

WORLD ECONOMIC FORUM



Technology
Pioneers
2009



Talent for innovation:

Getting noticed in a global market

**The World Economic Forum's
Technology Pioneers 2009**

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Preface



2009 marks the 10th edition of the Technology Pioneers Award of the World Economic Forum. In the past decade, we have identified close to 400 of the most innovative companies in the fields of biotechnology and health, energy and the environment, and information technologies. They have contributed substantially to the progress of both society and business, and the world is better place due to their impact.

This year's Award marks a significant milestone for several reasons:

- We received a record number of 180 candidates, an increase of 50% in comparison to last year.
- Our selection committee comprised 44 technology experts from around the world, and included a unique pool of leading academics, media leaders, venture capitalists and business visionaries.
- The programme has generated an unprecedented interest from candidates in emerging economies, whose applications constituted 22% of the total.
- This year, we welcomed the first ever Technology Pioneers from Africa, Chile and the People's Republic of China. We are convinced that the globalization of science and technology will continue to improve standards of living around the world in the years to come.

The Forum would like to express thanks and appreciation to the members of the selection committee whose enthusiasm and expertise were critical in selecting the impressive group of Technology Pioneers featured in this publication, and to the Partners that generously support this programme: Accel Partners, BT, KPMG and Kudelski Group.

During these difficult times, we are certain that the technologies driven by these visionary companies will contribute to the next wave of growth, with the innovative and entrepreneurial spirit that characterizes them. We will integrate them into our most important initiatives, and they will play a crucial role during the World Economic Forum Annual Meeting 2009 with the theme "Shaping the Post-Crisis World".

We congratulate the 34 companies selected as Technology Pioneers for their remarkable achievements, and welcome them to the wider community of the World Economic Forum.

André Schneider
Managing Director and Chief Operating Officer
World Economic Forum

Foreword



I am delighted the Technology Pioneers programme of the World Economic Forum is celebrating its tenth anniversary because this year's class is one of the most geographically diverse ever, proving once again that when it comes to innovation, talent truly knows no borders.

This year, our essay "Talent for Innovation" concludes that the quest for talent has become a defining issue. In today's world people can work for anyone from anywhere thanks to technology – work is being defined as something you do rather than somewhere you go.

Today the shortage driving this global talent search is not restricted to technical skill (which typically can be taught) but it's about finding people and companies who have hybrid skills and are prepared to lead the charge, embracing the challenge of innovation and change.

We are fast moving to a world where enterprises have porous boundaries, with people, systems and processes shifting beyond these boundaries – this world is smaller, flatter and even more connected. Innovation networks are crossing these perimeters to harness this surge of ideas. They are an integral part of BT's open innovation strategy, which I lead.

Our belief in the transformational power of innovation is at the heart of why BT is a committed strategic partner of the World Economic Forum's Technology Pioneers programme.

This year's global list of Technology Pioneers demonstrably proves that it is the freedom to innovate that marks visionary companies apart in the global innovation marketplace.

To be selected as a Technology Pioneer, a company must be involved in the development of life-changing technology innovation and have the potential for long-term impact on countries, companies and communities on a planetary basis.

In addition, it must demonstrate visionary leadership, show all the signs of being a long-standing market leader – and its technology must be proven. Previous Technology Pioneers include Amyris Biotechnologies, Dr Reddy Laboratories, Google, Gridpoint, Hycrete, Infosys, Kaspersky Lab, Mozilla Corporation, RainDance Technologies and Wikimedia Foundation.

I want to personally thank the global judging panel for their efforts in pinpointing this year's innovation leaders in biotech, health, energy, environmental tech and IT. This group of companies is the result of a vigorous selection process, in which the Forum received an unprecedented number of candidates from around the world. For the first time, we have included the impressive list of judges on page 34 to recognise their contribution to the programme.

Matt Bross
CEO BT Innovate and
BT Group Chief Technology Officer

Talent for innovation

Breakthrough ideas readily cross borders and as a result there is an emerging global market for innovation talent

Leonardo Da Vinci unquestionably had it in the 15th century; so did Thomas Edison in the 19th century. But today, “talent for innovation” means something rather different. Innovation is no longer the work of one individual toiling in a workshop. In today’s globalised, interconnected world, innovation is the work of teams, often based in particular innovation hotspots, and often collaborating with partners, suppliers and customers both nearby and in other countries. Innovation has become a global activity as it has become easier for ideas and talented people to move from one country to another. This has both quickened the pace of technological development and presented many new opportunities, as creative individuals have become increasingly prized and there has been greater recognition of new sources of talent, beyond the traditional innovation hotspots of the developed world.

at Columbia University, argues that such “orchestration” of innovation can actually be more important in driving economic activity than pure research. “In a world where breakthrough ideas easily cross national borders, the origin of ideas is inconsequential,” he writes. Ideas cross borders not just in the form of research papers, e-mails and web pages, but also inside the heads of talented people.

This movement of talent is not simply driven by financial incentives. Individuals may also be motivated by a desire for greater academic freedom, better access to research facilities and funding, or the opportunity to work with key researchers in a particular field. Countries that can attract talented individuals can benefit from more rapid economic growth, closer collaboration with the countries where those individuals originated, and the likelihood that immigrant entrepreneurs will set up new companies and create jobs.

If a country educates workers at the taxpayers’ expense, does it not have a claim on their talent?

The result is a global exchange of ideas, and a global market for innovation talent. Along with growth in international trade and foreign direct investment, the mobility of talent is one of the hallmarks of modern globalisation. Talented innovators are regarded by companies, universities and governments as a vital resource, as precious as oil or water. They are sought after for the simple reason that innovation in products and services is generally agreed to be a large component, if not the largest component, in driving economic growth.

It should be noted that “innovation” in this context does not simply mean the development of new, cutting-edge technologies by researchers. It also includes the creative ways in which other people then refine, repackage and combine those technologies and bring them to market.

Indeed, in his recent book, “The Venturesome Economy”, Amar Bhidé, professor of business

Mobility of talent helps to link companies to sources of foreign

innovation and research expertise, to the benefit of both. Workers who emigrate to another country may bring valuable knowledge of their home markets with them, which can subsequently help companies in the destination country to enter those markets more easily. Analysis of scientific journals suggests that international co-authorship is increasing, and there is some evidence that collaborative work has a greater impact than work carried out in one country. Skilled individuals also act as repositories of knowledge, training the next generation and passing on their accumulated wisdom.

But the picture is complicated by a number of concerns. In developed countries which have historically depended to a large extent on foreign talent (such as the United States), there is anxiety that it is becoming increasingly difficult to attract talent as new opportunities arise elsewhere. Compared with the situation a decade ago, Indian software engineers, for example, may be more inclined to set

up a company in India, rather than moving to America to work for a software company there.

In developed countries that have not historically relied on foreign talent (such as Germany), meanwhile, the ageing of the population as the birth rate falls and life expectancy increases means there is a need to widen the supply of talent, as skilled workers leave the workforce and young people show less interest than they used to in technical subjects. And in developing countries, where there is a huge supply of new talent (hundreds of thousands of engineers graduate from Indian and Chinese universities every year), the worry is that these graduates have a broad technical grounding but may lack the specialised skills demanded by particular industries.

Other shifts are also under way. The increasing sophistication of emerging economies (notably India and China) is overturning the old model of “create in the West, customise for the East”. Indian and Chinese companies are now globally competitive in many industries. And although the mobility of talent is increasing, workers who move to another country are less likely to stay for the long-term, and are more likely to return to their country of origin. The number of Chinese students studying abroad increased from 125,000 in 2002 to 134,000 in 2006, for example, but the proportion who stayed in the country where they studied after graduating fell from 85% to 69% over the same period, according to figures from the OECD (see page 10).

What is clear is that the emergence of a global market for talent means gifted innovators are more likely to be able to succeed, and new and unexpected opportunities are being exploited, as this year’s Technology Pioneers demonstrate. They highlight three important aspects of the global market for talent: the benefits of mobility, the significant role of diasporas, and the importance of network effects in catalysing innovation.

Brain drain, or gain?

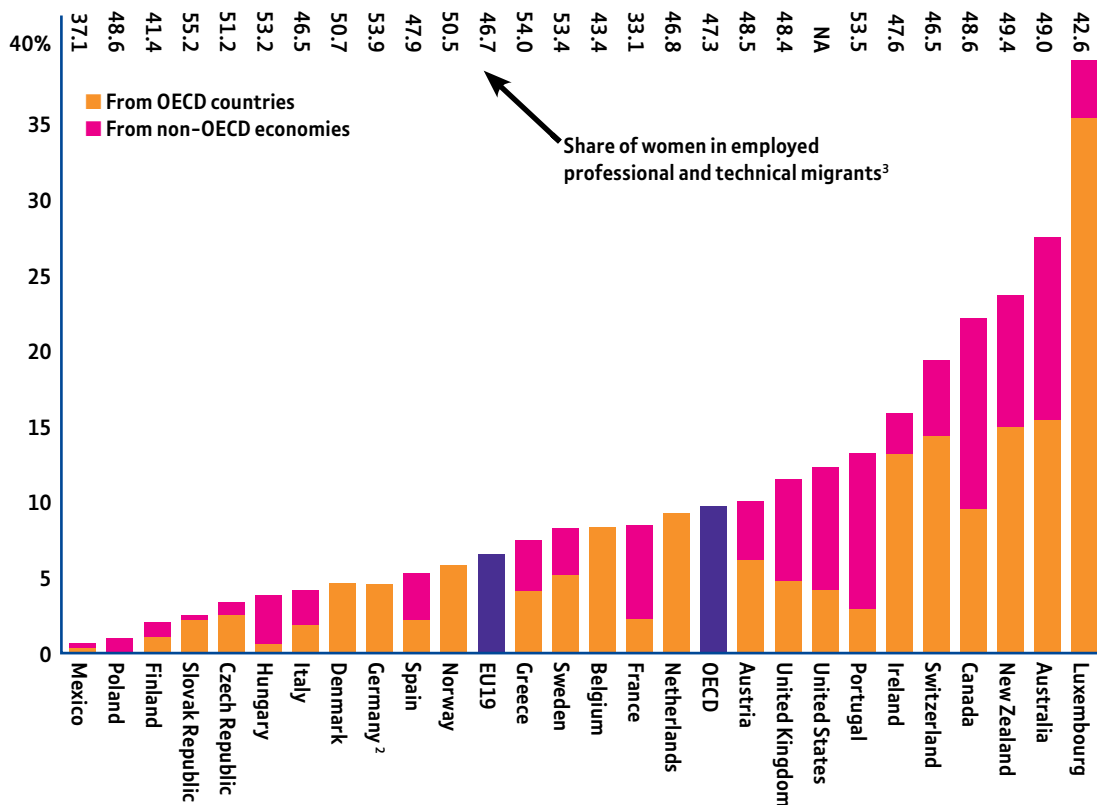
Perhaps the most familiar aspect of the debate about flows of talent is the widely expressed concern about the “brain drain” from countries that supply talented workers. If a country educates workers at the taxpayers’ expense, does it not have a claim on their talent? There are also worries that the loss of skilled workers can hamper institutional development and drive up the cost of technical services. But such concerns must be weighed against the benefits of greater mobility.

There are not always opportunities for skilled individuals in their country of birth. The prospect of emigration can encourage the development of skills by individuals who may not in fact decide to emigrate. Workers who emigrate may send remittances back to their families at home, which can be a significant source of income and can help to alleviate poverty. And skilled workers may return to their home countries after a period working abroad, further stimulating knowledge transfer and improving the prospects for domestic growth,



International mobility of the highly skilled: employed professional and technical migrants from OECD and non-OECD country of residence

As a percentage of total employed professionals and technicians in the country of residence¹



1 Data are not available for Iceland, Japan, Korea and Turkey, which are excluded from the OECD total.

2 The country of birth is unknown for a significant number of employees who have been excluded from the calculation.

3 Data for the United States are not available. The OECD total excludes Iceland, Japan, Korea, Turkey and the United States.

4 Excluding Belgium, Germany, Iceland, Japan, Korea, the Netherlands, Norway and Turkey as country of residence.

5 OECD migrants to all available OECD countries except Iceland, Japan, Korea, Turkey and the United States.

6 Excluding migrants to Belgium, Iceland, Japan, Korea, the Netherlands, Norway and Turkey.

Source: OECD Science Technology and Industry Scoreboard 2007

since they will maintain contacts with researchers overseas.

mobility of talent opens up new possibilities and can benefit everyone.

As a result, argues a recent report from the OECD, it makes more sense to talk of a complex process of “brain circulation” rather than a one-way “brain drain”. The movement of talent is not simply a zero-sum gain in which sending countries lose, and receiving countries benefit. Greater availability and

Consider, for example, BioMedica Diagnostics of Windsor, Nova Scotia. The company makes medical diagnostic systems, some of them battery-operated, that can be used to provide health care in remote regions to people who would otherwise lack access to it. It was founded by Abdullah Kirumira, a Ugandan

biochemist who moved to Canada in 1990 and became a professor at Acadia University. There he developed a rapid test for HIV in conjunction with one of his students, Hermes Chan (a native of Hong Kong who had moved to Canada to study).

According to the United States Centers for Disease Control, around one-third of people tested for HIV do not return to get the result when it takes days or weeks to determine. Dr Kirumira and Dr Chan developed a new test that provides the result in three minutes, so that a diagnosis can be made on the spot. Dr Kirumira is a prolific inventor who went on to found several companies, and has been described as “the pioneer of Nova Scotia’s biotechnology sector”. Today BioMedica makes a range of diagnostic products that are portable, affordable and robust, making them ideally suited for use in developing countries. They allow people to be rapidly screened for a range of conditions, including HIV, hepatitis, malaria, rubella, typhoid and cholera. The firm’s customers include the World Health Organisation.

Providing such tests to patients in the developing world is a personal mission of Dr Kirumira’s, but it also makes sound business sense: the market for in-vitro diagnostics in the developing world is growing by over 25% a year, the company notes, compared with growth of only 5% a year in developed nations. Moving to Canada gave Dr Kirumira research

The mobility of talent is one of the hallmarks of modern globalisation

opportunities and access to venture funding that were not available in Uganda. His innovations now provide an affordable way for hospitals in his native continent of Africa to perform vital tests.

A similar example is provided by mPedigree, a start-up that has developed a mobile-phone-based system that allows people to verify the authenticity of medicines. Counterfeit drugs are widespread in the developing world: they are estimated to account

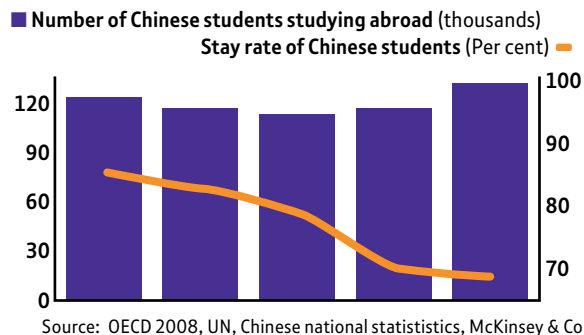
for 10-25% of all drugs sold, and over 80% in some countries. The World Health Organisation estimates that a fake vaccine for meningitis, distributed in Niger in 1995, killed over 2,500 people. mPedigree was established by Bright Simons, a Ghanaian social entrepreneur, in conjunction with Ashifi Gogo, a fellow Ghanaian. The two were more than just acquaintances having met at Secondary School. There are many high-tech authentication systems available in the developed world for drug packaging, involving radio-frequency identification (RFID) chips, DNA tags, and so forth.

The mPedigree system developed by Mr Gogo, an engineering student, is much cheaper and simpler and only requires the use of a mobile phone — an item that is now spreading more quickly in Africa than in any other region of the world. Once the drugs have been purchased, a panel on the label is scratched off to reveal a special code. The patient then sends this code, by text message, to a particular number. The code is looked up in a database and a message is sent back specifying whether the drugs are genuine. The system is free to use because the drug companies cover the cost of the text messages. It was launched in Ghana in 2007, and mPedigree’s founders hope to extend it to all 48 sub-Saharan African countries within a decade, and to other parts of in the developing world.

The effort is being supported by Ghana’s Food and Drug Board, and by local telecoms operators and drug manufacturers. Mr Gogo has now been admitted into a special programme at Dartmouth College in the United States that develops entrepreneurial skills, in addition to technical skills, in engineers. Like Dr Kirumira, he is benefiting from opportunities that did not exist in his home country, and his country is benefiting too.

This case of mPedigree shows that it is wrong to assume that the movement of talent is one-way (from poor to rich countries) and permanent. As it has become easier to travel and communications technology has improved, skilled workers have

Decreasing stay ratio of chinese students



become more likely to spend brief spells in other countries that provide opportunities, rather than emigrating permanently.

And many entrepreneurs and innovators shuttle between two or more places — between Tel Aviv and Silicon Valley, for example, or Silicon Valley and Hsinchu in Taiwan — in a pattern of “circular” migration, in which it is no longer meaningful to distinguish between “sending” and “receiving” countries.

The benefits of a diaspora

Migration (whether temporary, permanent or circular) to a foreign country can be facilitated by the existence of a diaspora, since it can be easier to adjust to a new culture when you are surrounded by compatriots who have already done so. Some observers worry that diasporas make migration too easy, in the sense that they may encourage a larger number of talented individuals to leave their home country than would otherwise be the case, to the detriment of that country.

But as with the broader debate about migration, this turns out to be only part of the story. Diasporas can have a powerful positive effect in promoting innovation and benefiting the home country. Large American technology firms, for example, have set up research centres in India in part because they have been impressed by the calibre of the migrant Indian engineers they have employed in America. Diasporas

also provide a channel for knowledge and skills to pass back to the home country.

James Nakagawa, a Canadian of Japanese origin and the founder of Mobile Healthcare, is a case in point. A third-generation immigrant, he grew up in Canada but decided in 1994 to move to Japan, where he worked for a number of technology firms and set up his own financial-services consultancy. In 2000 he had the idea that led him to found Mobile Healthcare, when a friend was diagnosed with diabetes and lamented that he found it difficult to determine which foods to eat, and which to avoid.

The rapid spread of advanced mobile phones in Japan, a world leader in mobile telecoms, prompted Mr Nakagawa to devise Lifewatcher, Mobile Healthcare’s main product. It is a “disease self-management system” used in conjunction with a doctor, based around a secure online database that can be accessed via a mobile phone. Patients record what medicines they are taking and what food they are eating, taking a picture of each meal. A database of common foodstuffs, including menu items from restaurants and fast-food chains, helps users work out what they can safely eat. Patients can also call up their medical records to follow the progress of key health indicators, such as blood sugar, blood pressure, cholesterol levels and calorie intake.

All of this information can also be accessed online by the patient’s doctor or nutritionist. The system allows people with diabetes or obesity (both of which are rapidly becoming more prevalent in Japan and elsewhere) to take an active role in managing their conditions. Mr Nakagawa did three months of research in the United States and Canada while developing Lifewatcher, which was created with support from Apple (which helped with hardware and software), the Japanese Red Cross and Japan’s Ministry of Health and Welfare (which provided full access to its nutritional database).

Japanese patients who are enrolled in the system have 70% of the cost covered by their health insurance. Mr

Nakagawa is now working to introduce Lifewatcher in the United States and Canada, where obesity and diabetes are also becoming more widespread — along advanced mobile phones of the kind once only found in Japan. Mr Nakagawa’s ability to move freely between Japanese and North American cultures, combining the telecoms expertise of the former with the entrepreneurial approach of the latter, has resulted in a system that can benefit both.

The story of Calvin Chin, the Chinese-American founder of Qifang, is similar. Mr Chin was born and educated in America, and worked in the financial-services and technology industries for several years before moving to China. Expatriate Chinese who return to the country, enticed by opportunities in its fast-growing economy, are known as “returning turtles”. Qifang is a “peer to peer” (P2P) lending site that enables students to borrow money to finance their education from other users of the site.

P2P lending has been pioneered in other countries by sites such as Zopa and Prosper in other countries. Such sites require would-be borrowers to provide a range of personal details about themselves to

Bosses who had lived abroad and returned to India made far more use of diaspora links upon their return than entrepreneurs who had never lived abroad.

reassure lenders, and perform credit checks on them. Borrowers pay above-market rates, which is what attracts lenders. Qifang adds several twists to this formula. It is concentrating solely on student loans, which means that regulators are more likely to look favourably on the company’s unusual business model. It allows payments to be made directly to educational institutions, to make sure the money goes to the right place. Qifang also requires borrowers to give their parents’ names when taking out a loan, which increases the social pressure on them not to default, since that would cause the family to lose face.

Mr Chin has thus tuned an existing business model to take account of the cultural and regulatory environment in China, where P2P lending could be particularly attractive, given the relatively undeveloped state of China’s financial-services market. In a sense, Qifang is just an updated, online version of the community group-lending schemes that are commonly used to finance education in China. The company’s motto is that “everyone should be able to get an education, no matter their financial means”.

Just as Mr Chin is trying to use knowledge acquired in the developed world to help people in his mother country of China, Sachin Duggal hopes his company, Nivio, will do something similar for people in India. Mr Duggal was born in Britain and is of Indian extraction. He worked in financial services, including a stint as a technologist at Deutsche Bank, before setting up Nivio, which essentially provides a PC desktop, personalised with a user’s software and documents, that can be accessed from any web browser.

This approach makes it possible to centralise the management of PCs in a large company, and is already popular in the business world. But Mr Duggal hopes that it will also make computing more accessible to people who find the prospect of owning and managing their own PCs (and dealing with spam and viruses) too daunting, or simply cannot afford a PC at all. Nivio’s software was developed in India, where Mr Duggal teamed up with Iqbal Gandham, the founder of Net4India, one of India’s first internet-service providers. Mr Duggal believes that the “virtual webtop” model could have great potential in extending access to computers to rural parts of India, and thus spreading the opportunities associated with the country’s high-tech boom.

A survey of the bosses of Indian software firms clearly shows how diasporas can promote innovation. It found that those bosses who had lived abroad

and returned to India made far more use of diaspora links upon their return than entrepreneurs who had never lived abroad, which gave them access to capital and skills in other countries. Diasporas can, in other words, help to ensure that “brain drain” does indeed turn into “brain gain”, provided the government of the country in question puts appropriate policies in place to facilitate the movement of people, technology and capital.

Making the connection

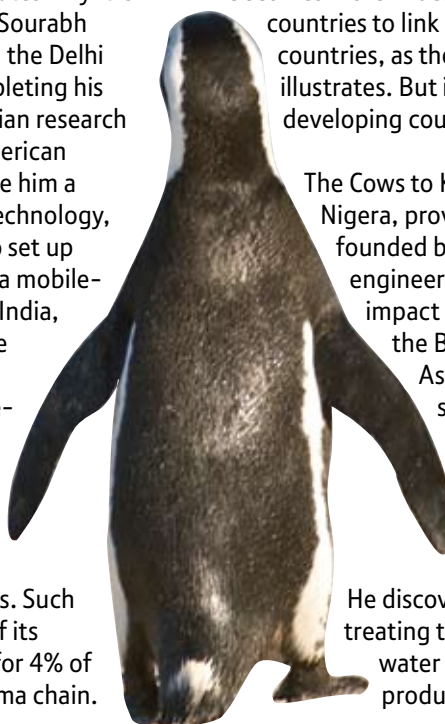
Multinational companies can also play an important role in providing new opportunities for talented individuals, and facilitating the transfer of skills. In recent years many technology companies have set up large operations in India, for example, in order to benefit from the availability of talented engineers and the services provided by local companies. Is this simply exploitation of low-paid workers by Western companies?

The example of JiGrahak Mobility Solutions, a start-up based in Bangalore, illustrates why it is not. The company was founded by Sourabh Jain, an engineering graduate from the Delhi Institute of Technology. After completing his studies he went to work for the Indian research arm of Lucent Technologies, an American telecoms-equipment firm. This gave him a solid grounding in mobile-phone technology, which subsequently enabled him to set up JiGrahak, a company that provides a mobile-commerce service called Ngpay. In India, where many people first experience the internet on a mobile phone, rather than a PC, and where mobile-phones are far more widespread than PCs, there is much potential for phone-based shopping and payment services. Ngpay lets users buy tickets, pay bills and transfer money using their handsets. Such is its popularity that with months of its launch in 2008, Ngpay accounted for 4% of ticket sales at Fame, an Indian cinema chain.

The role of large companies in nurturing talented individuals, who then leave to set up their own companies, is widely understood in Silicon Valley. Start-ups are often founded by alumni from Sun, HP, Oracle and other big names. Rather than worrying that they could be raising their own future competitors, large companies understand that the resulting dynamic, innovative environment benefits everyone, as large firms spawn, compete with and acquire smaller ones.

As large firms establish outposts in developing countries, such catalysis of innovation is becoming more widespread. Companies with large numbers of employees and former employees spread around the world can function rather like a corporate diaspora, in short, providing another form of network along which skills and technology can diffuse. The network that has had the greatest impact on spreading ideas, promoting innovation and allowing potential partners to find out about each other’s research is, of course, the internet. As access to the internet becomes more widespread, it can allow developing countries to link up more closely with developed countries, as the rise of India’s software industry illustrates. But it can also promote links between developing countries.

The Cows to Kilowatts Partnership, based in Nigera, provides an unusual example. It was founded by Joseph Adelagan, a Nigerian engineer, who was concerned about the impact on local rivers of effluent from the Bodija Market abattoir in Ibadan. As well as the polluting the water supply of several nearby villages, the effluent carried animal diseases that could be passed to humans. Dr Adelagan proposed setting up an effluent-treatment plant. He discovered, however, that although treating the effluent would reduce water pollution, the process would produce carbon-dioxide and methane



emissions that contribute to climate change. So he began to look for ways to capture these gases and make use of them. Researching the subject online, he found that a research institution in Thailand, the Centre for Waste Utilisation and Management at King Mongkut University of Technology Thonburi, had developed anaerobic reactors that could transform agroindustrial waste into biogas. He made contact with the Thai researchers, and together they developed a version of the technology suitable for use in Nigeria that turns the abattoir waste into clean household cooking gas and organic fertiliser, thus reducing the need for expensive chemical fertiliser. The same approach could be applied across Africa, Dr Adelagan believes. The Cows to Kilowatts project illustrates the global nature of modern innovation, facilitated by the free movement of both ideas and people. Thanks to the internet, people in one part of the world can easily make contact with people trying to solve similar problems elsewhere.

Lessons learned

What policies should governments adopt in order to develop and attract innovation talent, encourage its movement and benefit from its circulation? At the most basic level, investment in education is vital. Perhaps surprisingly, however, Amar Bhidé of Columbia University suggests that promoting innovation does not mean pushing as many students as possible into technical subjects. Although researchers and technologists provide the raw material for innovation, he points out, a crucial role in orchestrating innovation is also played by entrepreneurs who may not have a technical background. So it is important to promote a mixture of skills. A strong education system also has the potential to attract skilled foreign students, academics and researchers, and gives foreign companies an incentive to establish nearby research and development operations.

Many countries already offer research grants, scholarships and tax benefits to attract talented immigrants. In many cases immigration procedures

are “fast tracked” for individuals working in science and technology. But there is still scope to remove barriers to the mobility of talent. Mobility of skilled workers increasingly involves short stays, rather than permanent moves, but this is not yet widely reflected in immigration policy. Removing barriers to short-term stays can increase “brain circulation” and promote diaspora links.

The Global competition for talent is not a zero-sum game in which some countries win and others lose

Another problem for many skilled workers is that their qualifications are not always recognised in other countries. Greater harmonisation of standards for qualifications is one way to tackle this problem; some countries also have formal systems to evaluate foreign qualifications and determine their local equivalents. Countries must also provide an open and flexible business environment to ensure that promising innovations can be brought to market. If market access or financial backing are not available, after all, today’s global-trotting innovators increasingly have the option of going elsewhere.

The most important point is that the global competition for talent is not a zero-sum game in which some countries win, and others lose. As the Technology Pioneers described here demonstrate, the nature of innovation, and the global movement of talent and ideas, is far more complicated than the simplistic notion of a “talent war” between developed and developing nations would suggest. Innovation is a global activity, and granting the greatest possible freedom to innovators can help to ensure that the ideas they generate will benefit the greatest possible number of people.

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Thirty-four companies have been chosen as Technology Pioneers in 2009. They come from three categories: biotechnology and health, energy/environmental technology and information technology. Candidates are nominated by members, constituents and collaborators of the World Economic Forum. Candidates are reviewed by an external Selection Advisory Committee (see page 34) comprising technology experts in a variety of fields; the World Economic Forum takes the final decision. The Pioneers are chosen on the basis of six selection criteria:

Innovation The company must be truly innovative. A new version or repackaging of an already well-accepted technological solution does not qualify as an innovation. The innovation and commercialisation should be recent. The company should invest significantly in R&D.

Potential impact The company must have the potential to have a substantial long-term impact on business and society.

Growth and sustainability The company should have all the signs of a long-term market leader and should have well-formulated plans for future development and growth.

Proof of concept The company must have a product on the market or have proven practical applications of the technology. Companies in “stealth” mode and those with untested ideas or models do not qualify.

Leadership The company must have visionary leadership that plays a critical role in driving it towards its goals.

Status The company must not currently be a Member of the World Economic Forum.

AC Immune

Andrea Pfeifer, CEO

LOCATION Lausanne, Switzerland

NUMBER OF EMPLOYEES 30

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Alzheimer's disease is one of the greatest health fears of an ageing population, affecting more than 26 million people worldwide. It is also one of the key focal points for AC Immune, a start-up firm that is developing new therapies to treat diseases of the central nervous system (CNS) such as Alzheimer's.

The disease is a progressive condition, affecting the brain and nervous system, which manifests in a slow and insidious onset of debilitating symptoms. It is caused by mutation (or "conformation"—a change in structure) of a specific protein in the brain. By developing two technology platforms from which to develop therapies, AC Immune hopes to study and treat Alzheimer's. The company's drug pipeline consists of three products, all of which will be in clinical trials in 2009, which have the potential to create a cure for this devastating disease.

CEO Andrea Pfeifer, formerly a research scientist, toxicologist and director of the Nestlé Research Centre in Switzerland, had personal experience of losing family and colleagues to cancer, which spurred her to form AC Immune. In late 2006, AC Immune formed a multi-year licensing deal with US biotechnology company Genentech to collaborate in developing anti-beta-amyloid antibodies for Alzheimer's and other diseases.

Why the company is a pioneer

One of the difficulties in treating CNS diseases of the class that includes Alzheimer's has been that because the brain protein is not foreign to the body, it does not elicit an immune reaction from the body when it begins to change. AC Immune's first antigen platform technology allows the body to break its immune tolerance to "self" proteins. The company's second platform uses chemistry to create drugs capable of targeting and modifying the conformational state of targeted proteins to render them harmless.

AC Immune
PSE Building B - EPFL
1015 Lausanne
Switzerland

Telephone: +41 21 693 91 21
Facsimile: +41 21 693 91 20
www.acimmune.com

Alnylam Pharmaceuticals

John Maraganore, CEO

LOCATION Massachusetts, USA

NUMBER OF EMPLOYEES 145

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

RNA interference, or RNAi, is a natural cellular process that selectively switches off a gene's activity by targeting RNA, the key chemical between DNA and proteins. By harnessing this process, Alnylam Pharmaceuticals is developing drugs that can selectively suppress certain proteins in genes that play a harmful role in disease.

Alnylam was an early leader in uncovering how RNAi works, and the company's subsequent research and collaborative projects delve into many important areas of medicine. Alnylam runs its own drug discovery programme, and is midway through human clinical trials with a treatment for respiratory syncytial virus (RSV), one of the leading causes of respiratory tract infection. It is also developing treatments for liver cancer, high cholesterol, TTR amyloidosis, hepatitis C, Huntington's disease, progressive multifocal leukoencephalopathy, inflammatory diseases such as rheumatoid arthritis and inflammatory bowel disease.

The company has also formed spin-offs and joint ventures in fields such as biodefence and microRNA therapeutics. Meanwhile, high-powered partnerships with pharmaceutical giants Roche and Takeda are putting muscle behind Alnylam's technology in areas like metabolic and liver diseases and cancer.

Why the company is a pioneer

The significance of RNAi was emphasised in 2006, when the two US researchers who first described it were awarded the Nobel Prize. Alnylam saw the potential for RNAi early and secured key patents, technology, knowledge and partnerships that should keep it at the cutting edge of research and drug development in this field.

Alnylam Pharmaceuticals
300 Third Street, 3rd Floor
Cambridge, MA 02142
USA

Telephone: +1 617 551 8200
Facsimile: +1 617 551 8101
www.alnylam.com

BioMedica Diagnostics

Abdullah Kirumira, founder and CEO

LOCATION Nova Scotia, Canada

NUMBER OF EMPLOYEES 22

YEAR FOUNDED 1999

ORIGINS University research spin-off

Up to 50% of clinical diagnoses made by doctors in Africa are inaccurate, mostly because of a lack of basic lab support. According to BioMedica Diagnostics' founder, Ugandan-born Dr Abdullah Kirumira, this lack of affordable diagnostics is a missing link in Africa's healthcare system.

BioMedica's vision was to devise a way to provide basic medical diagnostics to the developing world, funded by the sale of its diagnostic reagents in better-off healthcare systems in Europe, the US, Japan and China. With this financial model, the company is able to supply portable, low-maintenance equipment that is robust for harsher environments, which helps cut testing costs and delivers a fast return on investment. BioMedica's lab and mobile medical products provide blood tests for cardiovascular risk, haematology blood cell counts, common immunodiagnostics and serology for infectious diseases, fertility testing, drugs of abuse, cardiac disease and cancer markers, and urinalysis and diabetes management products.

The equipment and products are widely used in locations ranging from small to medium-sized hospitals and physicians' office laboratories to military field hospitals, rural and remote clinics and United Nations programmes, as well as training institutes.

Why the company is a pioneer

BioMedica uses its biotechnology capabilities to create a link between the medical diagnostic needs of affluent communities and the basic healthcare needs of the developing world. By introducing affordable diagnostics at all district-level hospitals in Africa, BioMedica believes it can help reduce unnecessary mortality and morbidity by up to 30%.

BioMedica Diagnostics
94 Wentworth Road
Windsor, Nova Scotia
Canada

Telephone: +1 902 798 5105.
Facsimile: +1 902 798 1025.
www.biomedicadiagnostics.com

Intercell

Gerd Zettlmeissl, CEO

LOCATION Vienna, Austria

NUMBER OF EMPLOYEES 388

YEAR FOUNDED 1998

ORIGINS Spin-off from the Campus Vienna Biocenter

One of the most significant unmet medical needs, globally, is for the development and supply of new vaccines. As with all medicines, development costs are high, and because many vaccines are intended for developing markets, profit margins can be minimal.

Bucking this accepted wisdom, Intercell has set its sights on the development of new vaccines and treatments for infectious diseases, particularly those for which specific medicine is not currently available. Its main product is a preventative vaccine against Japanese encephalitis. It successfully concluded clinical trials in 2006, and at the time this report went to press, the vaccine was awaiting regulatory approval in the US, Europe, Australia and Canada.

Meanwhile, the company's development pipeline includes several new vaccines and prophylactics, including a patch for travellers' diarrhoea, which is due to go into late-stage clinical trials. Intercell is also leading the charge in developing vaccines for hospital-acquired "superbugs", including *Staphylococcus aureus*, and is developing vaccines for pandemic influenza and *Pseudomonas*, a bacterium that can cause chronic infections. Based on its technologies, Intercell has formed strategic partnerships with a number of global pharmaceutical companies, including Novartis, Merck & Co, Wyeth, Sanofi Pasteur and Kirin.

Why the company is a pioneer

With its three technology platforms, Intercell is positioned as one of the most innovative vaccine companies worldwide. The company's antigen identification programme and needle-free patch delivery vaccine technology provide potential future alternatives to current injected vaccines. The company's work in influenza, tuberculosis and hospital-acquired infection vaccines may also prove to be vitally important.

Intercell
Campus Vienna Biocenter 3
1030 Vienna
Austria

Telephone: +43 1 20620 0
Facsimile: +43 1 20620 800
www.intercell.com

Mobile Healthcare

James Hiroshi Nakagawa, founder and CEO

LOCATION Tokyo, Japan

NUMBER OF EMPLOYEES 7

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

When a friend was diagnosed with diabetes a few years ago, James Nakagawa was horrified by the difficulty and amount of time taken to obtain basic information, such as the number of calories in a hamburger. This sparked the idea for Lifewatcher—a system which, while monitoring patients' vital signs, also allows users to search and obtain nutritional information on foods ranging from standard supermarket fare to haute cuisine.

Lifewatcher is a converged internet and mobile phone-based health management application for people with so-called lifestyle diseases such as diabetes and obesity. It allows users to monitor their condition by logging blood sugar levels, calorie intake, exercise and other variables, and then creates an at-a-glance health portfolio that collates daily, monthly and even yearly data. It also delivers vital medical information, reminders and alerts with gradually escalating alarm levels if goals are not met. Users can be in a constant dialogue with medical practitioners to ensure things are running smoothly or, if not, to spark intervention that could save a life.

Lifewatcher has more than 3,000 users and is backed by healthcare and corporate sponsors, among them Microsoft HealthVault, The Independent Physicians Association of America (TIPAAA) and Yahoo! Japan. The US Army will conduct a clinical trial of the system.

Why the company is a pioneer

With diabetes and obesity conditions on the increase, and mobile phone penetration almost universal in many developed countries, it makes sense to bring the two together. Hailed as a world first in mobile self-disease management, Lifewatcher is an easy-to-use, intelligent system that is seamlessly incorporated into most people's lifestyle, giving users more control over their own health.

Mobile Healthcare
79-2-407 Shimizucho
Itabashiku, Tokyo 174-0053
Japan

Telephone: +81 3 5375 3921 (English)
Telephone: +81 3 5375 3922 (Japanese)
www.lifewatcher.com

MorphoSys

Simon E Moroney, CEO

LOCATION Martinsried (near Munich), Germany

NUMBER OF EMPLOYEES 330

YEAR FOUNDED 1992

ORIGINS Entrepreneurial start-up

Antibodies, which are found in the blood and bodily fluids of humans and animals, are used by the immune system to identify harmful bacteria and viruses, and then eliminate them. MorphoSys' focus is on human antibodies and the company has developed a library of them for use in developing new drugs and treatment for diseases. MorphoSys' patented HuCAL (Human Combinatorial Antibody Library) contains more than 12 billion different fully-human antibodies, and allows quick and automated production of antibodies for researchers and companies to use. Its strength lies in the fact that antibodies produced by HuCAL are pre-programmed for specific diseases, so treatments derived from them can be more effective and specifically targeted.

MorphoSys operates on two levels. As well as delivering high-quality antibodies to the research market, it also develops drug candidates for itself and the company's commercial partners—global pharmaceutical and biotech companies, including Centocor/Johnson & Johnson, Daiichi-Sankyo, Schering-Plough, Merck & Co, Novartis, Pfizer and Roche.

Why the company is a pioneer

Antibodies derived from mice, the most commonly used in medical research, are of limited use as therapeutic agents—the human immune system often registers them as foreign and triggers a defence reaction. By developing a way to generate fully human and highly specialised human antibodies in vitro, MorphoSys has helped to stretch the boundaries of what can be done in drug development.

MorphoSys
Lena-Christ-Straße 48
82152 Planegg
Germany

Telephone: +49 89 899 27 0
Facsimile: +49 89 899 27 222
www.morphosys.com

Phase Forward

Robert Weiler, chairman, president and CEO

LOCATION Massachusetts, USA

NUMBER OF EMPLOYEES 698

YEAR FOUNDED 1997

ORIGINS Entrepreneurial start-up

Drug development generates a huge amount of data, especially when a drug reaches clinical trials. Managing that data, and harnessing it to prove to regulators that a drug works safely, has long been one of the biggest headaches for pharmaceutical and biotech firms.

Phase Forward's technology sits on the cusp between IT and life science research. The company provides software for electronic management of clinical trial and drug safety data, and a host of complementary services to support best practices and regulatory compliance. The company's products are scalable, and ultimately are designed to provide end-to-end management of clinical trials to achieve regulatory approval and assist in post-marketing analysis.

Phase Forward's flagship technology is an electronic data capture system, InForm, which has fundamentally transformed the way clinical data are collected, analysed and managed. So far, the firm's services and technology, which are suited to life science companies of all stripes and sizes, has been used in more than 10,000 clinical trials, involving more than a million trial study participants at pharmaceutical and biotech companies, medical device firms, regulatory agencies and public health organisations.

Why the company is a pioneer

Standardised data collection and management that can be easily accessed by pharmaceutical, biotechnology and medical device companies and contract research organisations, as well as the all-important regulators, is critical for the development of new, safer, more effective medicines. Phase Forward also allows its clients to track and monitor product efficacy and safety, as well as design more efficient and cost-effective clinical trials.

Phase Forward
880 Winter Street
Waltham, MA 02451
USA

Telephone: +1 888 703 1122
Facsimile: +1 781 890 4848
www.phaseforward.com

Proteus Biomedical

Andrew Thompson, CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 65

YEAR FOUNDED 2001

ORIGINS Entrepreneurial start-up

Intelligent medicine—where proven drugs and devices work together with widely used communication devices to deliver personalised treatment—is one of the holy grails of healthcare. In recent years, with new technology developments, companies such as Proteus Biomedical have started providing the tools to help achieve that goal.

Proteus' expertise is in combining high precision process technologies, known as MEMS, with integrated circuit design to produce tiny medical systems designed for integration in existing products used inside the human body. Proteus uses batch fabrication techniques similar to those employed for integrated circuits, which means that a sophisticated, reliable medical technology can be placed on a small silicon chip at a relatively low cost.

Proteus' two innovative technologies, ChipSkin and Raisin, have transformed and improved the way conventional treatments work. Implanted medical devices and diagnostics are subject to erosion by bodily fluids, but ChipSkin—a thin and durable protective layer—can ensure long-term survival of devices only 1mm in diameter. The company's Raisin system, for heart patients and others, involves chips made from common vitamins inserted in medication, which monitor its uptake in the body. The system thus takes the burden off patients and medical practitioners, and allows for precise tracking.

Why the company is a pioneer

So far, the world has only seen the tip of the iceberg in applications for intelligent medicine. Proteus is focusing on embedding its technologies in proven therapies for conditions including cardiovascular and respiratory diseases, metabolic and central nervous system disorders and oncology. The company has partnerships with global leaders in medical devices, pharmaceuticals and mobile phone technology.

Proteus Biomedical
2600 Bridge Parkway, Suite 101
Redwood City, CA 94065
USA

Telephone: +1 650 632 4031
Facsimile: +1 650 632 4071
www.proteus.bz

BrightSource Energy

John Woolard, CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 130

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

The price of solar energy is falling as worldwide demand for alternative energy sources drives commercial developments in the field. Converting sunlight to produce steam, which is then used to generate electricity, is one approach that is proving an attractive alternative to traditional fossil fuels.

BrightSource Energy's Luz Power Tower (LPT) technology uses thousands of small mirrors, known as heliostats, to harness the power of the sun. The mirrors project sunlight onto a modified boiler to produce high-temperature steam, which is then piped to a conventional turbine to produce electricity. BrightSource is currently building LPT systems that will allow power companies in the US to reduce their dependency on fossil fuels. According to BrightSource, each mirror produces enough energy to power an average home, and if less than 2% of the surface of California's 130,000 square kilometre Mojave Desert was to be used by LPT plants, enough energy would be produced to power homes across the state and reduce CO₂ emissions by 30 million tonnes per year.

BrightSource is in experienced hands. Co-founder Arnold Goldman developed the first solar power stations in California between 1984 and 1990.

Why the company is a pioneer

Unlike many solar power systems, which use large expensive mirrors, LPT mirrors are relatively small, easy to manufacture and simpler to install than parabolic mirrors used in solar troughs. Furthermore, these heliostats are on motorised bases, allowing them to track the sun in two dimensions, maximising energy capture throughout the day. The company has the largest solar power agreement ever made under its belt and is actively developing new projects that could power more than 1.4 million homes in south-western US.

BrightSource Energy
1999 Harrison Street, Suite 2150
Oakland, CA 94612
USA

Telephone: +1 510 550 8161
Facsimile: +1 510 550 8165
www.brightsourceenergy.com

Cows to Kilowatts Partnership

Dr Joseph Adelegan, co-founder and CEO

LOCATION Ibadan, Nigeria

NUMBER OF EMPLOYEES 13

YEAR FOUNDED 2006

ORIGINS Alliance of NGOs, research institutes and organisations

The Cows to Kilowatts Partnership, which started life in Ibadan, Nigeria's second-largest city, is transforming noxious abattoir waste into low-cost household cooking gas, as well as fertiliser for struggling farmers.

The abattoir in Ibadan slaughters two-thirds of the animals in Nigeria's Oyo state, and is a major source of local water pollution and greenhouse gas emissions. Unlike most of the developed world, specific regulations for abattoirs do not exist in many developing countries, and if they do they are seldom enforced.

In 2001 Dr Joseph Adelegan, a Nigerian engineer and founder of the Global Network for Environmental and Economic Development Research, recognised that the abattoir's operations could unfold into an environmental and human disaster. As a result of his research, the network joined forces with a number of local and international groups to address the problem. After a handful of false starts, they identified a technology which had been developed by a Thai research institute. With some re-engineering, this technology could transform slaughterhouse waste into clean household cooking gas, and, as an added bonus, into organic fertiliser.

Why the company is a pioneer

Construction of the Cows to Kilowatts biogas plant, which will be one of the biggest in Africa, began in 2007. With an estimated life span of 15 years, it is designed to be commercially viable and is expected to reduce greenhouse gas emissions from the slaughterhouse by more than 22,300 tonnes of CO₂ per year. Not only has Cows to Kilowatts solved a potentially disastrous problem, it has also created opportunities that could be replicated elsewhere in the developing world.

Cows to Kilowatts Partnership
16, Ladoke Akintola Avenue,
New Bodija Estate
Ibadan, Oyo State, Nigeria

Telephone: +234 806 284 3428
Facsimile: +234 2 810 6202
www.c2k.org

Current Group

Thomas J Casey, CEO

LOCATION Maryland, USA

NUMBER OF EMPLOYEES 200

YEAR FOUNDED 2000

ORIGINS Entrepreneurial start-up

Power grids around the world are ageing and require a radical overhaul if they are to meet rising demand for energy. In the meantime, as electricity generation produces more than 40 per cent of CO2 emissions, it is unsurprising that governments are stepping up the pressure on energy firms.

Current Group has set its sights on becoming part of this broader global push to make ageing electricity delivery grids more efficient and environmentally friendly. Smarter electricity grids not only cut consumption, and therefore costs, but could also help to reduce CO2 emissions in the US by as much as 25 per cent by 2020. With this in mind, Current developed its Smart Grid electricity transmission and distribution network, which relies on robust two-way communications, advanced sensors and distributed computers to increase the efficiency and reliability of power delivery.

Just as telemetry systems monitor the performance of engine, car and driver in Formula One racing, Current's IP-based system transforms the electricity grid from a mere conduit to an intelligent adaptive system able to collect and distil vast amounts of data from the network. The principle has many advantages, not least an ability to manage the demand and supply of electricity in real time.

Why the company is a pioneer

Companies like Current bring the power of the internet to transmission, distribution and use of electricity. Many alternative technologies often manage a limited number of components on the electric distribution system. Current says its offering acts as an infrastructure for utilities to monitor and control millions of devices in the electricity distribution grid. The technology is already being used on four continents, by some of the world's largest utility companies.

Current Group
20420 Century Blvd
Germantown, MD 20874
USA

Telephone: +1 301 944 2700
Facsimile: +1 301 944 2711
www.currentgroup.com

GreenPeak Technologies

Cees Links, founder and CEO

LOCATION Utrecht, The Netherlands

NUMBER OF EMPLOYEES 40

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Inadvertently leaving the lights on is not only costly, but flies in the face of growing awareness that energy is a precious resource.

Start-ups like GreenPeak Technologies are addressing this challenge by building low-power wireless sensor networks to improve energy efficiency. They are designed to be used in a range of lighting applications, as well as heating, ventilation and air conditioning control and access control systems. Going a step further, the system could have potential in remote monitoring of agriculture and foresting projects, or large area building structures such as dams, pipelines and bridges.

The adoption of low-power wireless energy sensor networks has been made possible by the arrival of a new standard, known as ZigBee, which makes it easier to integrate them into the networking environment. It also means that wires are no longer needed to pass information from the sensor to the controller, while power connections and batteries become a thing of the past too. Instead, the sensors and communication nodes are now powered by so-called energy harvesting, the process of capturing energy from a variety of existing sources such as solar power, thermal, wind or kinetic energy.

Why the company is a pioneer

It is one thing to install a wireless system, but quite another to keep batteries charged with minimal hassle. Unlike many other wireless networks, such as Wi-Fi or Bluetooth, wireless energy sensor networks like GreenPeak's solve the ongoing challenge of maintenance. Energy-efficient and battery-free, they could become central to energy control and increased energy efficiency, in both new builds and renovations—as well as a money-saver for people who cannot remember to switch off the lights.

GreenPeak Technologies
Catharijnesingel 30 - 3511 GB
Utrecht
The Netherlands

Telephone: +31 30 262 1157
Facsimile: +31 30 262 1159
www.greenpeak.com

Lemnis Lighting

Warner Philips and Frans Otten, co-founders

LOCATION Den Bosch, The Netherlands and California, USA

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

If your great-grandfather was the founder of electrical giant Philips, and you want to specialise in lighting, you have a tough act to follow. But Warner Philips, one of the founders of Lemnis Lighting, would probably make his ancestor proud.

Lemnis, which has sustainable lighting at the core of its business plan, has developed commercial LEDs (light-emitting diodes) to work in mainstream domestic and industrial applications. Although LEDs have been around since the 1970s, until now they have only really been used for digital displays and specialist niche lighting.

One advantage of LED bulbs is that they consume less energy than conventional bulbs. The Pharox light bulbs produced by Lemnis look similar to conventional incandescent bulbs, and produce as much warm white light as standard 40-60 Watt bulb. However, they last for up to 50,000 hours and are as much as 90 per cent more efficient. Furthermore, unlike low-energy compact fluorescent lamps, which contain mercury, Lemnis' bulbs do not produce toxic waste.

Other developments by Lemnis include outdoor lighting based on mesopic light, which is considered the most effective kind of night-lighting. The company's outdoor lighting was developed to resonate with the behaviour of a human eye in the dark, resulting in superior vision.

Why the company is a pioneer

Given that around 20% of the world's energy is currently used for lighting, making lighting more energy-efficient is a clear way to reduce environmental impact. Through its core LED technology, Lemnis is already generating high-volume demand where the impact on the planet is clear and measurable.

Lemnis Lighting
Het Zuiderkruis 15, 5215 MV's-
Hertogenbosch
The Netherlands

Telephone: + 31 73 615 6370
Facsimile: + 31 73 615 6361
www.lemnislighting.com

NovaTorque

John Petro, founder and president

LOCATION California, USA

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Electric motors convert electrical energy into mechanical energy to drive everything from refrigerators and washing machines to factory automation systems and industrial pumps. They consume as much as 50 per cent of the world's generated electricity, so improving their efficiency is an obvious way to reduce consumption.

NovaTorque has developed and patented a new electric motor technology that makes small to medium-sized motors far more efficient. Key to the efficiency, performance and cost benefits of NovaTorque's motor technology is the design of a completely different internal structure which combines elements of traditional rotary and axial motors. The result is a motor which provides greater continuous torque, higher speeds and cooler operation than conventional motors, according to NovaTorque, and which can be manufactured in volume at a lower cost than comparable motors.

The company says widespread adoption of its technology could reduce greenhouse gas emissions by over a billion tonnes per year with an energy cost saving of more than US\$100 billion. Promising initial applications for the NovaTorque motor include fans, pumps, compressors and conveyors.

Why the company is a pioneer

Electric motors were invented more than 100 years ago, but never before has there been such a need for improvements in their energy efficiency. NovaTorque has risen to the challenge by creating an electric motor that can significantly reduce consumers' electricity consumption and carbon footprint, while also offering more output power than traditional models.

NovaTorque
145 N. Wolfe Road
Sunnyvale, CA 94085
USA

Telephone: +1 916 331 8000
Facsimile: +1 916 331 2263
www.novatorque.com

RECYCLA Chile

Fernando Nilo, founder

LOCATION Santiago, Chile

NUMBER OF EMPLOYEES 25

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Rapid economic growth in Chile over the past two decades, coupled with political apathy towards waste management, at one stage spelled a looming environmental disaster. Chile currently disposes of 15 million mobile phones, 500,000 laptops and 300,000 printers every year.

Chilean entrepreneur Fernando Nilo recognised the problem, and also a business opportunity. Supported by the Schwab Foundation, Nilo established RECYCLA—the first company in Latin America to recycle electronic waste. The company currently recycles 10% of this waste and is also involved in more conventional recycling of non-ferrous metals. It collects unwanted consumer and industrial electronic items and then breaks them down into constituent parts. These are either reused or further processed to create recyclable materials such as copper and aluminium. Any non-recyclable elements such as batteries are disposed of in accredited hazardous waste treatment centres.

As part of its social responsibility ethos, the company runs a rehabilitation project which trains former prison inmates to work in the recycling plants. Wherever possible, the company refurbishes computers for use in charities which offer computer training for low-income groups.

Why the company is a pioneer

Being the first on a continent to address the issue of electronic waste is pioneering in itself, but RECYCLA's model also generates profits for shareholders, while addressing a worrying environmental issue in a socially responsible way. RECYCLA's next step will be to export its business model throughout South America, while helping to ensure that its social responsibility ethos remains at the core.

RECYCLA Chile
Av del Valle 945 office 5607
Ciudad Empresarial Huechuraba,
Santiago, Chile

Telephone: +56 2 580 36 36
Facsimile: +56 2 580 36 37
www.recycla.cl

RecycleBank

Ron Gonen, co-founder and CEO

LOCATION New York, USA

NUMBER OF EMPLOYEES 80

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

If getting consumers to recycle for the purely altruistic motive of saving the planet proves too difficult, perhaps what is needed is an economic incentive. This is the principle behind US-based RecycleBank, which applies a technology-driven incentive scheme to the low-tech activity of collecting recyclable rubbish. Simply put, RecycleBank is a green rewards programme, whereby households collect points for recycling which can then be redeemed for coupons for goods or services from more than 400 local and national retailers. RecycleBank's goal is to motivate all households to recycle, whether urban or suburban, rich or poor.

One of the advantages of the scheme is that there is little onus on householders to do much more than sign up to the RecycleBank service. Participants dispose of their recyclable waste in the usual way, except that their bin has been fitted with a radio frequency identification chip. On collection, the waste is weighed, the chip scanned and the information transferred wirelessly to RecycleBank's database. The weight of the recycled material is then converted into points on the household RecycleBank account. Users can check their points status online, and RecycleBank provides further motivation by calculating how many trees have survived and how much oil has been saved as a result of users' recycling habits.

Why the company is a pioneer

RecycleBank has linked a proprietary software system to existing hardware and coupled this with an innovative marketing strategy to reward and motivate households (a nice contrast from local councils penalising those who don't recycle). Most municipalities that have deployed RecycleBank's service have realised a 100% increase in their recycling rate.

RecycleBank
149 Fifth Ave, 4th Floor
New York, NY 10010
USA

Telephone: +1 888 727 2978
Facsimile: +1 212 504 8359
www.recyclebank.com

SemiLEDs Corporation

Trung Tri Doan, chairman and CEO

LOCATION Idaho, USA and Taiwan

NUMBER OF EMPLOYEES 230

YEAR FOUNDED December 2004

ORIGINS Entrepreneurial start-up

Lighting technology has come a long way. The latest solid state lighting bulbs are more efficient and last longer, and because they do not contain mercury they are cleaner to produce than compact fluorescent bulbs. The downside to solid state lighting, which is based on light emitting diodes (LEDs) rather than electrical filaments or gas, is that they are expensive to make and not as bright as other bulbs.

But that is changing with the help of technological developments at companies like SemiLEDs, which is producing so-called High Performance LED lighting. These can be used in a number of applications, including cars, billboards and general household lighting. SemiLEDs was one of the first companies to be able to produce them in large numbers.

SemiLEDs has taken the technology a step further, using a flexible copper alloy material to produce what it calls Metal Vertical Photon LEDs. These bulbs have better electrical and thermal conductivity, making them brighter, more efficient and less prone to overheating. So far, the bulbs have seen a 20% improvement in performance over other LED-based lighting, which means the technology can now compete with other light sources on output and on cost.

Why the company is a pioneer

SemiLEDs is now applying lithography technology to LED production, which could speed the development of a new family of products and applications for the technology in areas such as sanitation, cancer treatment, inkjet printers and tanning. It could also herald a new generation of highly efficient, mercury-free solid state bulbs that generate greater wattage at a similar cost to compact fluorescents.

SemiLEDs Corporation
999 Main Street, Suite 1010
Boise ID 83702
USA

Telephone: +1 208 389 7426
Facsimile: +1 208 389 7515
www.semileds.com

Virent Energy Systems

Eric Apfelbach, president and CEO

LOCATION Wisconsin, USA

NUMBER OF EMPLOYEES 75

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

The drive to produce biofuels from crops has been criticised for contributing to water and food shortages, as farmland is turned over to the production of ethanol. Increasingly, however, a new breed of biofuel developer is emerging to drive greater efficiencies from plant material.

Working in collaboration with energy giant Shell, and with backing from Honda and Cargill, Virent Energy has been advancing a new chemical pathway in the manufacture of biofuels and bioproducts, known as aqueous phase reforming. When this is combined with catalytic refining technologies, Virent's method converts plant sugars into the same range of hydrocarbon molecules currently refined from petroleum to make fuels and chemicals.

This combination, which Virent calls BioForming, is unique because it can generate petrol, diesel and jet fuel with nearly twice the net energy benefit as traditional ethanol technologies from the same acreage of crop. Furthermore, unlike ethanol, the new fuels produced by the BioForming method are virtually identical to existing petroleum fuels, so there is no need for energy companies to upgrade existing pipeline infrastructure or for automotive firms to redesign engines—a big plus for businesses and consumers. BioForming can use both food and non-food crops such as sugar cane bagasse, beet pulp or wheat straw, to create green fuel.

Why the company is a pioneer

With its ability to generate economic and sustainable liquid hydrocarbon fuels and chemicals, Virent's innovative technology can speed the use of non-food plant sugars as an energy source in place of petroleum. This helps to decrease dependence on fossil fuels and sidesteps the need to upgrade existing infrastructure.

Virent Energy Systems
3571 Anderson Street
Madison, WI 53704
USA

Telephone: +1 608 237 8615
Facsimile: +1 608 663 1630
www.virent.com

ZPower

Ross E Dueber, president and CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 82

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

Battery-powered devices are at the centre of modern life. Increasingly, however, consumers not only want longer life from their batteries, they also want them to be greener and safer.

With that in mind, ZPower has taken a technology first developed for the aerospace industry and turned it into a commercially viable product. Now patented, the company's rechargeable and recyclable silver-zinc battery has three main benefits. The first is that ZPower's battery technology can deliver the same power as a comparable lithium-ion product, but with a lifespan up to 40% longer. Secondly, the batteries are more environmentally friendly—the company maintains that 95% of the key components of a silver-zinc battery can be recycled to make new batteries. To prove its eco-friendly credentials, ZPower is going a step further by providing customers with a financial incentive to recycle.

According to ZPower, the final selling point for its batteries is that they are safer than lithium-ion versions because there is no risk that they will catch fire—problems with overheating ion-lithium batteries have led to recent recalls by several manufacturers.

Why the company is a pioneer

ZPower has commercialised technology that addresses the big issues of battery sustainability, efficiency and safety. Although its batteries will be priced at a premium to lithium-ion batteries, ZPower has recently struck a deal with a major laptop computer manufacturer. Intel Capital, the venture capital arm of the world's biggest computer chip manufacturer, has also invested in ZPower.

ZPower
4765 Calle Quetzal
Camarillo, CA 93012
USA

Telephone: +1 805 445 7789
Facsimile: +1 805 445 4487
www.zpowerbattery.com

Advanced Track & Trace

Jean-Pierre Massicot, CEO

LOCATION Paris, France

NUMBER OF EMPLOYEES 27

YEAR FOUNDED 2003

ORIGINS Subsidiary of French LAMY Energies & Technologies Group

Counterfeiting, piracy, hacking and other illegal practices are big business—not just for the perpetrators of the crimes, but also for companies helping to stamp them out.

Advanced Track and Trace helps businesses operating across global markets, often with disparate legal systems, which face the challenge of protecting their brands, trademarks, products and documents. Such infringements to intellectual property can cost millions in lost revenues and consumer trust, and the problem is growing. According to the World Customs Organisation, the number of counterfeit articles seized by customs in Europe increased by 1,000 per cent between 1998 and 2004.

To combat the problem, Advanced Track & Trace has developed a digital authentication technology, Seal Vector, to offer two industrial products. The first, which secures a product from the factory to the point of sale, involves embedding the product, container and packaging with two-dimensional barcode technology which can then be tracked and authenticated at any point in the supply chain. Data exchange occurs over the internet, using cryptographic keys and protocols. The second solution is the authentication of official documents, which are increasingly vulnerable to falsification and electronic hacking.

Why the company is a pioneer

Advanced Track & Trace has demonstrated that it is possible to create a new kind of secure, two-dimensional barcode that is impossible to copy yet simple to produce. An added advantage is that unlike traditional printed security techniques, Seal Vector is a digital technology—because it does not require disposable items like ink or paper, it has environmental benefits.

Advanced Track & Trace
99 av. De la Châtaigneraie
92504 Rueil-Malmaison Cedex
France

Telephone: +33 1 47 16 64 72
Facsimile: +33 1 47 16 64 70
www.advancedtrackandtrace.com

Brightcove

Jeremy Allaire, chairman and CEO

LOCATION Massachusetts, USA

NUMBER OF EMPLOYEES 160

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

Companies are fast learning that online video means more than the latest popular clip on YouTube. Video is now central to the way any organisation or government entity communicates online. At the same time, operating successful online video initiatives has become increasingly complex.

Over the past three years, Brightcove's online video platform has become a standard for hundreds of major brands around the world which publish and distribute video on the internet, including BSKyB, Sony Music Entertainment, the New York Times and the British prime minister's office. Brightcove-powered video now reaches more than 135 million internet users every month.

This is achieved through the company's software-as-a-service (SaaS) platform, which enables users to integrate broadcast-quality video across web pages, connect it to social media tools to grow audiences and easily integrate advertising. Online video is increasingly common, but Brightcove's message has been that one size does not fit all. The company's platform is offered in three editions to meet different organisations' various online video publishing and distribution needs.

Why the company is a pioneer

Brightcove helped pioneer the online SaaS video platform in 2004 and has been a catalyst for rapid adoption of video for websites across nearly every sector of industry and society. To date, Brightcove's competitors are largely organisations' own in-house IT departments. But as demand grows for outsourced solutions for online video, Brightcove's comprehensive suite of capabilities continues to set it apart.

Brightcove
1 Cambridge Center
Cambridge, MA 02142
USA

Telephone: +1 888 882 1880
Facsimile: +1 617 395 8352
www.brightcove.com

Etsy

Robert Kalin, co-founder

LOCATION New York, USA

NUMBER OF EMPLOYEES 65

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Etsy, an old-fashioned concept for a new world, is in essence an online marketplace for buying and selling handmade goods. What makes it different is that on Etsy consumers buy items directly from producers, just as they might at an art fair.

The founders' rationale in creating Etsy was a shared belief that empowering people to earn a living making things is vital to creating a sustainable economy. There are already 170,000 Etsy "shops", mostly based in the US and Europe, but also in the Australian outback, Africa and central Siberia, selling 2 million items, including jewellery, ceramics, rugs and music. There is even a taxidermy section. Although art and craft is a key theme, anything that has not been mass produced, like music, qualifies for sale. A novel feature called Alchemy allows consumers to request custom-made items, for which sellers can pitch.

Etsy is a vibrant, interactive community. Users can enrol in courses, join workshops to improve their sales strategy, share tips or arrange to meet up in person. The company's next step will be to create a more global marketplace which supports local currencies and language. The development of a non-profit division, Etsy.org, will focus on education.

Like eBay, Etsy is a platform, charging sellers a small listing and sales fee to connect them directly with buyers. The company projected gross merchandise sales of US\$100 million in 2008.

Why the company is a pioneer

Etsy looks back to a time before mega-brands dominated global markets. It gives individual sellers an opportunity to access a marketplace far beyond their local community, and links them directly with consumers who in turn have a deeper connection to what they buy.

Etsy
325 Gold St, 6th Floor
Brooklyn, NY 11201
USA

Telephone: +1 718 855 7955
Facsimile: +1 877 718 6639
www.etsy.com

Gameforge

Klaas Kersting and Alexander Rösner, founders

LOCATION Karlsruhe, Germany

NUMBER OF EMPLOYEES 175

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Take two young internet-savvy gaming addicts, stir in entrepreneurial spirit and a fast broadband connection, and the result is millions of people playing games together online.

Gameforge, an internet gaming developer and publisher of massively multiplayer online games (MMOGs), is one of a handful of companies taking gaming to the next level. By tapping the rapid growth of high-speed internet connections, Gameforge has been able to distribute new kinds of browser and client-based games that are attracting millions of players worldwide.

More than 65 million people have already registered to play, in more than 50 languages. That translates to more than 13.5 million active users each month, and Gameforge says it is adding 250,000 players daily. Three of its games have passed the 1 million active user mark in just two months. Gameforge believes that the reason for this rapid growth is that it sticks to the following mantra: free of charge, accessible anywhere and at anytime, user friendly but technologically advanced.

Since its launch in 2003 the company has grown at a rate of 350 per cent per year, propelling investment firm Accel Partners to take a stake in the company in 2007.

Why the company is a pioneer

At this moment, thousands of people in every corner of the globe are playing online browser-based games. That figure is expected to treble over the coming three years. Gameforge's founders were the first to turn browser-based games development from a hobby into a professional outfit. This gives them an edge in the fastest growing segment of the online gaming industry.

Gameforge
Albert-Nestler-Strasse 8
76131 Karlsruhe
Germany

Telephone: +49 721 354808-0
Facsimile: +49 721 354808-152
www.gameforge.de

JiGrahak Mobility Solutions

Sourabh Jain, CEO

LOCATION Bangalore, India

NUMBER OF EMPLOYEES 35

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

When Microsoft describes a company as one of the most innovative in India, it is probably worth taking note. The company in question is Bangalore-based JiGrahak Mobility Solutions, which has developed India's largest end-to-end mobile commerce service, ngpay.

The company has set its sights on India's rapidly growing mobile community. According to the country's telecommunications regulator, mobile phone adoption in India is growing at a rapid 10 million per month. Furthermore, although the average Indian does not own a PC, some 270 million already have a mobile handset and 70 million of those are already accessing the internet.

JiGrahak recognised that, until recently, technological limitations had prevented the widespread uptake of mobile commerce in India. The company set out to develop the financial grade security needed for a service which works on entry-level handsets on any network, which was free to download and simple to use. Ngpay, now branded India's largest "mall on the mobile", has more than 250,000 users, who are transacting with more than 65 businesses across 10 sectors, for banking, shopping, entertainment and bill payment. The one-stop-shop business model and interactive user experience is said to be India's first viable mobile commerce service.

Why the company is a pioneer

JiGrahak believes that ngpay will do for mobile commerce in India what companies like Amazon did for electronic commerce in the US and Europe in the 1990s. Given that 70 million Indians are already accessing the internet via mobile, ngpay is creating new commercial opportunities in that country, particularly for rural and working-class people—70 per cent of the company's users are outside major metropolitan areas.

JiGrahak Mobility Solutions
No. 10 'Ozone' 2nd Floor, 3rd
Main Road, Ashwini Layout
Koramangala, Bangalore
560047 India

Telephone: +91 80 6637 5400
Facsimile: +91 80 6637 5401
www.ngpay.com

Mint.com

Aaron Patzer, founder and CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 25

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

If there is one product that might be expected to succeed in a global downturn, it is one which helps people to better manage their budgets. Mint.com has pioneered a free online money management service designed to help users save money more easily. The service was launched officially in September 2007 and now has more than 600,000 users.

Users register anonymously, with only a valid email address and postcode, and then provide Mint.com with the login details to all their bank accounts. By connecting to more than 7,500 US financial institutions, Mint.com applies technology to unscramble the transaction descriptions found on credit card, bank and brokerage statements. It then updates data daily into neat graphs of cash flow and expenditure. Purchases are colourfully categorised to show how much a user spends in the pub, on parking, on rent or in restaurants. Investment performance and fees are clearly displayed.

Mint.com then goes a step further, by recommending to its users money savers such as cheaper credit cards, based on their own spending patterns. It also alerts users when their bank balances are getting low, when they have any overdue bills, and about any potentially suspicious activity on their accounts. The service makes its revenue from referral fees from banks, brokers and other financial institutions, but Mint.com says it remains objective in its recommendations.

Why the company is a pioneer

As well as saving users time and money, Mint.com has also addressed the vital issue of security. The company applies bank level data security and has been certified by leading internet security systems. Other safeguards are also in place—users cannot transfer funds to pay bills, for example.

Mint.com
280 Hope Street
Mountain View, CA 94041
USA

Telephone: +1 650 996 7676
Facsimile: +1 415 402 0237
www.mint.com

Mojix

Dr Ramin Sadr, founder and CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 40

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

In 1989, an unmanned spaceship known as Galileo was launched by NASA to study the planet Jupiter and its moons. On reaching Jupiter six years later, Galileo developed antennae problems. It was Mojix's founder and CEO, Dr Ramin Sadr, and his team of scientists at Caltech's Jet Propulsion Laboratory who were tasked with salvaging telemetry data from this deep spacecraft mission from Earth, 588 million kilometres away. Having successfully overcome some of the toughest challenges posed by deep space communications, Dr Sadr set about using his experience from the US space programme to create value for large enterprises. He applied the signal processing technology used to read very faint signals from deep space probes to develop a commercial product for radio-frequency identification (RFID), increasingly used in supply-chain management.

By 2004, the Mojix STAR system had begun to take shape. A team of 15 with expertise in a range of fields—including antennae, radio frequency circuits, digital hardware, real-time software, operating system design and implementation—set about developing a proof of concept for Mojix technology. The first model of the system was showcased in 2006 and proved able to read RFID tags at a distance of more than 240 metres. It was the first time in history that a passive tag was read at such a distance.

Why the company is a pioneer

Mojix's RFID system allows a single patented antenna array to read tag emissions from a distance of more than 300 metres, compared to just 9 metres for a conventional reader. The system can also determine the location of the tag, and provide other uses, including security. With these capabilities, the Mojix system breaks through the previous economic and technical barriers to deploy large-scale RFID systems, which opens the door to vastly more efficient automation of supply chain management.

Mojix
11075 Santa Monica Blvd,
Suite 350
Los Angeles, CA 90025 USA

Telephone: +1 877 886 6549
Facsimile: +1 310 479 9602
www.mojix.com

mPedigree

Bright Simons, chief strategist

LOCATION Accra, Ghana and Pennsylvania, USA

NUMBER OF EMPLOYEES 8

YEAR FOUNDED 2007

ORIGINS Entrepreneurial start-up

mPedigree has developed a platform that aims to ensure the validity of drugs in developing countries. Under the system, all drugs distributed in participating countries are labelled with a scratch-panel that reveals a unique code, or “pedigree”. When drugs are purchased, the patient or medical officer sends the code to a designated number via free SMS, and instantly receives a response confirming whether or not the batch is legitimate. By using the GSM mobile communication system, which is widely available in the developing world, mPedigree puts the power in the hands of end users and makes information easily obtainable.

As well as preventing deaths and further complications from counterfeit drugs, mPedigree’s goal is to promote safer, more efficient and transparent pharmaceutical distribution networks, promoting the growth of vital pharmaceutical industry and commerce in the developing world, particularly in Africa.

Successfully piloted in Ghana from January 2008, mPedigree aims to expand its platform to all 48 sub-Saharan African countries, starting with Nigeria, over the next decade, and then into other developing countries in South Asia, South America, the Middle East and North Africa.

Why the company is a pioneer

Counterfeit drugs are a huge problem in developing countries. The implications for human health include over-dosage, low-dosage—which means the drug’s desired effect is lessened or useless—further illness, poisoning and death. It is vitally important to develop a system that not only prevents and detects counterfeit drugs but also encourages use by being easily accessible, cheap and relatively foolproof. mPedigree’s platform offers such a solution for the real world.

mPedigree
Ground Floor, Narnor Place
Kokomlemle, Accra
Ghana

Telephone: +233 246 081335
Facsimile: +233 21 270335
www.mpedigree.org/home

Nivio

Sachin Duggal, CEO

LOCATION Aigle, Switzerland and India

NUMBER OF EMPLOYEES 50

YEAR FOUNDED 2004

ORIGINS Spin-off from GE Healthcare

Web-based email caused a small revolution by allowing computer users to check their mail from any internet-connected computer. Nivio has taken the concept a step further, allowing people to access a private, web-based, Microsoft Windows XP desktop.

For a small monthly fee, Nivio users can log on from internet devices, PCs or even set-top boxes anywhere in the world, and receive a streamed, virtual version of their own Windows desktop. Users can access free software, or rent commercial software such as Microsoft Office by the month. They also gain 5GB of storage space, back-up, anti-spam and anti-virus protection, as well as the freedom to move around without having to carry a laptop or storage media. Nivio allows subscribers to securely create, store and share their work, photos, music and a host of media.

Why the company is a pioneer

Nivio is the first hosted Windows desktop. As a small start-up, the company was able to create something none of its larger rivals were able to do. This technology provides a new way to access modern computing for the developing world and extends the life of equipment for people who already own computers. And, because it is based on an operating system used by around 90 per cent of the world’s users, Nivio offers broad functionality.

Nivio
Place du Marche 3,
CP 156. 1860, Aigle
Switzerland

contact@nivio.com
www.nivio.com

Qifang

Calvin Chin, co-founder and CEO

LOCATION Shanghai, China

NUMBER OF EMPLOYEES 14

YEAR FOUNDED 2007

ORIGINS Entrepreneurial start-up

A university education is an important step for young people in China, but the ability to pay for that step is out of the reach of many. US-born Calvin Chin moved to China in 2004, to work for a semiconductor firm and to play a role in the changes sweeping the country. By 2007, he and some colleagues had embarked on a new venture, which aimed to address the gap between opportunity and day-to-day reality faced by many Chinese. The result is Qifang, an innovative peer-to-peer lending platform that is now helping to bring together students and those who can help fund their education.

The principle is simple: when students receive a letter of admission to a university, they post their loan requirements on the Qifang website. Would-be lenders, including banks, charities, businesses and philanthropists, then offer to invest. Interest rates on most Qifang loans are between 5-12 per cent (depending on how many lenders bid on each loan), so the returns are good. Qifang does the administration and brokering of the loan, which takes the burdens from educational institutions. Meanwhile, students build a good credit record and begin to learn some invaluable lessons about managing their personal finances. Among the company's unique methods for discouraging loan defaults: each loan recipient's parents are named in an online register, the idea being that a student's fear of bringing shame on their family will be more than enough of an inducement to keep up their payments.

Why the company is a pioneer

Combining technological innovations such as P2P lending, microfinance, Web 2.0 and online bidding with social and educational interests, Qifang may well revolutionise and democratise higher education in China. The company's name means "bloom", a reference to a classical Chinese poem: "Bai hua qi fang"—"Let a hundred flowers bloom."

Qifang
1500 Huaihai Middle Road,
Tower 1, Unit 27A,
Shanghai, 200031 China

Telephone: +86 21 6431 1808
www.qifang.cn

Slide

Max Levchin, CEO

LOCATION California, USA

NUMBER OF EMPLOYEES 195

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

One of the hallmarks of Web 2.0 is a new wave of online applications centred on social networks, entertainment and interactivity. Slide is riding on this phenomenon, allowing people to interact in enjoyable ways through profiles and networks they have already formed on sites such as Facebook and MySpace. To achieve this, Slide develops "social entertainment applications", such as Top Friends, FunSpace, and SuperPoke, the latter allowing Facebook users to (virtually) hug, tickle, pinch or throw watermelons at each other.

Like many deceptively simple concepts, Slide's have been enormously successful—more than 150 million users interact with at least one of the company's products every month. Slide also encompasses photo sharing and slideshows (the basis for the company's name), image hosting, widgets, MySpace codes, web publishing and music.

Behind the fun façade is some serious business muscle. Slide was founded by Max Levchin, who was the co-founder of online payment pioneer PayPal, and the company's management team includes several other talented PayPal alumni.

Why the company is a pioneer

By having the foresight to anticipate how humans socially interact in the Web 2.0 era, Slide has been at the forefront of development of the latest wave of collaborative entertainment. Rather than creating yet another Facebook or Bebo, Slide's complementary applications take advantage of networks that are already established, adding a range of attractive, light-hearted applications that go free to users but offer advertising content as well. As the company says of itself, at Slide, they "take fun very seriously".

Slide
301 Brannan Street, 6th Floor
San Francisco, CA 94107
USA

www.slide.com

SpinVox

Christina Domecq, co-founder and CEO

LOCATION Buckinghamshire, UK

NUMBER OF EMPLOYEES 350

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Simply put, SpinVox turns the spoken word into text. Starting off in 2003 as a service that automatically converted voicemails into text messages for users on the go, it now encompasses a whole chorus of voice-to-text options, delivering messages to a user's email inbox, blog, mobile phone, PDA or social networking site.

The backbone of the technology is SpinVox's patented voice message conversion system, D2, which uses a combination of artificial intelligence, voice recognition and natural linguistics. Among the beauties of the system is that it "learns" as it goes—at a rate of thousands of new words per week—and is not impacted by accents or differing tones of voice in English, French, Spanish, German, Portuguese and Italian.

It is a fresh approach for people on the move, and has garnered endorsements from a wide range of people, including lawyers who use SpinVox to check their voicemail while in court, and busy businesspeople who use it in meetings or while on the move. Broadcaster and self-confessed technology addict Stephen Fry recently summarised his experience with SpinVox: "It might not immediately strike you as useful, but once you have experienced a day where you don't have to dial in to listen to messages, but can just glance at them, you will never want to go back."

Why the company is a pioneer

SpinVox is a deceptively simple idea, but one which is catching on with people across five continents who are increasingly time-poor. As well as receiving voicemail as text, people now also use SpinVox to call through memos to themselves that are sent to them as printable "to do" lists, or recipes which can come up on a mobile phone when users are at the shops, or important business updates sent on the fly to key board members.

SpinVox
Wethered House, Pound Lane,
Marlow, Buckinghamshire
SL7 2AF United Kingdom

Telephone: +44 207 965 2000
Facsimile: +44 207 965 2001
www.spinvox.com

Tideway Systems

Richard Muirhead, CEO

LOCATION London, UK

NUMBER OF EMPLOYEES 100

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

As they grow, companies' structures become complex. But a good proportion of those structures remain below the surface, contributing to even more complexity. That is especially true of IT systems—even managers in this area can find it hard to assess the role of every server across an enterprise. And as UK-based Tideway Systems points out, you can't manage what you can't measure, and you can't measure what you can't see.

The basis for Tideway's flagship product, Foundation, is that it helps companies to get to grips with their own IT systems. Foundation is a platform for data centre search, which allows companies to get a complete view of their IT systems, across all of its technology layers, with the result that they are able to better manage their systems and get a measurable return on their IT investments. Given that it may cost many thousands of pounds to run a single server for 12 months, the potential for cost saving is considerable. Tideway's own technology is updated regularly to make sure that nothing slips through the net.

In 2008, Tideway launched a community section on its site, Configipedia, a collaborative online resource for customers, partners and the IT community at large to share best practices, exchange opinions, offer tips and openly discuss common problems.

Why the company is a pioneer

Tideway's technology replaces expensive and inaccurate manual processes and frees up IT staff to focus on their jobs. It collaboratively pools knowledge gleaned from global data centres to make them more resilient and efficient. As power consumption, energy efficiency and overall environmental impact become an increasing concern for companies, Tideway can provide the intelligence they need to responsibly meet these challenges.

Tideway Systems
Anchor House, 15-19 Britten St
London SW3 3TY
United Kingdom

Telephone: +44 870 843 3929
Facsimile: +44 20 7352 4922
www.tideway.com

TraceTracker Innovation

Ole-Henning Fredriksen, CEO

LOCATION Oslo, Norway

NUMBER OF EMPLOYEES 50

YEAR FOUNDED 2000

ORIGINS Spin-off from technology incubator

In 2008, hundreds of products in more than 30 countries worldwide were pulled from supermarket shelves because they contained milk and milk by-products contaminated in Chinese factories with dangerous levels of melamine. This incident highlighted the importance of knowing not just where our food comes from, but where every single ingredient originates.

TraceTracker's Global Traceability Network, GTNet, allows complete traceability as an information exchange platform for the food industry. Food supply chain partners log critical information about the goods they trade via a web interface, giving quick and secure access to their trading partners to manage risks, optimise operations and engage customers.

Another advantage for food businesses using GTNet is that they can increase revenues and cut costs by proving the quality of their products, potentially opening up new markets. A suite of solutions layered on top of GTNet help businesses to back up their safety, authenticity, freshness and sustainability claims.

Why the company is a pioneer

The company's vision is to deliver global traceability "from farm to fork" online, showing product origin, production history, storage, transportation and distribution. TraceTracker's strength lies in the fact that GTNet is decentralised, relatively cheap and easy for companies to buy into, which encourages widespread usage and trust. It has also been adopted by national bodies and authorities including Norway's seafood industry and Vietnam's poultry industry. In China, the Shandong Institute of Standardisation has entered into a joint venture with TraceTracker to improve the safety of Chinese goods with a new online traceability system called ChinaTrace.

TraceTracker Innovation
Christian Krohgs gate 32
0186, Oslo
Norway

Telephone: +47 48 20 30 00
Facsimile: + 47 22 20 50 46
www.tracetracker.com

Ubiquisys

Chris Gilbert, CEO

LOCATION Swindon, UK

NUMBER OF EMPLOYEES 80

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

Imagine having a single contact number on which people could reach you for work, leisure, business or family. It sounds like the sort of simplicity most of us gave up long ago, but with femtocell technology, it could again become reality.

A femtocell is a tiny indoor cellular access point that represents the next stage of technology convergence. It was invented by UK entrepreneur Will Franks, now Ubiquisys' chief technology officer, who was frustrated that he could not get mobile phone coverage in his home. Because walls and windows get in the way of wireless signals, mobile phone reception is often poor indoors. And with their higher frequency, the indoor coverage for 3G-enabled phones is worse than their 2G predecessors. Ubiquisys has developed a simple 3G femtocell it calls ZoneGate for consumer and enterprise use. ZoneGate plugs into a broadband connection, then relays mobile signals indoors, improving reception and enabling users to make mobile calls at landline rates when within range. The femtocell also provides mobile internet at broadband speeds, opening up the web to a new market of mobile users.

Why the company is a pioneer

Many companies are now developing femtocell technology, but Ubiquisys was the first vendor to demonstrate a fully working femtocell product, in 2006. A year later, in Barcelona, Ubiquisys unveiled the world's first commercial grade femtocell system. Completing a trio of firsts, the company recently announced that Japan's SoftBank will be the world's first mobile operator to offer 3G femtocells to its customers, from Q1 2009. ZoneGate will be available from other operators in Europe and globally during 2009.

Ubiquisys
The Stella Building
Windmill Hill Business Park
Swindon, Wiltshire SN5 6NX UK

Telephone: +44 2071 833400
www.ubiquisys.com

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ACCEL[®]

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The Technology Pioneers programme is run by the World Economic Forum with guidance from BT, KPMG, Kudelski Group and Accel Partners. BT Innovate CEO and BT Group Chief Technology Officer, Matt Bross would like to recognise and thank these three strategic partners.

For over 25 years, Accel Partners has sought out entrepreneurs with the rare combination of insight, determination, and ambition to create the next-generation of category defining companies in various technology markets. Technology innovation is a global phenomenon, and our firm maintains offices in Silicon Valley, London, China and India to better serve our growing network of companies and entrepreneurs.

As a long-standing partner of the World Economic Forum, Accel is thrilled to support the Technology Pioneers Programme. Given the enormous financial, environmental, health, and technology challenges facing the world today, nothing is more important than unleashing the talent of our greatest innovators to attack these issues. The Forum Technology Pioneers Programme is ideally situated to help identify and nurture innovative companies in many different fields, who individually and collectively can have substantial business and social impact.

The Technology Pioneers Programme serves a crucial role in helping identify and create awareness about important young companies. Our belief is that participation at the World Economic Forum in Davos provides a unique opportunity for these Tech Pioneers to meet established leaders in their field as well as network with other members of the Forum community who can help accelerate their implementation plans and increase their potential for success. Tech Pioneers also participate in the Forum's regional meetings and often become significant contributors to the Forum's global initiatives in areas such as climate change, health, and innovation.

Each year we look forward to evaluating the full list of candidates for the Tech Pioneers Programme as the selection process is a humbling reminder of the brilliant international talent pool focused on addressing important global problems. We hope that you'll join us in saluting the fabulous class of 2009 Tech Pioneers.

Bruce Golden
Partner, Accel Partners

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The Technology Pioneers programme strives to identify companies and individuals that drive technological innovation benefiting the global business community and society at large. History has shown that technological advancements can alter human behavior and transform culture - transcending geographic, political, social and economic boundaries. The profound effect of innovation, such as the work done by the visionaries we recognize today, continues to drive global evolution by disrupting the way we work, communicate, and live. This year's crop of nominees from the fields of biotechnology and health, energy and the environment, and information technologies have done just.

History has also shown that in distressed economic times, focus should be placed on accelerating and fostering new technological advancements that will drive productivity and usher in a new wave of innovation, growth and evolution. Agile businesses distinguish themselves during uncertain times by strengthening and expanding their core competencies to take advantage of the economic upswing when it occurs, and to improve long-term competitive positioning. It is in these difficult times that game-changing technologies are being developed through strategic partnerships and collaboration that seeks to look beyond tomorrow and anticipate the problems and opportunities of the future.

To be innovative, it is not enough for technology to move at the same pace as society. Its role is to serve as the pace setter, introducing ideas and solutions that have never existed before. KPMG is committed to supporting and fostering the next wave of technology evolution by being a strategic partner of the World Economic Forum's Technology Pioneer programme. Congratulations to this year's award recipients. Recognition by the World Economic Forum's Technology Pioneers programme acknowledges the fact that these companies are not only altering the current state of civilization, but accelerating the rate at which the world is coming together.

Gary H. Matuszak
Global Leader of KPMG's Information, Communications,
and Entertainment (ICE) practice



Through its global presence over the 5 continents, the Swiss-based Kudelski Group is partnering with major technology driven companies to deliver best-in-class, tailor-made solutions for every market. Our technologies are used in a wide range of services and applications requiring access control and rights management to secure the revenue of content owners and service providers for digital television and interactive applications across broadcast, broadband and mobile delivery networks. Over the years, The Kudelski Group has become a world leader in digital security and convergent media solutions for the delivery of digital and interactive content. The group is also a world technology leader in the area of access control and management of people or vehicles to sites and events.

Since its creation in 1951, our Group has been driven by a strong entrepreneurship spirit which generated the permanent development of new technologies and solutions. Our technologies are currently being used by more than 120 leading Pay-TV operators worldwide securing content delivered to over 92 million active smart cards and devices.

Thanks to its long-term commitment towards the World Economic Forum, the Kudelski Group has demonstrated every year its passion for Technology and Innovation. We have been actively cooperating to deliver the best security and technology infrastructure for the Forum, be it during its Annual Meeting or its Regional events around the globe.

This year, we are proud to join the Technology Pioneers programme, in order to support young and talented companies, as well as innovators creating new solutions in our challenging environment.

We are convinced that the refreshing spirit and enormous drive brought by the Technology Pioneers programme will seriously help the most creative companies to positively challenge and support the World Economic Forum members.

We are looking forward to supporting the promising class of 2009 Tech Pioneers, and be part again, next year, of the Technology Pioneers programme.

Christophe Nicolas,
Senior VP and Chief Technology Officer
Kudelski Group

Meet our selection committee

Alain Baumann	World Economic Forum	USA
Matt Bross	BT Plc	United Kingdom
Timothy Chen	HTC-VIA	Taiwan, China
George F. Colony	Forrester Research Inc.	USA
Kevin E. Comolli	Accel Partners	United Kingdom
Adrienne Corboud Fumagalli	Ecole Polytechnique Fédérale de Lausanne (EPFL)	Switzerland
Andreas Diggelmann	SAS	USA
Soumitra Dutta	INSEAD	France
Esther Dyson	EDventure Holdings Inc.	USA
Christoph Frei	World Economic Forum	Switzerland
Friedrich Fröschl	HI TEC INVEST	USA
Alan Gershenfeld	E-line Ventures	USA
Neil Gershenfeld	The Center for Bits and Atoms, Massachusetts Institute of Technology	USA
Bruce Golden	Accel Partners	United Kingdom
John Hanten	Chevron Technology Ventures	USA
Tim Harper	Cientifica Ltd	United Kingdom
Lutz Heuser	SAP AG	Germany
Peter Horsburgh	Environmental Technologies	United Kingdom
Jiang Kejun	Energy Research Institute (ERI)	People's Republic of China
Calestous Juma	Belfer Center for Science and International Affairs, Harvard University	USA
William Kimble	KPMG	USA
Kaiser Kuo	Ogilvy & Mather	People's Republic of China
Li Zheng	Tsinghua University	People's Republic of China
Michael Liebreich	New Energy Finance Limited	United Kingdom
Sven Lingjaerde	Vision Capital Europe	Switzerland
Patricio López	Tecnológico de Monterrey (ITESM)	Mexico
Alan Marcus	World Economic Forum	USA
Yoichiro Matsumoto	University of Tokyo	Japan
Gary Matuszak	KPMG	USA
Geoffrey Moore	TCG Advisors LLC	USA
J. Christofe Moran	Applied Materials	USA
John Morris	KPMG	United Kingdom
Christophe Nicolas	Kudelski Group	Switzerland
Yves Pitton	Kudelski Group	Switzerland
Y.S. Rajan	Confederation of Indian Industry (CII)	India
Olivier Raynaud	World Economic Forum	Switzerland
J.P. Rangaswami	BT Plc	UK/USA
Paul L. Saffo	Saffo.com	USA
Jennifer Schenker	BusinessWeek	France
Ulrich Schriek	QIAGEN	Germany
Helmut M. Schühler	TVM Capital GmbH	Germany
Robert Scoble	Fast Company.TV	USA
Gary Shainberg	BT Plc	United Kingdom
Yossi Vardi	International Technologies Ventures	Israel

Contacts

To find out more about BT's open innovation programme contact Simon Dux.

Simon Dux
Head of Communications
BT Innovate
simon.dux@bt.com
+44 (0)20 7356 6720

BT Group plc.
Registered offices 81 Newgate Street, London EC1A 7AJ
Registered in England and Wales No. 4190816



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