doesn't pollute. And as they receive their Nobel prize, someone is going to ask them what made them do it."

Their answer, Mr Kamen hopes, will name-check FIRST (For Inspiration and Recognition of Science and Technology), a glitzy robotics competition that he started in 1989 and which now attracts over 200,000 entrants annually from schools in 56 countries. Working in teams supervised by a professional scientist or engineer, children construct and control robots in a series of competitive challenges, egged on by cheerleaders, screaming parents and the prospect of scholarships worth $12.2m in 2010 alone.

If that all sounds suspiciously similar to American high-school sports, it is no accident. "I want kids to realise that engineering and problem solving are every bit as fun and rewarding as bounce, bounce, bounce, throw," says Mr Kamen. "I want FIRST to compete with the Superbowl, the World Series and the Olympics. The next generation of real wealth is going to be produced in fields like proteomics, genomics and nanotechnology. For that you need world-class technology people, and if kids don't get on the train very early, it's left the station."

Despite his focus on the future, Mr Kamen's corner office at DEKA, his design and research company based in Manchester, New Hampshire, is crammed with icons of scientific and technological history. There's a Galilean thermometer on his desk and Einstein memorabilia in every corner. Fading cartoons of his Segway adorn the bare brick walls. Mr Kamen is a man who lives science, breathes technology and can't quite understand why everyone else doesn't feel the same way.

"If you look at the way science and technology are presented today, it's worse than they just don't get their fair share of time," he says. "It's like somebody brilliantly set out to undermine any prospect for the average kid—especially girls and minorities—to feel excited about science. When children see a scientist on television, it's either a squeaky, geeky misfit kid or a middle-aged white male with frizzy hair and a German accent."

With the exception of his native New York vowels, Mr Kamen's stereotype sounds like a self-portrait, such is the extent to which he conforms to the cliché of the mad scientist.

From a hexagonal, high-tech base on his own private island (the self-proclaimed Empire of North Dumpling), he hatches grandiose plans to save humanity. Traffic-busting electric vehicles! Devices that promise free power from waste! Machines to remove salt from seawater! Then there are the gadgets. He is the inventor of the iBot, a stair-climbing wheelchair, and has built gizmos for the American army including robot arms and fin-like prosthetics that allow soldiers to swim at twice their usual speed.

Lighting the way

Such a larger-than-life existence seems appropriate for a self-taught inventor whose father drew cartoons for *Weird Science* magazine in the 1950s. Once a squeaky, geeky misfit kid himself, his inventing career began at the age of 16, when he devised a dynamic lighting system that could respond to sound. He then wangled his way into the Hayden Planetarium in New York and convinced the director to buy several of the machines for $2,000 each.

When his elder brother, a medical student, complained of the difficulties in administering insulin to diabetics, Mr Kamen dropped out of college and created the world's first wearable drug-infusion pump. "I built these pumps and I thought within a year all diabetics would wear them," he says. In fact, it took more than 15 years to go from the first prototype to widespread medical use. In 1971 Mr Kamen set up a company to manufacture the pumps, and in 1982 he sold it to Baxter International, a medical-equipment firm. He then founded DEKA, a contract-research firm, and went on to design a home-dialysis machine that scaled down existing devices from the size of a washing machine to something no bigger than a shoebox. As with the portable infusion pump, this freed patients from having to make regular hospital visits for treatment, and took more than a decade to reach the market. (This year Baxter and America's Food & Drug Administration conducted a recall of some HomeChoice machines following reports of serious injuries and at least one death linked to its use.)

> Technology is easy to develop. Developing a new attitude, moving the culture, is the difficult part

Next came the iBot Transporter, a self-balancing, six-wheeled robotic wheelchair capable of going up and down stairs, navigating difficult terrain and "standing" to raise its user to eye level with other people. Co-developed by DEKA and Independence Technology, a subsidiary of Johnson & Johnson, a health-care giant, the wheelchairs cost $26,000 each. They have transformed hundreds of lives, and inspire fierce loyalty among their users, but are no longer manufactured.

The invention for which Mr Kamen is best known is the Segway Transporter, a gloriously over-engineered stand-up scooter that had the misfortune to emerge just after the dotcom crash in 2001, just as the disillusioned technology industry was looking for the next big thing. Before its unveiling, Mr Kamen's mysterious new invention was the subject of feverish speculation. Steve Jobs of Apple said it was "as big a deal as the PC" and John Doerr, a venture capitalist, mused that it would be "bigger than the internet". It was, in fact, a rather clever two-wheeled, self-balancing scooter, using technology similar to the iBot. But after all the hype it could not possibly live up to expectations.

Nine years on the Segway has yet to sell as many units as the firm predicted for its first nine months. Segways glide through theme parks, around warehouses and along Silicon Valley pavements, but are seldom seen elsewhere. Segway Inc, the company established to commercialise the technology, was sold to a British firm earlier this year. That does not mean the idea was fundamentally wrong, Mr Kamen insists. "Cities were made to be highly dense environments for pedestrians, while the car is a piece of hardware that was optimised to go really far, really fast," he says. Over half the world's population now lives in cities, he notes. "I don't know if people will be using Segways to get around cities in 20 years' time, but I do know they won't be using cars. The financial, emotional, political and environmental costs will be prohibitive."

Despite the sluggish acceptance of his medical innovations and the sniggering at his Segways, Mr Kamen is pressing on with other new ideas. If it takes a few years for society to catch up with his futuristic visions, so be it. His latest invention is an electrical generator based on a 19th-century idea—an unusually efficient kind of engine, called a Stirling engine—which never caught on. "With the Stirling, we've built the world's neatest little high reliability package that will turn any form of waste into power," he says. He has experimented with Stirling engines in electric cars and motorbikes, but his real target is the developing world. In trials in Bangladesh, a village used one of the engines to generate electricity for nearly six months using only cow dung for fuel.

The generator has a sidekick: a water-purification machine, called Slingshot. One of these rugged devices can turn 1,000 litres a day of contaminated groundwater, polluted river water or seawater into drinking water. "You can wipe out 50% of all human

river water or seawater into drinking water? "You can wipe out 90% of all human diseases just by giving everybody clean water," says Mr Kamen. "My fantasy is to give everybody electricity without destroying the environment, and to use some of that electricity to give everybody water in a sustainable way."

But moving the machines into mass production has proved problematic. "When you're trying to get electricity to a few billion people who've never had electricity, or who are sick and dying because they've never had clean water, it's not a technology problem," says Mr Kamen. "It's an infrastructure, mindset, logistics and sustainability problem that has so many dimensions to it." The health-care firms that license Mr Kamen's other inventions are not well placed to market his water and power machines where they are needed most. "They're interested in health care and interested in my projects," he explains. "But in many cases they have no capacity to deliver and sustain these technologies. There are 206 countries out there, but most medical-device companies do business only in the world's richest 40 or 50."

Once again, Mr Kamen has had more trouble than he anticipated in trying to take an idea from a successful prototype to a successful product. "Technology is easy to develop," he says. "Developing a new attitude, moving the culture from one mental model to another, that's the difficult part. You give people a solution to a problem and the great irony to me is that even though they're unhappy, they have high inertia. People don't like change. The reason it takes technology 15 or 20 years to come in is because 15 years is the time it takes a kid who saw it when he was young to become a functioning adult."

If at first you don't succeed...

Which brings him back to FIRST, the invention of which Mr Kamen is most proud. "It really is an invention because it was a different way to attack a fundamental social problem," he says. "For any one product I worked on, if I didn't do it, someone else would have. Maybe they would have done it a little later, or a little differently, but they would have done it. But when I look out in the stands at tens of thousands of kids each year during FIRST, I see all the scientists that are going to work on the really exciting stuff that's going to happen over the next 15 years. They will be making materials that have no resistance and can carry millions of amps, creating materials that can make, store and transform energy, understanding how to build at a molecular level to synthesise proteins and fix health problems, literally by engineering life."

Throughout his career Mr Kamen has been an instigator, proposing new ideas that have not always been well received. Over 1m children have taken part in FIRST's contests over the years, and Mr Kamen hopes that they will instigate big changes of their own. But as the Emperor of North Dumpling has found repeatedly, there is a big difference between coming up with an idea and making it happen.

The Economist Technology Quarterly | Technology Quarterly