

WORLD ECONOMIC FORUM



Technology
Pioneers
2008



Crowd wisdom: user-centric innovation

The World Economic Forum's
Technology Pioneers 2008

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BT is one of the world's leading providers of communications solutions and services operating in 170 countries. Its principal activities include networked IT services; local, national and international telecommunications services; higher-value broadband and internet products and services and converged fixed/mobile products and services. BT consists principally of four lines of business: BT Global Services, Openreach, BT Retail and BT Wholesale.

In the year ended 31 March 2007, BT Group plc's revenue was £20,223 million with profit before taxation of £2,484 million.

Contents

PREFACE	2
FOREWORD	3
CROWD WISDOM	4
TECHNOLOGY PIONEERS 2008	11
ACKNOWLEDGEMENTS	32

Preface

In line with its commitment to improving the state of the world, the World Economic Forum has created the Technology Pioneers Community. Technology Pioneers are companies from around the world that develop and apply the most innovative and transformational technologies in the fields of information technology, energy and environment, and biotechnology and health. The work undertaken by these companies holds the promise of significantly affecting the way business and society operate. Each innovation is another step in society's attempt to harness, adapt and use technology to change and improve our world.

This year the World Economic Forum received a record number of applications from companies around the world to become a Technology Pioneer. From a highly competitive field, we are extremely pleased to have a community that is using innovation and technology in a markedly collaborative manner to dramatically affect the way society and business operate. The theme of the World Economic Forum Annual Meeting 2008 is **The Power of Collaborative**

Innovation, and we are confident that the Technology Pioneers are at the forefront of both collaboration and innovation.

The Forum is pleased to congratulate the 39 companies selected as Technology Pioneers 2008 on their truly remarkable achievements and welcome them to the community of the World Economic Forum.



We would also like to express our 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.

Finally, the Forum would like to thank BT for the content and publication of this report and for their strong ongoing commitment to the Technology Pioneers programme.

Andre Schneider
Managing Director and Chief Operations Officer
World Economic Forum

Foreword

Globalisation and technology are accelerating the creation of new ideas and speeding them on their way to market. Today these ideas and concepts are triggering a new cycle of innovation. The result is an explosion of creativity that shows no sign of coming to an end. I call this phenomenon the Innovation Big Bang.

To survive and thrive in this new environment, companies need both deep skills to lead and interpret the opportunities in their innovation networks, but also broad and flexible skills to engage with customer needs, assimilate new capabilities and execute.

The window of opportunity for a new product or service innovation to carve out an appreciable marketshare has collapsed from years or months to weeks or even days.

Invention is not enough. As far as customers are concerned, genuine innovation happens only when their daily lives actually get better or their firms achieve greater success as a result.

The Innovation Big Bang increases the stakes. To ensure their competitiveness is sustainable and differentiable in the long term, firms must now look well beyond the limits of their own R&D departments and indeed their own payrolls. The world is full of people who are keen to offer their ideas, and firms will need to become exceptional exploiters of this immense pool of talent if they are to survive.

That's why, in my role as innovation champion for BT, I am committed to fostering innovation

networks because they form an integral part of BT's open innovation strategy. It is through innovation networks that many companies can minimise the dangers of becoming over-aligned to one view of the future, a single market segment, or to one industry structure.



The Technology Pioneers are at the heart of this emerging global innovation marketplace.

BT is committed to being a strategic partner of the World Economic Forum's Technology Pioneers programme because the technological innovation shown by these visionary companies demonstrates the real potential for a sustained impact across business and society globally. Previous Technology Pioneers have included Autonomy, Cambridge Silicon Radio, Google, Millennium Pharmaceuticals, Mozilla and Sling Media.

This year's Technology Pioneers were nominated by leading venture capital and technology companies from around the world. The final selection was made by a panel of leading technology experts appointed by the World Economic Forum.

The depth, breadth and diversity of the innovation represented by this year's Technology Pioneers delivers a wellspring of collaborative innovation opportunities for any organisation choosing to do business with them.

Matt Bross
Chief Technology Officer
BT Group

Crowd wisdom: user-centric innovation

Customers are proving to be a useful and growing source of innovation globally

IS IT a bold and promising new approach to innovation, or just the application of new buzzwords to existing practices? The idea of involving customers directly in the development and deployment of new products and services, variously known as “user-centric innovation”, “outside innovation”, “mass collaboration”, “wikinomics” or “crowdsourcing”, certainly sounds novel. In some ways, however, it is not that different in practice from established practices such as open-source software development, in which volunteer programmers collaborate over the internet, or the even older practice of designing new products that take into account the wishes of particularly demanding customers. And even Scottish philosopher Adam Smith praised workmen who developed “easier and readier” tools for their own use, noting that many machines involved in early industrial processes were invented by end-users who improved upon earlier versions.

But what is certainly new is that companies are now recognising that customers can play a valuable role in devising and distributing new ideas — and are taking a greater interest in tapping into a source of inspiration and innovation that may only have been used informally and occasionally in the past. This is bringing into being new products and services, by distributing tasks among large groups, exploiting large data sets and economies of scale, and harnessing the enthusiasm of volunteers, enthusiasts and tinkerers.

Much of this has been made possible by the internet, of course, and its famed ability to allow groups of people with a shared interest, no matter how obscure, to connect with

each other. But it is also a recognition by companies that their customers constitute a valuable supply of ideas, manpower, skills and information. The old model, in which a company develops a product and then puts it on the market for customers to buy, has given way in many cases to a new model in which customers participate in the development of new products, and help to create, improve, distribute and promote them. Companies generally have far more customers than they do employees, after all, so why not make use of their input?

A classic example, cited by Eric von Hippel, a guru of user-centric innovation and the author of *Democratizing Innovation*, is that of the Lego Group, Europe’s largest toymaker, and its Mindstorms product. This combined Lego’s usual snap-together plastic bricks with a special control unit into which simple programs could be downloaded from a computer, thus making possible the construction of robots and other complex models. The software inside the Mindstorms brick was developed over a period of many months by a small team of Lego engineers. Within three weeks of the original product’s release in 1998, however, an internet user group had reverse-engineered the software and written their own, more efficient version. The user group quickly amassed hundreds of members — far outnumbering Lego’s original team of programmers. At first the company was unsure how to respond, but eventually it decided to embrace the contributions of its customers, opening up its products for further customisation and including their ideas in subsequent versions of Mindstorms. The number of potential innovators outside the company, its managers realised, was far greater than the number within the company.

There are many other cases. Haier, China’s leading manufacturer of household appliances, found



that some of its customers were using its washing machines to clean vegetables as well as clothes, so it made new models with wider outlet pipes to prevent them from getting clogged up with bits of peel. Boeing and Airbus design new airliners after holding detailed discussions with their main customers, and also work closely with their own suppliers of machine tools on the design of new production gear. Manufacturers of sports equipment, from mountain bikes to snowboards, have learned to pay attention

“The number of potential innovators outside Lego was far greater than the number within...”

to the ways in which advanced users customise their products. One survey found that 38% of members of specialised “extreme” sports clubs had developed or modified their own equipment, for example. These “lead users” can provide valuable ideas — what Dr von Hippel calls a “product feedstock” — for future models.

Manufacturers and users each have access to different information, which prompts them to innovate in different ways. In the case of scientific instruments, for example, users tend to modify them in order to get them to do entirely new things, whereas manufacturers’ innovations tend to be about making existing products easier to use, more convenient, or more reliable. In general, Dr von Hippel points out, manufacturers tend to look for problems that can be solved using whatever technologies they have to hand (a new material, an improved process, and so on), whereas users tend to look for new solutions to problems they really need to solve. That makes user-driven innovations more valuable and, studies suggest, more profitable as well when harnessed by manufacturers. And even when they are not directly involved in the development of a new product, users can play a valuable role in improving and deploying it, and their willingness to get involved is, once again, a recognition of the product’s appeal and value. The involvement of users in various ways now underpins

innovation in a number of fields, as this year’s Technology Pioneers demonstrate.

Look it up on Wikipedia

Perhaps the single best example is the Wikimedia Foundation, the organisation behind Wikipedia, the open-source, user-generated encyclopedia, and several other related projects. The basic idea of Wikipedia is that of an encyclopedia in which every page is a wiki — a web page with an “edit

this page” button. This allows any reader to add to, correct and interlink the encyclopedia’s entries. (“Wiki” is a Hawaiian word

that means “fast”, since the wiki-based approach to creating and editing web pages is much faster than using traditional authoring software.) Launched in January 2001, Wikipedia had 20,000 entries in English by the end of that year, 100,000 a year later, and then grew rapidly, amassing over 2m entries by October 2007 and making it the largest encyclopedia ever compiled.

Wikipedia is arguably the most impressive item of “user-generated content” on the internet, not only because of its size, but also because of its accuracy. Studies have shown that although its entries vary in quality and contain errors, the frequency of errors is comparable to that of traditional encyclopedias. When an expert in a particular subject spots a mistake in a Wikipedia entry, it is, after all, a simple matter to correct it. Inevitably, some entries (such as those on Islam and George W Bush) have become the focus of controversy and conflict, so that it has become necessary to restrict the editing of some entries to prevent vandalism. But rather than being an indication of the weakness of Wikipedia’s approach, this could be seen as a measure of its success and influence. Look up almost anything using a search engine, and the corresponding Wikipedia entry will usually be at or near the top of the list of results.

The wiki-based approach has inspired a host of

other related projects in which the users directly participate in the creation and development of intellectual property. The basic idea is “many hands make light work”; useful things can be done by sharing out tasks among a large community of internet users and aggregating the results. This has also been called “wikinomics” and “crowdsourcing” and has much in common with the Web 2.0 movement, which involves harnessing the contributions of users, both in creating content and helping others to navigate it. One popular way to do this is to allow users of a website to apply keywords or “tags” to items of content such as video clips (YouTube), blog postings and news items (Digg, Reddit) or photographs (Flickr). This provides a flexible, bottom-up way of arranging and navigating through large amounts of information.

Polar Rose, a start-up based in Malmo, Sweden, is applying the crowdsourcing approach to photographs with a particular aim: to create a visual index of images of people on the internet. Whenever its users, called “explorers”, see photographs of people on the internet, they have the option of adding a tag giving the name of the person shown. As more and more images are tagged, two things

“The internet is central to many examples of user-centric innovation...”

become possible: users can use the Polar Rose browser plug-in to ask “who is this” (a small rose icon is added to tagged photos) and can search for images containing a particular person. As with Wikipedia, the users of the service also help to build it.

FON is a Spanish start-up with a novel approach to building a free wireless network: get the network’s users to do it, granting them free access in return for sharing their own Wi-Fi access. Members of the FON community, who are known as “Foneros”, install a Wi-Fi base station called “La Fonera”. This functions like an ordinary Wi-Fi base station, providing wireless access to a broadband internet connection within

a small radius, but it provides authorised access to other Foneros as well as its owner. The owner, in turn, gets free coverage when in range of another Fonero’s base station. BT, the UK’s main telecoms operator, recently joined forces with FON and has invited its 3m broadband customers to become Foneros. It joins other major operators such as Time Warner Cable, Neuf Cegetel and BB Excite. Non-Foneros can use the FON network by paying a small fee, with a small commission going to the Fonero through whose base station this fee is collected. The result, says FON, is the largest Wi-Fi community in the world — built and operated by and for its own users.

This won’t hurt a bit

It is hardly surprising that the internet is central to many examples of user-centric innovation. But that does not mean that the same sort of approach does not apply in other fields. It is not just programmers who like to build their own tools; the same is true of doctors, and surgeons in particular. They often face problems that can be solved by inventing a new device or customising or improving upon an old one, and their direct practical experience gives them insights that a theoretical researcher at a medical-instrument manufacturer simply would not have.

One survey of surgeons carried out in Germany found that 22% had devised or modified an item of medical equipment for their own use, and that around one-half of these innovations ended up being adopted by medical-equipment makers. The first heart-lung machine, for example, was developed by John Gibbon, a Philadelphia surgeon, and his team in 1953, and was subsequently commercialised.

The CyberKnife, invented by John Adler of Stanford University and now commercialised by his company, Accuray, based in Sunnyvale, California, follows in the same tradition. During a fellowship in Sweden, Dr Adler was inspired when he saw a device called a Gamma Knife, developed by Lars Leksell, a Swedish surgeon. This used 3-D imaging to deliver finely targeted bursts of radiation to destroy otherwise inaccessible brain lesions, but required the patient

to be held perfectly still using a system of restraints screwed into the skull. Dr Adler set out to improve on this approach and devised the CyberKnife, which uses robotic technology to monitor and compensate for the patient's movement during treatment. In addition, the CyberKnife can be used to treat hard-to-reach lesions in other parts of the body, not just the brain. In keeping with the tradition of user-led innovation in medical technology, Accuray has set up an online forum to allow surgeons to share their experiences, offer advice to each other and, in the process, steer the development of subsequent versions of the product.

As well as developing new tools and techniques, surgeons are also well placed to develop new medical devices and implants. Joshua Ben-Nun, an experienced Israeli eye surgeon, has developed a new kind of lens implant for use in treating cataracts (the gradual yellowing and clouding of the lens that causes loss of vision). The usual treatment is to remove the lens and to replace it with an artificial implant. But such implants have no ability to focus, so that the patient ends up with excellent long-distance vision, but must use glasses for reading. One way around this problem is to use a multifocal lens implant, with concentric, alternating rings that focus on near and distant objects. But these lenses can cause problems with night vision. Dr Ben-Nun's company, NuLens, is one of several firms pursuing a new "accommodative" lens that can refocus just as a natural lens does, by changing its shape. His design is based on a flexible capsule of silicon gel that bulges in response to movement of existing eye muscles. It has been successfully tested in monkeys, and the first human trials are now under way.

The latest twist on user-centric innovation in bio-science comes from 23andMe, a start-up based in California's Silicon Valley. The company, which takes its name from the 23 pairs of chromosomes that make up an individual's genome, is a "personal genetics" outfit that provides detailed analysis of its customers' genomes from a saliva sample. By looking up the results on the company's website, customers

can then find out about their ancestry, their inherited traits, and whether they are at risk of developing particular diseases. Several other companies offer similar services, all of them based on genetic analysis using "gene chips", rather than the full sequencing of each customer's genome — something that is still prohibitively expensive. 23andMe's analysis, which looks at around 600,000 regions in the genome where the most important variations between individuals are found, costs US\$999; sequencing a full genome would cost US\$1m-2m, although this figure is expected to fall a thousand-fold within the next decade. What 23andMe adds, however, are social-networking features akin to those on Facebook or MySpace, allowing users to contact other people with whom they share ancestors or genetic risk factors. According to the company's founders, by pooling the genetic data from thousands of users while maintaining personal privacy, it will eventually become possible to perform new kinds of research and enable users to take part in scientific studies. And as medicine becomes increasingly "personalised", and new drugs emerge that only work well on a specific subset of the population, it will be possible for cancer patients, for example, to identify which treatment is best for them.

Plugging into the innovation grid

What of the field of energy? It is hard to imagine how users can drive innovation in such a capital-intensive industry, even working together. And yet they can. For instance, the Toyota Prius, an iconic petrol-electric hybrid car,

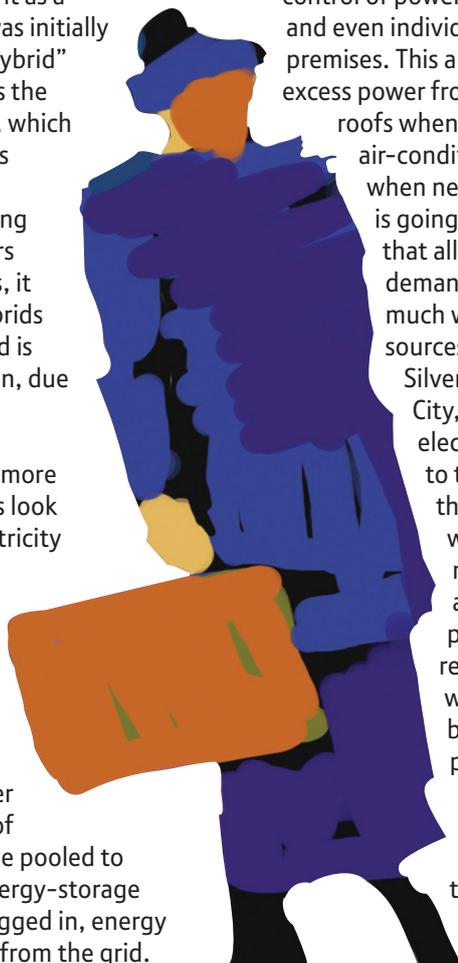


captures energy usually lost during braking and uses it to power the vehicle at low speeds, such as in stop-start traffic, and to provide occasional bursts of acceleration when needed, thus boosting the car's fuel economy. This is all very clever, but for some Prius drivers it is simply not green enough. So they have modified their vehicles by fitting them with extra batteries and new control software. This gives the modified Prius a range of 20 miles or so on all-electric power; the petrol engine only kicks in on longer journeys, or at highway speeds. (A standard Prius, in contrast, can travel less than a mile on battery power alone.) The modified version can be charged from the mains overnight, so that anyone with a short commute can use it as a pure electric vehicle. Toyota was initially sceptical about this "plug-in hybrid" approach. The company thinks the simplicity of the original Prius, which never has to be plugged in, has greater consumer appeal. But faced by the groundswell among its most enthusiastic customers as they modified their vehicles, it has conceded that plug-in hybrids might make sense after all, and is now developing its own version, due in 2010.

Consumers are also becoming more influential as utility companies look for new ways to generate electricity and manage demand. One increasingly popular approach is to allow homes and offices that generate their own electricity (from solar panels or wind turbines) to sell excess power back to the grid when needed. Another proposal is that the batteries of electric cars could, in effect, be pooled to provide utilities with a vast energy-storage system. When the cars are plugged in, energy is dumped into their batteries from the grid.

If more power is suddenly needed, it can then be borrowed back again, flowing out of the batteries and back onto the grid. Once there are significant numbers of electric (or plug-in hybrid-electric) cars in circulation, a useful proportion of them will be plugged in at any one time. Rather than simply being users of electricity, in short, consumers could soon be involved in generating and storing it, in partnership with utilities.

All of this will require new "smart grid" technologies such as those developed by GridPoint, a start-up based in Washington, DC. It has devised an internet-based control system that gives utilities centralised control of power sources, energy-storage capacity and even individual appliances on customers' premises. This allows a power company to draw on excess power from solar panels on its customers' roofs when needed, for example, or turn down air-conditioning units to reduce demand when necessary. Customers can see what is going on via a website. Smarter grids that allow utilities to balance supply and demand more easily will pave the way for much wider adoption of alternative-energy sources by their customers. Similarly, SilverSpring Networks, based in Redwood City, California, has developed smart electricity meters that enable customers to take an active role in managing their energy consumption. A two-way network connection with the meter, based on internet standards, allows utilities to implement dynamic pricing and enables consumers to regulate demand accordingly. A washing machine, for example, could be set to come on when the electricity price falls below a certain level. As standards for smart grids start to emerge, they could underpin a bottom-up revolution in energy technology, just as the rise of internet standards has unleashed so much innovation in computing.



Following the user, the user, the user

How can companies best exploit user-centric innovation? Dr von Hippel suggests three possible responses. The first, and simplest, is to adopt user-developed innovations and produce them commercially, in some cases in co-operation with the users responsible for the innovations. If advanced users of a particular product are modifying it in a

“Attempting to discourage lead users from innovating can be counter-productive...”

particular way, it makes sense for the manufacturer to adopt their suggestions and offer the modified product to a wider customer base, as they are likely to have similar needs. Companies can gain competitive advantage by doing this more efficiently than their rivals, perhaps by forming close links with their lead users; attempting to discourage lead users from modifying products (in other words, innovating) can be counter-productive. A variation of this approach is to offer custom-manufacturing services to advanced users, which can be beneficial to both parties. Users can take advantage of high-quality manufacturing techniques, and manufacturers can learn and benefit from the designs cooked up by their customers. Threadless, for example, is an online T-shirt firm that invites internet users to upload T-shirt designs, vote for their favourites and order them to wear. Each week’s winning design wins a cash prize and prompts thousands of sales. The suggestion by the company’s founders that this approach could work in the car industry seems far-fetched, given the long lead-times involved, but it could probably work for surfboards or customised mobile phones.

The second approach companies can take is to make life easier for would-be user innovators, by offering design tools or other platforms for their use. Many computer games, for example, now ship with special level-design software that enables gamers to design new levels and accessories for the game, which are often distributed on the internet. Traditionally, game

developers kept such tools to themselves. But they have now realised the value of enabling users to modify and extend their products. In some cases, these user-generated add-ons are adopted by the original manufacturer and become products in their own right. A good example is “Counter-Strike”, a counter-terrorism combat simulator, which was created by enthusiasts who modified an existing game called “Half Life”. Such was the popularity of “Counter-Strike” that it was eventually released as a separate title. This broadened access to the game, since there

was no longer any need to apply software patches to “Half Life”, a fiddly process that put some people off. Providing tools for users is, in some ways, the opposite of what companies are used to doing. Rather than trying to anticipate the needs of their customers, they are in effect giving up and simply letting the users do what they like. But this can be a rich source of new ideas.

Third, companies can acknowledge user innovations by selling complementary products or services. Many computer-makers, for example, sell machines that are designed to run Linux, an open-source operating system developed and maintained by its users. They do not profit from the software, but from the demand it creates for hardware. Similarly, many software companies have developed commercial products, such as database programs, that run on top of Linux. And a host of firms have sprung up to provide consulting and support services for Linux and other open-source products. They are thus capitalising, albeit indirectly, on user-driven innovation. Some software companies operate “hybrid” open-source models in which they make part, but not all, of their products freely available. Apple does this with its Mac OS X operating system, for example, the basic underpinnings of which are available as an open-source project called Darwin. This allows the company to benefit from improvements to Darwin made by volunteers, while retaining the ability to charge for the full version of its operating system, in which Darwin is overlaid with

an advanced graphical interface. Apple also includes many popular pieces of open-source software with its Macintosh computers. It thus benefits from the innovation that goes into those products, while helping to encourage their adoption.

Although some aspects of it have been around for years, it is still early days for the user-centric innovation model, and surprising examples of it continue to emerge. And while it is true that much of the action is currently in software, the same principles and ideas are increasingly being applied in other fields in unexpected ways. It might seem hard to imagine how user-driven innovation could be applied in the pharmaceuticals industry, given the huge costs and regulatory hurdles associated with developing new drugs. How can you possibly trust users to do it? But even here there are innovative approaches emerging from the undergrowth: one is a new online game, akin to a three-dimensional version of Tetris, in which players race to fit molecules together. As players compete, they are actually working their way through a library of drug candidates, looking for possible docking sites with

proteins associated with particular diseases. As one researcher in the field points out, people around the world play billions of hours of Solitaire on their computers each year; building the Panama Canal, by comparison, took just 20m man-hours.

Searching for new drugs by getting volunteers to play a computer game? It sounds daft. But the idea of an encyclopedia written by its own readers, and becoming the largest and most comprehensive work of its kind, would have seemed outlandish a decade ago. Of course, user-centric innovation is not for everyone, and works better in some fields than others. That is the nature of innovation: as with Sudoku, the popular Japanese number-placing puzzle, there is no single winning strategy that works, and success depends on combining a number of strategies. User-centric innovation is just one more tool in the innovation toolbox. But even for companies that cannot find a way to embrace this new approach, it provides a valuable lesson: that good ideas can, and increasingly do, come from unexpected or unconventional sources.



“The idea of an encyclopedia, written by readers, becoming the largest and most comprehensive work of its kind, would have seemed outlandish a decade...”

Technology Pioneers 2008

Thirty-nine companies have been chosen as Technology Pioneers in 2008. 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 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.

Contents

BIOTECHNOLOGY/HEALTH

23andMe	12
Accuray	12
Anecova	13
InSightec	13
mondoBIOTECH	14
Neurosynaptic	14
NuLens	15
Oxitec	15
RainDance Technologies	16
Resverlogix	16
Rincon Pharmaceuticals	17
SiGNa Chemistry	17

ENERGY/ENVIRONMENTAL TECHNOLOGY

Cima NanoTech	18
FluXXion	18
GridPoint	19
Hycrete, Inc.	19
LS9, Inc.	20
Nanostellar	20
PrimaFuel	21
Silver Spring Networks	21
SkySails	22
Unidym, Inc.	22

INFORMATION TECHNOLOGY

AdMob	23
Arteris	23
Clearwire Corporation	24
Garlik	24
Imaginatik	25
Innovative Silicon	25
Kayak	26
Lumio	26
Medio	27
Meraki	27
Polar Rose	28
QlikTech	28
Roundbox, Inc.	29
SpeedBit	29
Transclick	30
Wikimedia Foundation	30
Yandex	31

23andMe

Linda Avey and Anne Wojcicki, co-founders

LOCATION California, USA

NUMBER OF EMPLOYEES 33

YEAR FOUNDED 2006

ORIGINS Entrepreneurial start-up

Advances in genetic analysis tools, which leverage data gleaned from the human genome project, are starting to shed light on how DNA influences the development and function of individuals.

23andMe aims to develop new ways to help people make sense of their own genetic information, by connecting customers with the 23 paired volumes of their own genetic blueprint (plus their mitochondrial DNA), bringing personal insight into ancestry, genealogy and inherited traits. The company builds on recent advances in DNA analysis technologies to enable broad, secure and private access to trustworthy and accurate individual genetic information. Combined with educational and scientific resources with which to interpret and understand it, people's genomes have now become personal in a whole new way. The second phase of 23andMe will enable individuals—armed with their genetic information—to network with others and tag their particular research interests.

The founders of 23andMe are Linda Avey, a biotechnology executive, whose recent career focus has been on the acceleration of personalised medicine, and Anne Wojcicki, who left the investment world with the hope that she could have a positive impact on medicine and biotechnology.

Why the company is a pioneer

Since the sequencing of the human genome, the concept of personalised medicine has often been discussed, but rarely has its promise been rendered tangible. The founders of 23andMe have been able to envisage a way to generate valuable, personalised profiles based on the core of an individual's DNA.

23andMe
2606 Bayshore Parkway
Mountain View, CA 94043
USA

Telephone: +1 650 938 6300
Facsimile: +1 650 938 6305
www.23andme.com

Accuray

Euan S Thomson, CEO

LOCATION Sunnyvale, USA

NUMBER OF EMPLOYEES 450

YEAR FOUNDED 1990

ORIGINS Entrepreneurial start-up

Accuray's roots go back to 1987, when John Adler, now a professor of neurosurgery and radiation oncology at Stanford University Medical Center, developed the CyberKnife Robotic Radiosurgery System after completing a fellowship in Sweden with Dr Lars Leksell, the founder of radiosurgery. With the CyberKnife System, Mr Adler's vision was to develop a non-invasive robotic radiosurgery system with superior accuracy for treatment of tumours anywhere in the body. The revolutionary concept reached far beyond the practice of radiosurgery at the time, which was restricted to the treatment of intracranial tumours.

In 1999 the CyberKnife System was approved for the treatment of head, neck and upper spine tumours, becoming the first radiosurgery system to combine image guidance and computer-controlled robotics, and was subsequently approved for treating other tumours including in the lungs, liver, pancreas and prostate. Since then, Accuray has continued to develop its technology, launching tumour detection and tracking systems. In November 2007, Accuray notched up a new milestone when the CyberKnife System was used to treat its 40,000th patient. Significantly, 4,000 of those were being treated for lung cancer, a rapidly growing target for Accuray.

Why the company is a pioneer

As Euan Thomson, the company's CEO, has explained, the paradigm of cancer care today is shifting towards treatment alternatives that exhibit fewer risks, fewer side-effects and decreased recovery times. Accuray's tried and tested radiosurgery technology is now recognised as being at the forefront of non-invasive cancer treatments, meaning that more patients can expect a better quality of life.

Accuray
1310 Chesapeake Terrace
Sunnyvale, CA 94089
USA

Telephone: +1 408 716 4600
Facsimile: +1 408 716 4601
www accuray.com

Anecova

Martin Velasco, Founder, Chairman and CEO

LOCATION Lausanne, Switzerland

NUMBER OF EMPLOYEES 10

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

Sterility now affects one couple in every 10, globally. In vitro technology has done much to offer hope to many couples who otherwise could not have children, but Anecova has now gone a step further.

The company began with the vision of Dr Pascal Mock, a researcher in human embryo implantation at the Clinique des Grangettes in Geneva, and Martin Velasco, entrepreneur and business angel. Dr Mock came up with the idea of replacing the test tube used for in vitro fertilisation with a permeable capsule, inserted in the mother's uterus, so that gametes (spermatozoa, ova) and/or embryos would develop under more natural conditions. In vivo fertilisation was born, so to speak.

The Anecova device is a vessel, 10 millimetres long and less than a millimetre in diameter, pierced with hundreds of tiny apertures to facilitate communication between the embryo and its natural environment. The result, Anecova expects, will be the development of better quality embryos. The advantage of the Anecova vessel is that an embryo can develop in close communication with its mother's environment from the very start of its life. Importantly, it is also satisfying for the mother.

Why the company is a pioneer

If its clinical successes continue, Anecova will be at the forefront of assisted reproduction technology – not just technically, but also in the important step of cementing the physical bonds of a child with its parent at the earliest stage of life, no matter the circumstances of its birth.

Anecova
6, Cours des Bastions
CH - 1205 Geneva

Telephone: +41 22 310 9542
Facsimile: 41 22/310 9642
www.anecova.com

InSightec

Dr Kobi Vortman, president and CEO

LOCATION Haifa, Israel

NUMBER OF EMPLOYEES 150

YEAR FOUNDED 1999

ORIGINS Spin-off from GE Healthcare

A patient is at the clinic, undergoing a magnetic resonance imaging (MRI) scan, which diagnoses a tumour. In just ten minutes, the diagnostic suite has become an operating theatre. Instead of surgery, however, the patient remains inside the MRI—and a short time later the patient's tumour is gone. This is the basis of the ExAblate 2000 technology developed by InSightec, which integrates MRI with focused ultrasound energy as a new treatment paradigm aimed at replacing invasive surgical procedures and providing a therapeutic alternative for some very serious diseases.

In the procedure, the MRI provides the physician with 3D images of the target and surrounding tissue. High-intensity, focused ultrasound waves are precisely directed into the body at the target raising the temperature of the targeted tissue to up to 85° Celsius and destroying it. Meanwhile, the thermal imaging capabilities of the MRI scanner provide real-time feedback on all aspects of the procedure, giving greater control over therapeutic outcomes.

ExAblate was first approved for use in 2004 to treat symptomatic uterine fibroids, and has since been used to treat more than 3,500 women. InSightec has also begun clinical trials to study its use in other indications including breast, bone, liver and brain tumours. It has also been approved in Europe as a treatment for pain palliation caused by bone metastases.

Why the company is a pioneer

Healthcare providers are seeking ways to provide localised targeted therapy, while sparing healthy tissue and without necessitating long, expensive stays in hospital. InSightec's ExAblate does just that, building on existing technology to create a new and precise treatment method with broad applications in serious medical conditions.

InSightec
5 Nahum Heth St.
39120 Tirat Carmel
Israel

Telephone: +972 4 813 1313
Facsimile: +972 4 813 1322
www.insightec.com

mondoBIOTECH

Fabio Cavalli, co-founder, CEO
and chief business architect

LOCATION Basel, Switzerland

NUMBER OF EMPLOYEES 35

YEAR FOUNDED 2001

ORIGINS Entrepreneurial start-up

Swiss-based mondoBIOTECH, founded just after the human genome was deciphered, has set its sights on finding treatments for so-called orphan diseases, and delivering its pipeline to larger biotechs and drug companies to be commercialised.

mondoBIOTECH uses its technologies—human peptide platforms—to seek out novel biopharmaceutical products. Among its targets are lesser known diseases, but which are nonetheless debilitating, such as idiopathic pulmonary fibrosis and pulmonary arterial hypertension. mondoBIOTECH has received 5 Orphan Medical Product Designations for the drug Aviptadil, in Europe and in the US. The last one was granted in October 2007 for Aviptadil in sarcoidosis, currently in mid-stage clinical trials—a rare lung disease in which patients are left with permanent lung damage. The disease affects as many as 80,000 people in Europe alone.

Clinical trials of such drugs are expensive, so mondoBIOTECH is sailing an intelligent course to make sure they reach patients—licensing its intellectual property and collaborating with bigger companies. On Aviptadil, for example, the company has partnered with a US firm, Biogen Idec, to commercialise the drug for the treatment of pulmonary arterial hypertension.

Why the company is a pioneer

Developments in technology have brought better medicines within the grasp of many patients. However, drug development remains expensive, so most large drug companies play it safe and concentrate on widespread diseases. Companies such as mondoBIOTECH play an increasingly important role in making sure that sufferers of lesser-known diseases eventually find relief from their conditions.

mondoBIOTECH
Hardstrasse 52
4052 Basel
Switzerland

Telephone: +41 84 020 0027
Facsimile: +41 84 020 0028
www.mondobiotech.com

Neurosynaptic Comms

Sameer Sawarkar, CEO

LOCATION Bangalore, India

NUMBER OF EMPLOYEES 26

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

Medical technology can be a wonderful enabler, provided that it is widely accessible. Advanced medical diagnostics and treatment are becoming commonplace in much of the developed world. Yet many people worldwide continue to suffer, simply because they are unable to take advantage of even simple and standard medical facilities and diagnostics.

Neurosynaptic Communications has set out to address this imbalance with a big vision: healthcare for all. Its mission is equally ambitious—to improve remote healthcare through technology. The company maintains that technology is key to breaking the distance barrier and achieving affordable, scalable and trustworthy healthcare delivery systems.

The company, in collaboration with the Indian Institute of Technology at Madras, has developed a wide range of medical diagnostic equipment for clinics, hospitals and rural healthcare centres, under the umbrella of its ReMeDi medical data acquisition system. The system gathers medical information and backs it up with a complete telemedicine solution, even providing the possibility of video and audio conferencing. ReMeDi is one part of the platform of technologies being implemented by the Indian Institute of Technology's Tenet group, in which local entrepreneurs in villages act as brokers of the technology, offering services such as telemedicine and broadband internet.

Why the company is a pioneer

While "unmet needs" in medicine typically refers to untreated diseases, Neurosynaptic has recognised that access to reliable, innovative technology is often also an unmet need in many communities. With a big vision behind it, the company is working to redress that balance from the ground up.

Neurosynaptic Communications
#6, 29th Main, BTM Layout, II
Stage, Bangalore - 560 076
Karnataka, India

Telephone: +91 80 6531 6520
Facsimile: +91 80 4111 0520
www.neurosynaptic.com

NuLens

Ori Gal, CEO

LOCATION Herzeliya, Israel

NUMBER OF EMPLOYEES 17

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

By the age of 40 most people will have experienced some degree of presbyopia—a vision disorder that involves the eye's inability to focus on near activities, like reading a newspaper. By the age of 65 many will also have had an operation for cataracts—the most common surgical procedure performed worldwide.

Today's cataract surgery procedures consist of inserting intraocular lenses (IOLs). Standard IOLs are monofocal, while the more advanced are multifocal or pseudo-accommodating with up to two diopters of accommodation. However, NuLens is developing a novel technology, real accommodating IOLs, which are designed to be inserted during cataract surgery and provide more than 10 diopters of accommodative power. Such a dynamic range means that patients could potentially leave cataract surgery with better vision than they had when they were 20 years old.

The technology is still in clinical trials, but initial research has given NuLens plenty of confidence. Its management has the right pedigree for success too. Its chairman, Glenn Sblendorio, recently led a US\$1bn deal between Eyetechnology, a biotech company, and Pfizer, a pharmaceutical firm, over Eyetechnology's lead product, Macugen, and Gerald ('Jerry') Ostrov, a board member, was head of J&J Visioncare in 2005.

Why the company is a pioneer

With the continued ageing of the population and an estimated 1bn people aged over 60 by the year 2020, the presbyopia and cataract markets will be among the largest in healthcare. NuLens's technology is poised to capture that market, while also leaving many people with a better vision of their future.

NuLens
Maskit 15
46121 Herzeliya Pituach
Israel

Telephone: +972 (9) 954 9495
Facsimile: +972 (9) 954 8060
www.nu-lens.com

Oxitec

Luke Alphey, founder and chief scientist

LOCATION Oxford, UK

NUMBER OF EMPLOYEES 25

YEAR FOUNDED 2005

ORIGINS Spin-out from Oxford University

Insects ravage crops and carry diseases of humans and livestock. Billions of dollars are spent each year on insecticides, but there is a growing demand for more environmentally friendly techniques. One of the best pest control methods is the sterile insect technique (SIT), which has been in use since the 1950s. The technique is safe and has a low environmental impact—it is very specific for the target pest and reduces or eliminates the need for insecticides. However, its wider use is currently restricted by several issues, including the need to irradiate the insects to sterilise them (some insects such as mosquitoes cannot tolerate irradiation).

Enter Oxitec, which is developing new technology to make SIT more affordable, safer and applicable to a wider range of pests. Oxitec's platform, RIDL, employs genetics and molecular biology to improve significantly the cost effectiveness and safety of SIT, and to extend it to a broader range of insect pests, notably flies, mosquitoes and moths.

Oxitec's RIDL insects are bred to be sterile, but can live and reproduce normally if fed a special diet. They can therefore be reared in a factory and released to mate with wild pest insects without the need for an additional sterilising step. RIDL insects will also be more vigorous and competitive for mates than irradiated ones, so fewer RIDL insects will be required for effective control, thus reducing costs.

Why the company is a pioneer

One of the hardest pests to control is the mosquito—as seen by the increase in mosquito-borne diseases such as dengue fever and malaria in the developing and developed world. Oxitec's technology could provide a safe and failsafe solution. The company was recently awarded part of a US\$20m grant by the Bill and Melinda Gates Foundation Grand Challenges for Global Health Initiative.

Oxitec
71 Milton Park
Abingdon Oxford
OX14 4RX UK

Telephone: +44 1235 832 393
Facsimile: +44 1235 861 138
www.oxitec.com

RainDance Technologies

Jonathan Rothberg, founder

LOCATION Guilford, USA

NUMBER OF EMPLOYEES 35

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

RainDance Technologies has developed the Professional Laboratory System (PLS), a laboratory benchtop system that automates data-rich assay and screening protocols for academic laboratories and corporate research centres across several disciplines. RainDance pioneered the use of micron-sized droplets to encapsulate chemical and biological samples on a microfluidic chip, making each droplet the equivalent of a well in a microtitre plate. Dozens of current generic and specialised genomic, drug discovery, diagnostic and industrial applications can be ported over to the PLS, which is then configured using inexpensive chips to replace a range of fluid-handling and analytical chemistry instruments, including microarrays, thermal cyclers, robotic screening platforms and flow cytometers.

The company's founders' own achievements span the sciences, from physics to biochemistry. They include Dr Jonathan Rothberg, a serial entrepreneur who has also founded similarly innovative companies such as 454 Life Sciences and CuraGen. But RainDance's platform has applications beyond life science research processes such as identification of cancer markers and drug discovery. It is also broad enough to take in enzyme evolution for industrial production, including biofuels.

Why the company is a pioneer

As laboratory research becomes increasingly complex, researchers depend increasingly on innovative technologies such as the RainDance PLS to help speed up and streamline the process—and save costs. The technology platform can process samples at 10,000 droplets per second, helping to deliver faster, cheaper and more accurate analysis than a host of common life science tools.

RainDance Technologies
530 Old Whitfield Street
Guilford, CT 06437
USA

Telephone: +1 203 458 2947
Facsimile: +1 203 458 2514
www.raindancetechnologies.com

Resverlogix

Donald J McCaffrey, president, CEO and co-founder

LOCATION Calgary, Canada

NUMBER OF EMPLOYEES 34

YEAR FOUNDED 2001

ORIGINS Entrepreneurial start-up

Revolutions don't always have to be tumultuous—sometimes they happen quietly. This is especially true in medicine, where new ways of looking at diseases can create more effective treatments for even the best-known diseases. Resverlogix was born when an entrepreneur, Donald McCaffrey, met a clinician, Norman Wong, at a conference. The two discussed the paradigm shift in the treatment of atherosclerosis (a disease affecting arterial blood vessels) from the reduction of LDL cholesterol to raising HDL cholesterol, and realised they had a common goal of developing better therapies for the treatment of cardiovascular diseases.

The result, several years later, is a product-driven, publicly traded drug development company with multiple programmes focused on several disease targets. Leading the charge is its NexVas technology, whose basis is a platform for the development of drugs by increasing the production of ApoA-I (the primary component of HDL cholesterol) to treat atherosclerosis, the underlying cause of cardiovascular diseases. This approach also holds promise for Alzheimer's disease—recent clinical trial data from Alzheimer's patients, coupled with findings from animal studies, indicate that raising ApoA-I/HDL levels could be beneficial in the treatment

Why the company is a pioneer

Backing up Resverlogix's research programme is the knowledge that working with larger partners is crucial if its products are to get to market. In the company's armoury is ReVas, a research-stage technology for the development of therapeutics, which can be used with medical devices for the treatment of cardiovascular diseases. Validating that technology is a partnership with Medtronic, a leading developer of drug-eluting stents.

Resverlogix
279 Midpark Way SE Suite 202
Calgary, AB T2X 1M2
Canada

Telephone: +1 403 254 9252
Facsimile: +1 403 256 8495
www.resverlogix.com

Rincon Pharmaceuticals

Bruce D Steel, CEO

LOCATION San Diego, USA

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2003

ORIGINS Spin-out from
The Scripps Research Institute

Protein therapeutics is one of the fastest-growing classes of molecules in drug development—more than 250 are currently in clinical trials. However, the time constraints, capital requirements and production costs involved in developing and producing protein therapeutics have created a massive barrier to entry in protein drug development.

Rincon Pharmaceuticals aims to address the shortcomings inherent in current recombinant protein production technologies, which include the difficulty involved in making complex proteins, as well as slow development speed, poor manufacturing scalability and high production costs. To do that, it has developed a platform technology, AlgRx, based on the novel use of eukaryotic microalgae as a production system for recombinant proteins. Microalgae provide several advantages as a protein production host cell—they are easy to modify genetically, grow easily and rapidly (doubling in cell number every eight hours), can be cultivated at very large scale, are not known to contain human viruses or pathogens, and have the ability to make complex proteins that may not be made in other systems.

The company's strategy is to partner its AlgRx platform with other biotech companies' pipelines and leverage its capabilities to develop a proprietary product pipeline. Rincon is currently evaluating several proteins produced in the AlgRx system as possible product candidates.

Why the company is a pioneer

Manufacturing capability is a key strategic asset in protein therapeutic development and is a major barrier to entry for the world's top biopharmaceutical companies. Rincon's AlgRx technology should help to reduce this barrier, while also developing unique and enhanced drug properties.

Rincon Pharmaceuticals
3030 Bunker Hill Street
Suite 318
San Diego, CA 92109 USA

Telephone: +1 858 736 3131
Facsimile: +1 858 736 3101
www.rinconpharma.com

SiGNa Chemistry

Michael Lefenfeld, founder, president and CEO

LOCATION New York, USA

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Across a range of industries—from pharmaceuticals and petroleum to environmental remediation—getting the chemistry right can be one of the trickiest components of scaling a project up to industrial capacity. Alkali metals, for example, have limited use in large-scale chemical synthesis because of their volatility when exposed to air or moisture, and practical alternatives have proven difficult to develop.

SiGNa Chemistry has developed and patented a method for making alkali metals and their derivatives a more practical part of industry's clean chemistry toolkit, by encapsulating them in nano-structured porous oxides and removing their hazards. SiGNa's alkali metal-porous oxide (M-SG) products are free-flowing powders that retain their parent alkali metal's usefulness, being able to perform fast reductions at room temperature and to remove impurities. But importantly, they also have stability among their attributes—they do not ignite or oxidise in air, which means that they are safer and cheaper to use and ship.

Why the company is a pioneer

SiGNa Chemistry is an early-stage company, but the materials and processes it has developed to stabilise reactive metals are already winning customers. In pharmaceuticals and industrial chemistry, SiGNa's materials have replaced hazardous processes with sustainable chemical pathways. They are also being used for the safe removal of polluting sulphur from petroleum, and constitute one of the most effective means for processing water into pure hydrogen fuel. SiGNa materials are also used as a benign mechanism for removing hazardous oil contamination, chemical warfare agents, PCBs and freons from the environment.

SiGNa Chemistry
Corporate Offices
530 East 76th Street Suite 9E
New York City, NY 10021 USA

Telephone: +1 212 933 4101
Facsimile: +1 212 208 2605
www.signachem.com

Cima NanoTech

Jon Brodd, CEO

LOCATION St Paul, USA

NUMBER OF EMPLOYEES 32

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

Cima NanoTech is an advanced materials company specialising in nanomaterials for the electronics industries. The company's commercial-scale nanomaterial production and advanced formulation capability have allowed the development of new technologies, such as conductive inks for use in inkjet printing of electronics and other applications and self-assembling transparent conductive coatings for flat panel displays, solar cells and other printed electronics applications.

Cima NanoTech has spearheaded the development of nanotechnology by co-founding the Nano Functional Materials Consortium, a collaboration of academia and industry designed to develop and commercialise nanotechnology. Applications of Cima's proprietary technology are being used by specialist firms in Japan, South Korea and the US.

The company is also currently researching and developing nanoscale semiconductor materials for use in radio frequency identity (RFID) tags and other printed electronics.

Why the company is a pioneer

Cima NanoTech's core group of researchers has developed patented methods for consistently manufacturing a wide range of nanometal and nanometal alloy particles that form the technology platform for its electronics-focused product development. The company's nanometal dispersions is the enabling technology for next-generation digital inkjet printing of microcircuits and transparent conductive coatings for electronics.

Cima NanoTech
1000 Westgate Drive
Suite 100
St Paul, MN 55114 USA

Telephone: +1 651 646 6266
Facsimile: +1 651 646 4161
www.cimananotech.com

FluXXion

Thijs Bril, CEO

LOCATION Eindhoven, Netherlands

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

FluXXion, a technology company, is the supplier of a new membrane technology for the bulk liquid and analytical filtering markets. The development and production of silicon wafer membranes is carried out in close co-operation with Royal Philips Electronics, with FluXXion applying the advanced capabilities in microsystem and semiconductor technology available at Philips's high-tech campus in Eindhoven. The technology is then applied to the product design and manufacture of micro filtration membrane products for the bulk and analytical liquid filtration markets.

FluXXion's filter units make use of a dynamic cross-flow pulsing technology, which provides a mechanical cleaning mechanism that keeps the holes in the filters open during filtration. The microfiltration system comprises a silicon disk, the same kind used for computer chips, from which an extremely thin membrane (less than a thousandth of a millimetre) is made. This makes it possible to build very compact filtration units, and also ensures high flow rates.

Why the company is a pioneer

FluXXion's key product is its bulk filtration unit, which enables low-cost filtration that is a hundred times faster than conventional processes, providing its customers with a far better yield. Compared with conventional membranes, the firm's membrane systems provide improvements in terms of filtration quality, cost of ownership, energy consumption, chemical inertness, fouling prevention, waste disposal and cleaning ability.

FluXXion
High Tech Campus 11
5656AE Eindhoven
The Netherlands

Telephone: +31 40 277 4069
Facsimile: +31 40 274 4199
www.fluXXion.com

GridPoint

Peter L Corsell, president and CEO

LOCATION Arlington, USA

NUMBER OF EMPLOYEES 75

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

With the world increasingly looking to harness as many different sources of energy as possible, the prospect of building new and costly power plants is starting to weigh up. GridPoint's SmartGrid Platform allows electric utility companies to tackle climate change where it can really count: at the point of energy consumption.

The technology is a modular, scalable and upgradable architecture that allows utilities to manage demand and supply using distributed conservation and generation technologies. The platform's load measurement and control capability allows utility firms to draw clean energy from new fuel sources, such as solar panels, fuel cells and plug-in hybrid electric technologies, which reside at the home or business. This helps utilities to move closer to their environmental goals, while securing supply. The platform also helps homeowners and businesses to save energy through better management—non-essential loads can be reduced and energy peaks ironed out to make energy purchasing cheaper and more predictable.

Why the company is a pioneer

GridPoint's intelligent network not only offers a new means of dealing with the energy crisis, but also allows utilities to improve their efficiency by providing better forecasting techniques and management of demand and supply.

GridPoint
2801 Clarendon Blvd.
Arlington, VA 22201
USA

Telephone: +1 202 903 2100
Facsimile: +1 202 903 2101
www.gridpoint.com

Hycrete, Inc.

David Rosenberg, president and CEO

LOCATION Carlstadt, USA

NUMBER OF EMPLOYEES 27

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Concrete is a wonderful building material, with one big drawback—it acts like a hard sponge and in many applications needs to be waterproofed. Traditional waterproofing relies on external membranes or coatings that must be applied with perfect workmanship in order to function correctly. In practice, this frequently fails and results in water ingress and corrosion of any steel reinforcement. Moreover, there is a large environmental impact, as many of these membranes are composed of toxic materials and are permanently bonded to the concrete, thus its recyclability.

Hycrete's technology provides a solution to this problem. The approach is based on a high-performance water-based material that, when mixed integrally with concrete, transforms concrete from an open network of capillaries to a waterproof and protective building material. This performance enhancement to the concrete eliminates the need for external membranes, coatings and sheeting treatments, which in turn accelerates construction timelines and uses less material, while being more economical and environmentally sound. Hycrete's admixture also binds to the steel reinforcement inside the concrete, which prevents corrosion and improves structural life.

Why the company is a pioneer

Hycrete's advanced material corrects the fundamental flaw of the most widely used building material in the world. Concrete is transformed from a hard sponge into a waterproof material. The company's technology produces a dry durable structure that accelerates construction schedules and is environmentally intelligent.

Hycrete, Inc.
462 Barell Avenue
Carlstadt, NJ 07072
USA

Telephone: +1 201 386 8110
Facsimile: +1 201 386 8155
www.hycrete.com

LS9, Inc.

Robert Walsh, president

LOCATION San Carlos, USA

NUMBER OF EMPLOYEES 27

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Economic growth in India, China and other developing markets is creating serious issues for the energy industry and the environment, especially when it comes to the predicted explosion of cars and other motorised transport. Silicon Valley-based LS9 is addressing this challenge by using synthetic biology to produce proprietary biofuels that resemble petroleum-derived fuel.

LS9's renewable biofuel will provide a cost-competitive and clean option that could enable these nations to grow and meet their population's need for personal transport while cutting back on emissions throughout the rest of the world. Combining industrial and synthetic biotechnology, LS9 has engineered natural biological "tools", as are used in the production of ethanol, to come up with an industrial-sized solution that it will launch in the next three to five years.

Why the company is a pioneer

LS9 is developing industrial-scale biofuels at a time when the world is seeking large-scale solutions to climate change. Its product could one day be a replacement for petrol (gasoline) or diesel, helping to provide a cost-effective solution that could remove some of the strain on already scarce natural resources while helping to curb carbon emissions.

LS9, Inc.
1300 Industrial Road, #16
San Carlos, California 94070
USA

Telephone: +1 650 596 8600
Facsimile: +1 650 596 6195
www.ls9.com

Nanostellar

Pankaj Dhingra, CEO

LOCATION Redwood City, California

NUMBER OF EMPLOYEES 33

YEAR FOUNDED 2003

ORIGINS Stanford University

Spurred by the environmental threat posed by pollution from transportation, governments in a number of developed nations have passed legislation that sets incrementally stricter emissions reductions. This makes the quest for more efficient methods of reducing diesel emissions not just desirable, but also a legal obligation. It is a big issue, but in providing a solution, Nanostellar has thought small—very small—as well as at a large-scale.

Its Rational Catalyst Design (RCD) methodology unites two disciplines—computational nanoscience and advanced synthetic chemistry—to speed the pace of development for nanoscaled catalytic materials for diesel emissions control. RCD allows Nanostellar to gain a fundamental understanding of the surface chemistry and properties of nanomaterials, enabling it to engineer new nanoscale alloys that reduce exhaust emissions and improve the performance of diesel emissions control catalysts by 25-30%.

The traditional method of catalyst design has been either by trial and error, which can be costly and carries no guarantee of success, or through combinatorial chemistry, which is expensive and can lead to false results. Nanostellar's technology uses fundamental knowledge of a catalyst's structure and reactivity, combined with state-of-the-art computational methods, to guide the creation of new products.

Why the company is a pioneer

Nanostellar's rational design approach is changing the face of nanomaterials design, in the same way that electronic design automation (EDA) changed electronic circuit design, by allowing complex circuits to be designed and tested computationally. Computer-based design for nanomaterials helps to slash costs and reduce time to market.

Nanostellar Inc.
3696 Haven Avenue
Redwood City, CA 94063
USA

Telephone: +1 650 368 1010
Facsimile: +1 650 368 1101
www.nanostellar.com

Primafuel

Brook Porter, co-founder and executive vice-president

LOCATION Long Beach, USA

NUMBER OF EMPLOYEES 40

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

The development of alternatives to petrol, sourced from biological materials, is a hot topic. Yet surprisingly few companies look close to being able to provide practical, commercial-scale biofuels that are also carbon-neutral and sustainable. Primafuel has concentrated on developing the infrastructure and technologies needed throughout the fuel supply chain, which could ultimately allow utilities and governments to move towards zero-carbon fuels.

Working with the world's largest oil companies and agriculture conglomerates, Primafuel looks at every point of biofuels production and supply, from securing the most practical locations to build refineries, to developing more efficient processing and conversion technologies, to constructing refineries that process multiple feedstocks, and finally to developing a large-scale, and sustainable, supply chain.

Biofuels are being touted as one of the world's solutions to fuelling transport options in the fight against climate change. But Primafuel's work goes beyond the green rhetoric, and takes in public health, natural resource management, food security and sustainable agriculture in an effort to help overcome some of the challenges involved in getting zero-carbon biofuels to the market.

Why the company is a pioneer

Although the biofuels industry is in its infancy, Primafuel has already been given a chance to demonstrate its worth. The California Air Resource Board has awarded Primafuel the largest-ever single California grant towards biodiesel production, which will help the company to build a US\$90m production facility in Sacramento.

Primafuel
2774 Dawson Ave
Signal Hill, CA 90755
USA

Telephone: +1 562 683 3470
Facsimile: +1 562 492 9568
www.primafuel.com

Silver Spring Networks

Scott Lang, president and CEO

LOCATION Redwood City, USA

NUMBER OF EMPLOYEES 100

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

Rather than waiting for the US government to mandate "smart" power grids, Silver Spring Networks has taken on the issue of rising energy demands and ageing infrastructure. The company's sole focus is on developing open, standards-based products that improve the efficiency and reliability of utility services through automation. It developed an IP-based smart grid using existing networking technologies to create a scalable product for the power industry. The technology helps to cut costs to residential consumers and businesses, while also opening up the market to new players, thus promoting competition and driving down costs.

Silver Spring Network's smart grid is built on standards-based technology, which means that it is open for others to build on—and also means lower development costs. It works by creating a real-time, two-way network that allows the consumer and the utility to manage power loads and limits. It also allows for the more efficient use of energy and enables the use of distributed generation and storage devices to minimise peaking stress on the grid.

Why the company is a pioneer

Silver Spring Networks has opened up a new market with its scalable technology that helps to control demand for energy, and which can be rolled out to thousands, or even millions, of customers worldwide.

Silver Spring Networks
575 Broadway
Redwood City, CA 94063
USA

Telephone: +1 650 298 4200
Facsimile: +1 650 363 5240
www.silverspringnetworks.com

SkySails

Stephan Wrage, CEO and chairman

LOCATION Hamburg, Germany

NUMBER OF EMPLOYEES 46

YEAR FOUNDED 2001

ORIGINS Germany

SkySails' wind propulsion system offers a creative approach to cutting carbon dioxide emissions, and saving fuel costs, for the rapidly growing industrial shipping industry. Right now, the shipping industry is totally dependent on oil, but SkySails' large towing kites could help individual ships to cut their fuel costs—and associated carbon emissions—by as much as 10-35% annually, depending on wind conditions.

The company's system works like a parachute—at decent wind speeds, it works to relieve pressure from the engine, either saving fuel costs at the same speed of travel or else propelling the ship faster to its destination. Under optimal wind conditions, fuel consumption can be temporarily reduced by as much as 50%, providing significant savings. The sail can be launched automatically in 10 to 20 minutes, with staff getting a real-time view of its operation via a ship monitor. And no extra crew are required to operate it.

Why the company is a pioneer

SkySails offers an innovative technology to shipping companies wanting to operate more efficiently, cutting their carbon dioxide emissions, as well as bringing down costs. The company plans to add to its offering with a weather routing system in 2008.

SkySails GmbH & Co. KG
Veritaskai 3
21079 Hamburg
Germany

Telephone: +49 40 7029 90
Facsimile: +49 40 7029 9333
www.skysails.com

Unidym, Inc.

Art Swift, president and CEO

LOCATION Menlo Park, USA

NUMBER OF EMPLOYEES 40

YEAR FOUNDED 2005

ORIGINS Subsidiary of Arrowhead
Research Corporation

Unidym is developing a new materials technology platform for advanced novel electronics and optoelectronics applications. The company develops and manufactures carbon nanotubes, a new class of material with extraordinary electrical, mechanical and thermal properties.

Its first carbon nanotube-based electronics product is a transparent, conductive film that replaces the films currently used in touch screens and displays made with indium tin oxide. These films, which mimic the properties of metals and silicon semiconductors, are solution-based and can be applied using fabrication processes that allow them to be "printed" onto practically any surface, including glass and polymers.

Unidym's patent portfolio covers a range of promising carbon nanotube applications: transparent electrodes, thin film transistors, fuel cells, solar cells and therapeutics. The company partners with and licenses its intellectual property (IP) to companies that are exploring other uses for carbon nanotubes. Carbon-based electronics are set to have a major effect on the industry, potentially providing wearable devices and solar cells that are sprayed on rooftops, energy-efficient large area solid state lighting devices, and electronic newspapers.

Why the company is a pioneer

Building directly on the work of the late Dr Richard Smalley, the Nobel Prize-winning pioneer of carbon nanotubes, and a distinguished professor, George Grüner, at UCLA, Unidym has created a major IP portfolio within the carbon nanotube industry, with over 150 foundational patents. It is well placed to benefit from a growing trend of replacing expensive materials and manufacturing processes with simpler, lower-cost production techniques similar to those found in the printing industry.

Unidym
Menlo Business Park
1430 O'Brien Drive
Menlo Park, CA 94025 USA

Telephone: +1 650 462 1935
Facsimile: +1 650 462 1939
www.unidym.com

AdMob

Omar Hamoui, founder and CEO

LOCATION San Mateo, USA

NUMBER OF EMPLOYEES 60

YEAR FOUNDED 2006

ORIGINS Entrepreneurial start-up

AdMob is a mobile advertising marketplace that brings together buyers and sellers of mobile ads. It offers both advertisers and publishers the ability to target and personalise advertising to their customers in over 160 countries. Publishers simply place some code into their mobile web pages and AdMob serves banner or text link advertising directly to visitors to the site. Adverts are priced on a pay-per-click or pay-per-thousand basis.

The company, which already serves some 1.6bn adverts a month, helps to bring advertisers of all sizes together with independent mobile content publishers. The mission is to help spur the growth of the open mobile web by providing new opportunities for advertisers and revenue for content publishers. When Coca-Cola ran an advertising campaign with AdMob, consumers viewed the adverts on thousands of mobile websites across 153 countries. AdMob offers granular targeting by factors such as country or mobile operator and even the type or capability of a particular handset. For example, it could run an ad that would only go on Vodafone, in the UK, on Nokia handsets that support polyphonic ringtones.

Why the company is a pioneer

AdMob helps both content publishers and advertisers to reach new mobile markets. For example, it has provided revenue for mobile websites of all sizes around the world, allowing publishers to earn revenue wherever their content is accessed.

AdMob
60 East 3rd Avenue
Suite 225
San Mateo 94402 USA

Telephone: +1 650 931 3940
Facsimile: +1 650 931 3979
www.admob.com

Arteris

K Charles Janac, chairman, president and CEO

LOCATION Paris, France and San Jose, USA

NUMBER OF EMPLOYEES 41

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Networking is an effective way of managing multi-level communications in distributed computer systems. But traditional approaches do not scale within increasingly complex networking environments. Arteris is a start-up founded in 2003 by a group of semiconductor industry veterans who wanted to tackle the challenge of adopting networking technology to on-chip communications in order to maintain improvements in semiconductor's technical and economic performance. Its management team brings experience from the communications, semiconductor, electronic design automation and intellectual property industries.

The company's focus is on the next generation of challenges associated with system-on-chip (SoC) design: on-chip communications, or network-on-chip (NoC). Arteris introduced a commercial implementation of a NoC in 2005, which helps to meet system performance requirements and facilitates rapid chip design.

Arteris's NoC transports and manages on-chip communications within complex circuits, increasing performance, while allowing for more complex designs. It comprises an intellectual property library, which in turn contains a set of configurable building blocks that manage all on-chip communications between intellectual property cores in SoC designs.

Why the company is a pioneer

In modern systems, which integrate many different functions into a single chip, the flexibility of a modular network is a significant advantage when building highly complex designs. Arteris's network on a chip technology has been designed to connect many of these SoCs, and avoid bottlenecks in the process.

Arteris
Parc Ariane, Immeuble no 6
Mercure, Boulevard des Chenes
78284 Guyancourt, France

Telephone: +33 1 61 37 38 40
Facsimile: +33 1 61 37 38 41
www.arteris.com

Clearwire Corporation

Benjamin G Wolff, CEO

LOCATION Kirkland, USA

NUMBER OF EMPLOYEES 1,900

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

Clearwire customers connect to the internet using licensed spectrum, rather than via a cable network or fixed phone line. The company's equipment transmits radio signals from a base station to a wireless modem the size of a paperback book or a laptop's PC card, which connects the user's computer to the internet. The modem simply plugs into an electrical outlet or other power source and into a computer via an ethernet cable, while the PC card requires no external power source other than the user's laptop. Connectivity is available anywhere within Clearwire's coverage area, so customers can connect to the internet from their home, office, local park or favourite cafe.

The company launched its first service in August 2004 and now offers services in more than 400 US cities, as well as in Ireland, Belgium and Spain. In addition, Clearwire has partnered with MVS Net and Danske Telecom to offer wireless high-speed internet services in Mexico and Denmark.

Why the company is a pioneer

Established by a telecom pioneer, Craig McCaw, Clearwire is a provider of simple, portable and reliable high-speed wireless internet services. Its customers can connect wirelessly to the internet from anywhere within the firm's coverage area, thus cutting out the need for traditional cable or fixed phone lines.

Clearwire Corporation
4400 Carillon Point
Kirkland, WA 98033
USA

Telephone: +1 425 216 7600
Facsimile: +1 425 216 7900
www.clearwire.com

Garlik

Tom Ilube, CEO

LOCATION Richmond, UK

NUMBER OF EMPLOYEES 15

YEAR FOUNDED 2005

ORIGINS Entrepreneurial start-up

Garlik was created to give consumers more control over the way their personal information is used in the digital world. Its debut service is DataPatrol Advanced, which searches more than 4bn web pages and public databases each week for personal data and connections. The service includes a monthly local area report, quarterly credit reports, a digital identity check and expert advice about protection from identity theft to help consumers manage their digital profile effectively. In addition, the system can analyse the content of web pages to build up a picture of a consumer's relationship to other people mentioned in the pages or databases.

Most recently, Garlik launched QDOS, a rating system measuring the digital presence of 45m Britons. The company believes that protecting digital identities from identity fraud is just part of the story, while people's digital status—the way they behave in the online world—increasingly influences the decisions made about them in the real world.

Why the company is a pioneer

In an era when people manage an increasingly large amount of personal information online, Garlik is raising awareness about online identity protection and management. It allows web surfers to manage their digital identities, monitor their online activities and keep an eye on their credit ratings—all of which helps consumers to be seen as they want to be seen in the digital world and to protect themselves from fraud and identity theft.

Garlik
2 Sheen Road
Richmond TW9 1AE
UK

Telephone: +44 20 8973 2462
Facsimile: +44 20 8973 2301
www.garlik.com

Imaginatik

Mark Turrell, CEO

LOCATION Winchester, UK

NUMBER OF EMPLOYEES 32

YEAR FOUNDED 1994

ORIGINS Entrepreneurial start-up

Imaginatik is a software and professional services company specialising in business innovation and providing information technology-based systems for collaborative innovation and idea management. Founded in 1994 by two doctoral researchers, Mark Turrell in London and Yvonne Lindow in Switzerland, the name was born from research into the diffusion of collaborative technologies within companies, and the differing approaches followed by companies when they applied similar technologies. From the beginning, the focus has been on how collaborative technologies can support organisations.

In late 2007, the company released version 8 of its flagship software, Idea Central, which taps into recent trends, such as the social networking phenomenon and the Web 2.0 user experience. The release adds to the core software, while also including new reporting tools.

Why the company is a pioneer

Imaginatik has worked with companies across a wide variety of industries, including Chevron, Dow Chemical, IBM, Merck, Pfizer and Xerox, improving the way they innovate. Its software and consulting services help firms to discover significant sources of additional revenue, while also providing tangible cost savings, process improvements and an increased product pipeline.

Imaginatik
6 Wessex Business Park
Colden Common
Winchester SO21 1WP UK

Telephone: +44 20 7917 2975 /
+1 866 917 2975
Facsimile: +44 20 7681 2808
www.imaginatik.com

Innovative Silicon

Mark-Eric Jones, president and CEO

LOCATION Santa Clara, USA

NUMBER OF EMPLOYEES 65

YEAR FOUNDED 2002

ORIGINS Entrepreneurial start-up

Innovative Silicon is a fast-growing, venture-capital-backed company that develops and licenses Z-RAM, or "zero-capacitor DRAM". An ultra-dense, low-cost semiconductor memory technology, Z-RAM is a direct replacement for today's DRAM memory technologies, designed for complex integrated circuits, microprocessors and stand-alone memory chips.

Innovative Silicon has attracted a world-class team of executives and technologists, earned 25 patents for its technology and raised more than US\$47m in venture-capital funding. Its Z-RAM memory technology has been licensed by Hynix Semiconductor for use in stand-alone memory chips, and has been licensed by AMD for the creation of large on-chip cache memories in future microprocessor designs.

Why the company is a pioneer

Z-RAM is a new concept in memory technology that uses a single transistor—and nothing else—as the memory bitcell. The technology uses the floating body effect of silicon on insulator semiconductor devices to provide advantages over standard bulk silicon memory technologies, including better scalability, faster speeds and a shorter manufacturing cycle. The density and simplicity of this technology makes Z-RAM one of the world's lowest-cost memory technologies, both as stand-alone memory and as embedded memory on microprocessors and other semiconductors.

Innovative Silicon
4800 Great America Parkway
Suite 500
Santa Clara, CA 95054 USA

Telephone: +1 408 969 2366
Facsimile: +1 408 969 2367
www.z-ram.com

Kayak

Steve Hafner, CEO and co-founder

LOCATION Norwalk, USA

NUMBER OF EMPLOYEES 24

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

In 2005 the co-founders of Orbitz, Travelocity and Expedia—the big three online travel agencies in the US—created a travel search engine, Kayak.com, to provide consumers with more comprehensive travel options in one place. The site provides pricing and availability from more than 400 travel sites, displaying the best deals from hundreds of airlines, more than 158,000 hotels, all major rental car companies and 17 cruise lines. All this information is provided to consumers in an easy-to-use and unbiased format, with a wide array of available itinerary/price combinations.

Kayak uses AJAX technology as part of its search functionality, helping to find and organise hundreds of options. Once a consumer inputs a request, Kayak gathers and sorts all the available price/itinerary combinations and displays the results by relevancy. Users can then use its sorting and filtering tools to change search parameters and see results update instantly. The company's MultiBook technology allows travellers to choose where to make their purchase: directly from the hotel, from an online travel agency or through a consolidator.

Why the company is a pioneer

Kayak's search engine finds all kinds of travel products, from flights and hotels to car rentals and cruises, while its fare alerts and fare history help travellers to stay on top of changing travel prices. By linking travellers directly to airlines, hotels and car hire firms to make their reservations, consumers can avoid paying the high service fees charged by online agencies.

Lumio

Jonathan Curtiss, president

LOCATION Menlo Park, USA

NUMBER OF EMPLOYEES 25

YEAR FOUNDED 2000

ORIGINS Entrepreneurial start-up

Lumio was established in May 2000 to capitalise on the idea of creating a virtual keyboard interface for mobile data users. The company develops, patents and sells intelligent optical modules for data input and output based around a core suite of virtual interface technologies. It released its virtual keyboard product to the market in early 2005, followed by a touch panel range in November 2007.

Lumio focuses on helping equipment manufacturers and system designers to integrate low cost, low overhead and low footprint components that can turn any flat surface into an interactive one, employing a range of human machine interface (HMI) tools. Its micro-projector modules can project large, clearly visible and crisp images onto almost any surface from a low height, at strongly oblique angles and at a minimal distance. Its designs are being used in various applications, such as touch screens, automotive, white goods, consumer electronics and industrial automation applications.

Why the company is a pioneer

Whether replacing touch screens and electro-mechanical buttons or bringing a new interface to an otherwise inert surface, Lumio helps to provide low-cost, easy-to-use, software configurable control surfaces. It has developed technology to project interfaces where printed interfaces or conventional, flat panel LCD screens are insufficient or inappropriate.

Kayak
27 Ann Street, Suite 300
Norwalk, CT 06854-2256
USA

Telephone: +1 203 899 3104
Facsimile: +1 203 899 3125
www.kayak.com

Lumio
325 Sharon Park Drive
Suite 710
Menlo Park, CA 94025 USA

Telephone: +1 650 587 1553
Facsimile: +1 650 618 1999
www.lumio.com

Medio

Brian Lent, CEO

LOCATION Seattle, USA

NUMBER OF EMPLOYEES 140

YEAR FOUNDED 2004

ORIGINS Entrepreneurial start-up

Medio Systems delivers mobile search and mobile advertising products that help mobile operators to provide a good customer experience and allow advertisers to reach their intended target audiences. Created specifically for mobile devices, Medio's technologies combine an intuitive user interface with powerful recommendation and personalisation technologies. Its focus on mobile helps it to deliver the most relevant answers across all categories, including downloadable content, local search and the mobile web.

Using the precise targeting capabilities of the mobile search platform, Medio's MobileNow search advertising network enables advertisers to identify and reach audiences that are interested in what they're selling—at just the right time—and achieve the best results for their campaign. Through its partnerships with mobile carriers, adverts are integrated into the mobile search experience, where increased relevance improves response. Medio's customers and partners include mobile operators, publishers and advertisers, such as Verizon Wireless, T-Mobile, Telus Mobility, ABC and CBS Mobile.

Why the company is a pioneer

Medio's technologies are entirely mobile-centric, delivering a personal search and advertising experience to every consumer. Its applications take into account the mobile platform's advantages and limitations. As a part of this, its search and advertising products are device and network agnostic, designed to overcome the constraints of different devices and networks, including speed, memory, display capabilities and the varying end-user platforms in the market.

Medio
701 Pike Street
Suite 1500
Seattle, WA 98101 USA

Telephone: +1 206 262 3700
Facsimile: +1 206 262 3799
www.medio.com

Meraki

Sanjit Biswas, CEO and co-founder

LOCATION Mountain View, USA

NUMBER OF EMPLOYEES Undisclosed

YEAR FOUNDED 2006

ORIGINS MIT spin-out

Meraki's mission is to bring affordable internet access to the next billion people. The company began operations in 2006, originating from a Ph.D. research project at MIT, with the intent of helping to bring cost-effective access to people around the world. Its approach to wireless networking enables service providers of all sizes, from community groups to carriers, to spread broadband connections easily.

Meraki's cost-effective, plug-and-play wireless technology makes it simple to deploy wireless internet access across single neighbourhoods or entire cities. Each Meraki US\$50 device functions as a wireless repeater for other nearby devices, enabling a small number of internet connections to serve a large area. Its networks can be deployed anywhere with access to power and at least one internet connection. As an example, a network of Meraki repeaters in San Francisco has served over 30,000 users, and was deployed entirely by volunteers placing the company's repeaters in the windows and roofs of their homes.

Why the company is a pioneer

Starting with a single network that covered Cambridge, Massachusetts, the technology spread into 70 countries around the world in less than a year. Today, the company's networks are being built in thousands of locations around the world, connecting people everywhere from San Francisco to villages in India.

Meraki
313 W Evelyn Ave
Mountain View, CA 94043
USA

Telephone: +1 650 810 8500
Facsimile: +1 650 810 8590
www.meraki.com

Polar Rose

Nikolaj Nyholm, CEO

LOCATION Malmo, Sweden and Warsaw, Poland

NUMBER OF EMPLOYEES 20

YEAR FOUNDED 2004

ORIGINS Spin-out from Universities of Lund and Malmo, Sweden

Searching for people's photos on the internet in the same way as searching for a face in a crowd is the principle behind Polar Rose. The company's technology uses a set of visual cues of the photo, instead of the search engine's analysis of nearby text, and can create a 3D model from a single 2D image of a face.

Polar Rose, which takes its name from a flower-shaped mathematical curve, grew out of computer vision research—the analysis of digital images and video. The company's aim is to give meaning to digital photos, and allow them to be indexable, just like text documents on the web are today, by augmenting a website with true people search and enabling linked data discovery in connection with a person in any photo.

Polar Rose's forthcoming product releases are currently in a closed beta with a limited number of users, but will be more widely released as it achieves sufficient scale. The company's technology, available as a free web browser plug-in and through royalty-free arrangements with partners, aims seamlessly to enhance the experience of browsing and searching for photos of people.

Why the company is a pioneer

The rise of the internet and the surge in availability of capturing images—digital cameras, camera-phones—has created whole new paradigms of visual information. Polar Rose is one of the first companies to be able to conceive of a way of organising and accessing that information.

Polar Rose
Ankargripsgatan 3
211 19 Malmo
Sweden

Telephone: +45 4093 0331
Facsimile: +46 4010 3350
www.polarrose.com

QlikTech

Mans Hultman, chairman

LOCATION Radnor, USA

NUMBER OF EMPLOYEES 350

YEAR FOUNDED 1993

ORIGINS Consultancy

Information is power, and today's technologies allow companies to collect data on a truly enormous scale. But what use is information without clever tools to interpret it? Formed in 1993 and now one of Sweden's most successful technology companies, QlikTech helps organisations around the world to get extra value out of their business and customer data through its business intelligence software. Called QlikView, the software is described as associative in-memory software, providing a point-and-click way for organisations to view data and information.

The company's technology is designed to support certain preferences of the human brain, such as the way it uses associations when searching for a memory, or its ability to recognise patterns. The only way to enable this, while still providing decent response times, is to run the program's analysis in a computer's random access memory (RAM). As RAM size expands and speeds up, the better associative in-memory analysis performs over rival disk-based technologies.

Qliktech's technology also has significant cost benefits. The application's deployment typically takes a couple of weeks, runs on mainstream hardware and requires little training. Accordingly, business is booming. Today, the firm has more than 6,500 customers, with a total of over 300,000 users across a range of industries, in 79 countries.

Why the company is a pioneer

QlikTech has recognised that one of the key factors in business intelligence is speed—but that many of its potential customers will not want to pay enormous amounts of money for the privilege. Its lead product has attracted attention because of its ability to manipulate rapidly large datasets on low-cost hardware.

QlikTech
150 Radnor Chester Road
Radnor, PA 19087
USA

Telephone: +46 46 286 2700
Facsimile: +46 46 286 2661
www.qlikview.com

Roundbox, Inc.

Dennis Specht, co-founder, co-chairman,
president and CEO

LOCATION Florham Park, USA

NUMBER OF EMPLOYEES 41

YEAR FOUNDED 2003

ORIGINS Entrepreneurial start-up

As mobile handsets increasingly become the personal computing choice for consumers in both developed and developing countries, a key obstacle to global connectivity remains the cost of content delivery over wireless networks. Roundbox develops software that uses new “mobile broadcast” technologies to deliver cost effectively a new class of services to new consumers.

Television is one of the original, mass market global mediums and Roundbox’s technology helps to deliver it to the next billion consumers whose primary consumer electronic device is the mobile handset. In partnership with Gemstar-TV Guide, the company’s electronic service guide helps these consumers to navigate and access video and radio services.

Roundbox’s software also helps mobile operators to deliver entirely new services that combine the power of mobile and broadcast technologies. Its datacasting product enables third-party application developers to deliver these services in compelling, low-cost ways, providing consumers with the benefits of “always on” reach. In collaboration with a Japanese firm, Roundbox demonstrated in 2007 how datacasting could enable mobile users to receive real-time and localised data such as news and weather, as well as advertising and stock data.

Why the company is a pioneer

Roundbox is helping the mobile communications industry to innovate, by developing multi-platform, standards-based software to support the broadcast of mobile applications that encompass video and other rich content over mobile networks.

Roundbox
25 Hanover Road
Building A, Suite 101
Florham Park, NJ 07932 USA

Telephone: +1 973 966 0037
Facsimile: +1 973 966 0737
www.roundbox.com

SpeedBit

Ariel Yarnitsky, CEO

LOCATION Haifa, Israel

NUMBER OF EMPLOYEES Under 30

YEAR FOUNDED 1999

ORIGINS Entrepreneurial start-up

SpeedBit has been responsible for breaking several speed barriers for internet downloading and streaming, most recently with a new video accelerator that allows for a smooth video streaming experience, or the downloading of a movie in less than 20 minutes, a milestone with major implications for the online and entertainment industries.

Conventional video delivered over the internet essentially travels in a single continuous stream from the source to the destination—that is, from the seller to the customer. By contrast, SpeedBit uses complex algorithms to optimise available bandwidth, in effect downloading and streaming different chunks of a video simultaneously over multiple internet connections, rather than in a single stream.

To date, the internet video businesses of companies such as Wal-Mart and Amazon.com have been in the slow lane. Even at current top internet speeds, buying and downloading all 1.5 gigabytes of a full feature film still takes hours, but demand is expected to rise sharply once download speeds reach 15-20 minutes, which is what SpeedBit promises to help deliver. Its accelerator technology currently supports iTunes and more than 60 video sites, such as YouTube. Users only have to download the software to use it. The firm is also porting its technology to other platforms, such as mobile phones, game consoles and set top boxes.

Why the company is a pioneer

SpeedBit’s bandwidth optimisation technology is addressing the internet’s inherent weaknesses when dealing with the volume and size of today’s network traffic, helping to cut internet download and streaming speeds.

Speedbit
Building 15 Matam
Haifa
Israel

Telephone: +972 4 855 0230
Facsimile: +972 4 855 0290
www.speedbit.com

Transclick

Robert Levin, CEO

LOCATION New York, USA

NUMBER OF EMPLOYEES 12 (incl. consultants)

YEAR FOUNDED 1999

ORIGINS Entrepreneurial start-up, following a research grant

Transclick is a software service designed to translate instant messages, text messages and e-mails into any of 16 languages, in real time, via the internet or mobile-phone networks. The technology has the potential to improve and, as millions adopt it, transform business and personal communication globally. It also represents a powerful tool for collaboration within global companies.

Users enter a message which is then translated into the preferred language of the recipient with grammar, syntax and specialised dictionaries. The company says that messages are translated at a rate of 400 words per second, with accuracy rates of between 80% and 100%. It also provides over 127 market-specific dictionaries, enabling messages to be translated within a specific professional context, such as finance, medical, legal and IT, among others.

Transclick also offers voice recognition and speech generation options for voice portals, while other developments include closer integration with online collaboration tools from Google, Microsoft, AOL, Yahoo and Skype. The company also offers developers a licence to the technology's API, allowing the integration of real-time multilingual communications technology with e-mail, instant messaging and mobile SMS. Its service is available in English, Arabic, Chinese, Farsi, French, German, Hebrew, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish, Turkish and Ukrainian.

Why the company is a pioneer

Transclick offers a powerful, patented solution for immediate language translation via the internet or a mobile network, with customised linguistic terminology for higher accuracy than free online services, which promises to boost business and personal communications across major language groups globally.

Transclick
320 E. 46th Street, 11G
New York 10017
USA

Telephone: +1 212 751 5150
Facsimile: +1 212 751 5153
www.transclick.com

Wikimedia Foundation

Florence Devouard, chairwoman

LOCATION St Petersburg, USA

NUMBER OF EMPLOYEES 10

YEAR FOUNDED 2003

ORIGINS Charitable foundation

The charter of the Wikimedia Foundation, a non-profit organisation, is to empower and engage people around the world to collect and develop educational content and disseminate it effectively and globally. Its best-known project, Wikipedia, is one of the ten most visited sites in the world and has become an important reference tool for everyone, from students to major corporations. The English-language Wikipedia has grown to hold some 1.8m articles today, while eight other language versions hold some 250,000 articles of their own.

The Foundation operates several projects too, such as Wikimedia Commons, a repository of free images and other media, which surpassed 1m images in late 2006. Wiktionary, a free dictionary, has eight dictionaries with more than 50,000 entries, three of which have more than 200,000 definitions. Wikisource, an original source repository, is nearing 150,000 pages of content, while Wikiquote (quotations), Wikibooks (collaboratively written books), Wikinews (citizen journalism) and Wikiversity (curriculum development) all continue to grow. Wikimedia's projects have a total of more than 7.8m pages, 2.2m images and 5m registered accounts.

Why the company is a pioneer

Not-for-profit Wikimedia, armed with its flagship project Wikipedia, has used the internet and public participation to change the way that information is collected and shared. It has also undertaken to keep useful information within its projects available free of charge online, in perpetuity.

Wikimedia Foundation
200 2nd Ave. South #358
St Petersburg, FL 33701-4313
USA

Telephone: +1 727 231 0101
Facsimile: +1 727 258 0207
www.wikimediafoundation.org

Yandex

Arkady Volozh, co-founder and CEO

LOCATION Moscow, Russia

NUMBER OF EMPLOYEES Undisclosed

YEAR FOUNDED 1993

ORIGINS Entrepreneurial start-up

A major search engine and online information service for Russian-speaking people globally, Yandex accounts for around some two-thirds of all internet searches conducted in Russian, and has around 6m visitors daily. The founders coined the company's name as an acronym for the phrase, "Yet another indexer", but the search firm has now gone far beyond its roots.

A number of features distinguish Yandex from its rivals, such as giving users the ability to specify the geographic area they want to search in. Locally-specific content is one of its specialities. For example, its market site displays offerings from local retailers before the listings of national shops, while users can also prioritise news and other information by geographic area, getting their local news alongside national and international news. Free e-mail with unlimited storage space, local maps with real-time traffic information and satellite images, as well as a comparison shopping service and online payment system, all help to round out its offering.

Along with this, the company is helping to extend the availability of the internet in Russia through the creation of free wireless hotspots. Available in some 300 cafes, restaurants and other places, it is now the country's largest free wireless internet service.

Why the company is a pioneer

Yandex is playing a major role in extending the awareness and use of the internet throughout Russia by providing powerful and locally-specific search solutions. It has also created one of the country's biggest and free wireless networks.

Yandex
1 Building
21 Samokatnaya Street
111033 Moscow Russia

Telephone: +7 495 739 7000
Facsimile: +7 495 739 7070
www.yandex.ru

Acknowledgements

This report was prepared by BT Group with the help of the Economist Intelligence Unit. We would like to thank Tom Standage, Iain Scott, James Watson, Penny Jones, Siobhan Chapman and David Binning of the Economist Intelligence Unit. Thanks also goes to Rodolfo Lara and Matthias Lüfkens at the World Economic Forum; and Gary Shainberg and Simon Dux at BT. Designed by Michelle Young. Art from Getty Images.

The Technology Pioneers programme is run by the World Economic Forum with guidance from BT, Deloitte Touche Tohmatsu and Accel Partners. BT Group Chief Technology Officer, Matt Bross would like to recognise and thank these two strategic partners.

“Accel Partners is proud and honoured to be involved with the Technology Pioneers Programme. We are extremely impressed with the quality of the entrepreneurs and the distinctiveness of the innovation of the Technology Pioneers. We have been active in technology innovation for over 25 years and see thousands of entrepreneurs every year and it is with this experience that we can confidently and proudly say that the Technology Pioneers Class of 2008 are truly of world-class calibre.”

Kevin Comolli, Managing General Partner,
Accel Partners.

“We are honoured to have participated in the selection of this year’s winners, who join an illustrious group of Technology Pioneer innovators. The range and elegance of solutions that this year’s Technology Pioneers bring to the marketplace are truly stunning. Congratulations on translating technical breakthroughs into products that make the world a better, more connected, and healthier place.”

Edward K. Moran, Director of Product Innovation,
Deloitte Services LLP.

ACCEL

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Contacts

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

Simon Dux

Head of Communications CTO

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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