

PERSPECTIVES



HOW INNOVATIVE IS UK plc?

The CBI recently published the findings of its latest innovation survey taking in over 400 British firms¹.

Companies were asked about their R&D activities; their use of design and technology; their links with universities; and how they create new ideas and manage their knowledge base.

Drivers & constraints

Top drivers for innovation are customers and competition. Firms feel constrained, though, by lack of talent, funding and information. Many seem to be undervaluing knowledge management. Working with external collaborations is very common, but only half work closely with customers and suppliers. Less than half have foresight activities or gather ideas from staff, and less than 25% give any training in creativity or encourage knowledge transfer.

Could do better

Analysis of innovation potential showed that improvements could be made in 64% of cases. Furthermore, 60% of companies over-estimated their innovation potential.

Star innovators

The most innovative companies had much in common. Featuring strongly were:

- Creative cultures
- Strong R&D and marketing functions.
- Watch developments in technology and their markets
- Operate effective knowledge management systems.

Clearly, some valuable pointers for successful innovation.

UK R&D spend is 1.9% of GDP
 ... USA spends 2.7%

UK R&D spend as % of sales is
 ... half that of USA

UK government funding for R&D is
 ... 20% less than OECD mean

UK files 3.3 patents/10K people *pa.*
 ... OECD mean is 6.0

This issue of Perspectives explores:

How innovative is UK plc?	1
What is innovation anyway?	1
The world's most innovative companies	2
Hatching value from innovation	3
Customers know what they want ... or do they?	3
Sources of innovation	4
Innovation process models	6
Managing innovation	7
Sustainable innovation	7

What is Innovation Anyway?

Innovation is ...

- ◆ Growth in value by incremental or radical steps
- ◆ Learning and adapting to an uncertain future
- ◆ Creative destruction
- ◆ The exploitation of knowledge
- ◆ Growing ideas into practical use: valuable inventions
- ◆ New products, processes, strategies

The academic literature on innovation includes a number of definitions (see panel).

All allude to growth through the application of knowledge to create valuable tangibles or intangibles, *ie* not only new products, but also services, processes and strategies.

Also important are the concepts that we always have to deal with uncertainty, and that change is inevitable.

The World's Most Innovative Companies

Success today is directly proportional to the rate at which an organisation accumulates knowledge, and how it is brought to bear

Tom Peters

Which organisations are role models for innovation? How can their innovation potential be measured?

The CBI's UK survey was reported on page 1. A simpler approach could be to count the number of patents granted (see panel), but this is invention, only the proprietary

technology base for innovation, with no accounting for value.

*Fortune*³ canvassed 10,000 directors, managers and analysts to create a list of the 'World's Most Admired Companies'. Top of the list are Wal-Mart, General Electric, Microsoft, Dell and Johnson & Johnson.

Ranking by No. US Patents Granted per Decade ²		
Rank	1990-1999	1980-1989
1	IBM	General Electric
2	Canon	IBM
3	Toshiba	Hitachi
4	Hitachi	Toshiba
5	Mitsubishi	Canon
6	NEC Corporation	US Philips
7	Motorola	Siemens
8	Eastman Kodak	AT&T
9	General Electric	Westinghouse
10	Matsushita Electrical	Bayer

Inventiveness of US companies

Innovativeness was one aspect considered amongst, *eg* several financial measures, product quality, staff talents, social responsibility.

Companies scoring highly for innovation included:

- Nestlé
- Eli Lilly
- Walgreen
- Procter & Gamble,
- L'Oréal
- BP
- Shell

3M are often held-up as a model innovative firm (see case study below).

Case Study: 3M

3M⁴

*\$16 billion turnover
50,000 products
200 countries,
34 technology platforms*

3M's fundamental principle is:
'ingenuity with a purpose – to help customers succeed.'

3M's essentials for innovation are ...

- Vision
- Foresight & insight into technologies & customer needs
- Stretch goals to create urgency & momentum
- Empowerment
- Communication: networking & dissemination of ideas across the business
- Recognition of successful innovators & ideas deserving speed & resources

The company is renowned for empowering senior researchers to spend up to 15% their time on 'skunk work' - pursuing their own research interests and hunches with no obvious immediate commercial benefit.

3M Post-It Notes

Post-It Notes are a famous example of an intuitive innovation. The headline story of the 'failed glue' is well known, but the detail provides some useful insights.

Arthur Fry, a colleague of the glue's inventor, Silver Spence, realised that coating the paper slips he used as bookmarks would stop them falling out, yet the low sticking power of the glue would allow them to be easily removed.

When he tried to persuade the company to commercialise the idea he was initially met with scepticism. However, it became much more convincing when senior managers saw prototype Post-Its being widely used by their secretaries!

Hatching Value from Innovation

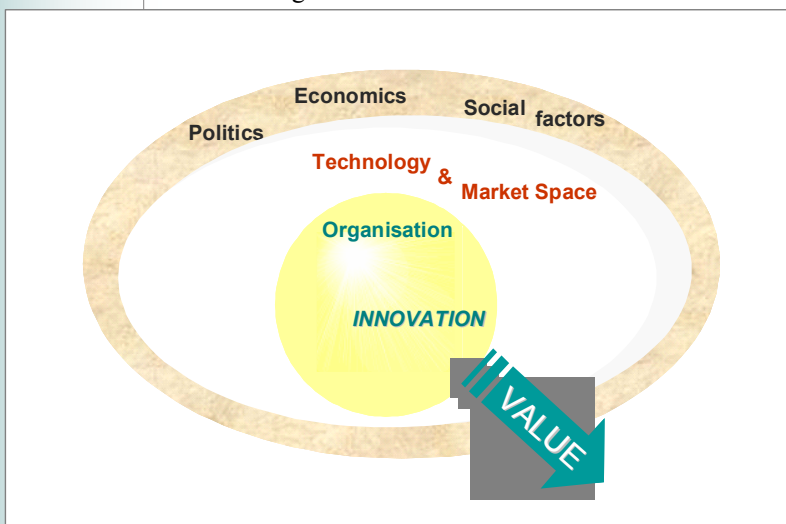
With the pace of innovation hotting up, any company that fails to replace 10% of its turnover annually, will be likely out of business within five years

(The Economist, 2003)

There are lone inventors, but no lone innovators.

You can't innovate alone, but must draw on networks of customers, suppliers, even competitors, and other stakeholders to determine what customers will find valuable. Equally, you must discover ways of delivering that value.

Innovators use the knowledge from technology and markets spaces to create and deliver goods and services that customers want. Often this means collaborating with others to develop or combine technologies or gain access to markets. Often it can mean finding a fit with other products which customers use in some combination.



They react to, and often help shape, the political, economic and social factors bearing on the areas of technology and markets in which they operate. Establishing standard protocols across new technologies which have to work together is one example. Another would be influencing new regulations.

Underpinning all of this, innovative organisations need to have the skilled people, right processes and strategies, culture and leadership to achieve success.

Incubating the value in innovation

Customers know what they want ... or do they?

You can't expect the customer to think the unthinkable ... before it became the hit toy of 1997, who wanted a tiny electronic chicken which needed feeding, nurturing and entertaining to keep it alive! (Tamagotchis—the pets from cyberspace)

Jonas Ridderstrale & Kjell Nordstrom

Customers want value and they want it now.

They want products for both rational and emotional reasons, because they are useful, give information or make them feel good. And usually someone can provide these - quickly.

On the other hand, customers may not know what they want until they see it, use it, feel it. How can they if things potentially of value are provided by new technology?

The future is always uncertain, and many factors (see panel) determine what will succeed and what will fail. What is essential is having sufficient knowledge to both know and anticipate customer needs.

Key Influencing Factors

- New technologies
- Knowledge economy
- Global competition
- Savvy customers
- Speed & reach of information
- Internet
- Mobile communications
- Intangibles
- Branding
- Stakeholders
- Regulations
- Environment

Sources of Innovation

Chance favours only the prepared mind

Louis Pasteur

What inspires innovation? A study of how the features of 200 innovations, their origins and track records concluded that success was far more likely to arise from a background of technical and market knowledge⁵.

Successful innovations often had these features:

- Based on established technology
- Met customers' needs
- Fit into existing practices
- Saved money

When the sources of the ideas behind the innovations were probed and analysed some intriguing results emerged. The ratio of successful innovations to failures was far higher when ideas were spotted by chance, but recognised as being potential winners.

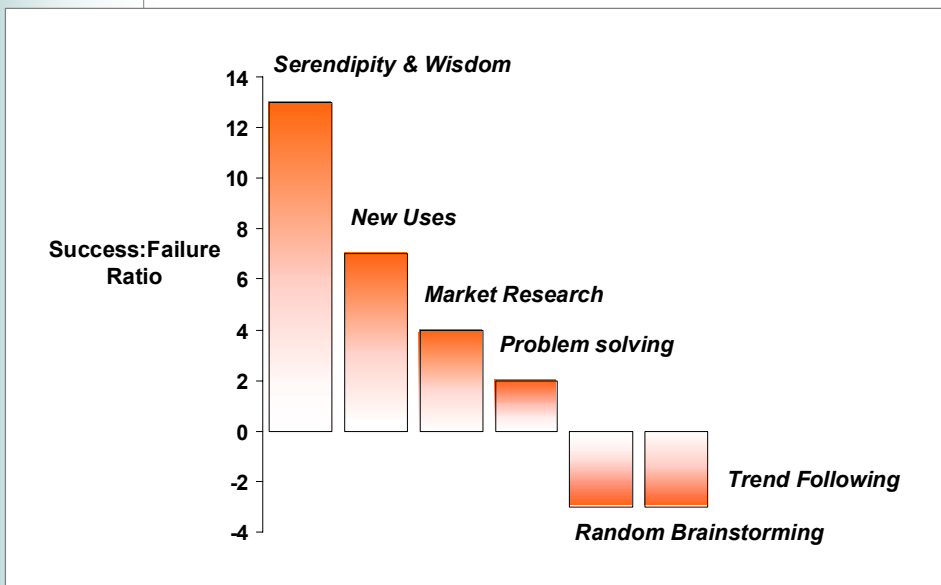
Clearly, the ability to make such a judgement demands intuition which comes from a deep understanding and knowledge, or wisdom. Additionally, in order to practise

Peter Drucker⁶ listed seven sources of innovation. ...

- 1. New knowledge**
- 2. New perceptions**
- 3. Needs must**
- 4. Demographic changes**
- 5. Market & industry changes**
- 6. Unrealised expectations**
- 7. The unexpected**

such intuition, the opportunities to do so must be maximised by watching developments in technologies and markets, both closer to current core interests and more widely.

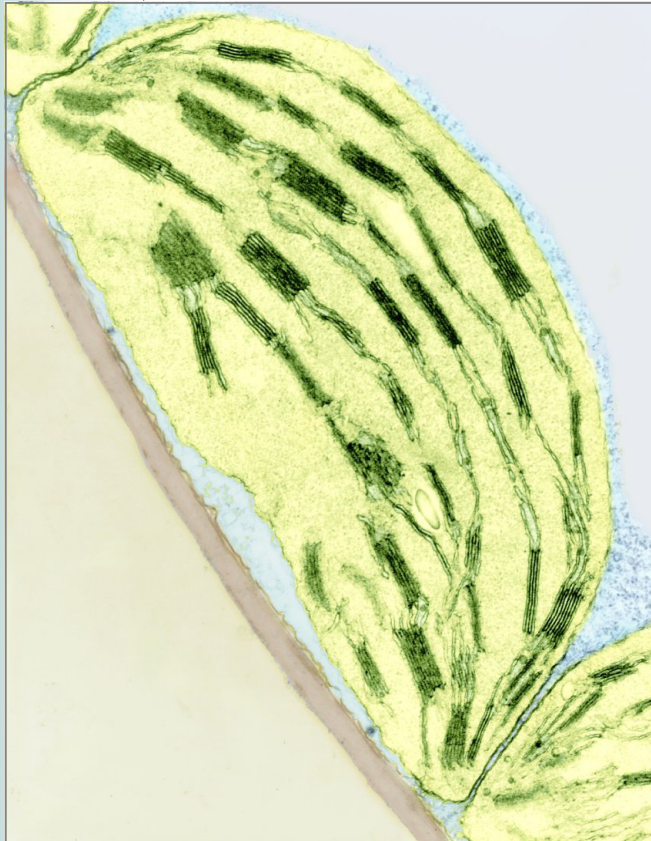
Spotting innovative ideas with a high probability of success early, and weeding out likely failures, means resources can be properly focused ... on products put into development and on the wider, intelligent search for new ideas.



Origin of ideas for innovations and bearing on probability of success

Case Study: Electron Microscope

The invention and development of the transmission electron microscope in the 1930's & 40's illustrates some important aspects of the innovation process⁷.



TS barley chloroplast. Taken using AEI EM6G TEM.
Reproduced courtesy of Cliff Hart & Jill Foundling, Syngenta

The basic technology was originally developed for a completely different purpose, but its exciting application to microscopy soon became evident. This was clearly a case of serendipity and wisdom (see page 4).

The concept spread to like-minded researchers through publications and networking at conferences. Several university researchers began to build their own DIY instruments, although there were many impracticalities which non-enthusiasts would not have readily accepted. However, there was much interest from colleagues, which was noted by potential manufacturers.

The successful commercial instrument, was not first to market, but was the first quality offer, thanks to the combined skills of key original researchers and the competences of the manufacturer. Many improvements were then developed in formal and informal collaborations between lead users and several manufacturers.

Electromagnetic lens invented by Knoll & Rudska (Technische Hochschule, Berlin). Developing methods for measuring lightning.

Marton, (Belgium) collaborated to build DIY instruments. Issues with stable power supply. Required 40,000 wet cell batteries!

Academic biologists and metallurgists made improvements and stimulated interest of manufacturers.

Marton & other academics joined RCA (USA). Combined skills with RCA's electrical competence to make first robust commercial TEM.

Innovation Process Models

Janszen⁸ has described the generic processes involved in innovation as:

- Targeting & Decision Making ... using resources to make plans and achieve goals in an environment of uncertainty
- Generation of Creative Ideas
- Prototyping or Screening ... in a compartmentalised innovation process in which interfaces are properly aligned and kept small in number for speed
- Knowledge Management
- Team Building
- Product Launch

Clearly, innovation is a dynamic process. The dynamics may include reinforcing or limiting loops, lock-in mechanisms, and time delay effects.

Loops exist where changes in one part of the system have knock-on effects. Reinforcement may be positive through virtuous loops, eg the co-evolution of complementary products, or negative through vicious loops, eg time spent 'firefighting' leading to a lack of innovation.

Limiting loops mean that innovations may be surpassed by substitutes in the marketplace, or restricted by regulations or

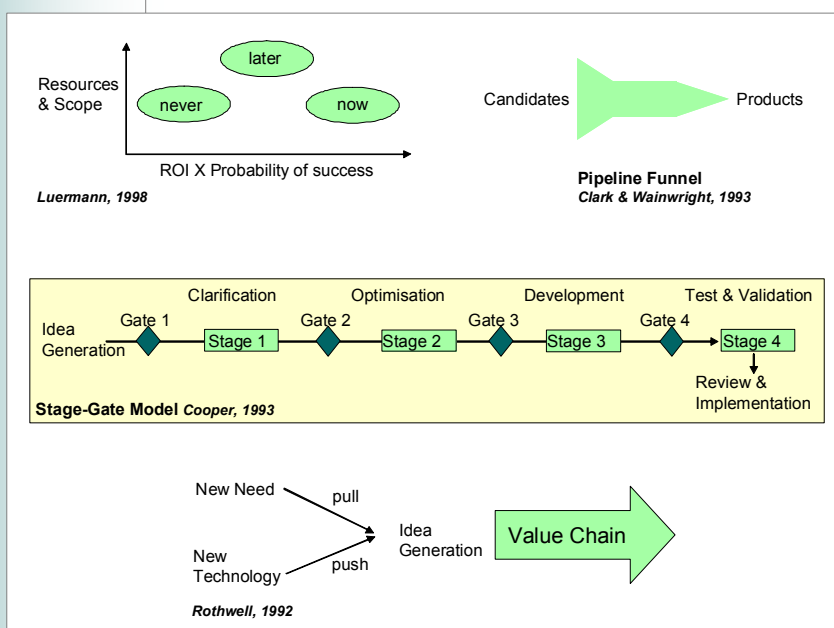
changing fashions. Internally, budgetary constraints may operate.

The complementary use of an innovation and other products may provide a lock-in mechanism whereby switching to alternatives is difficult, especially where standard protocols or operating systems are involved (eg the move to DVD format discs and players). Others may be less tangible, eg customer loyalty or 'group think'.

Innovation processes must minimise the delayed reaction to changes in supply and demand. The alternative is slipping into the 'Pig Cycle' ... price of pigs is high so farmers rear more pigs ... leading to a glut of pigs and low prices.

Attention must be focused on the bottlenecks in any innovation process ... both those already recognised and those anticipated.

A selection of generic innovation process models are illustrated in the panel.



Generic innovation process models

Managing Innovation

Features of Innovative Organisations¹

- *Future watch*
- *Creative*
- *Strong R&D*
- *Strong Marketing*
- *Manage knowledge*
- *Market focused*
- *Collaborate*
- *Champion innovation*
- *Learn*

Innovation begins with determining where an organisation is now and where it wants to go.

It needs to recognise its position, know its strengths and weaknesses, and what opportunities and threats await. Given available resources and motivation, targets can then be set and any additional needs recognised.

Successful innovation relies on adopting best practice project management, with important emphasis on:

- Managing Uncertainty
- Managing Knowledge
- Co-ordination of R&D and Marketing

Uncertainty

Dealing with uncertainty involves, firstly, acquiring as much technical and business information as possible. Secondly, projects need dividing into stages in which they can be given particular focus. Decisions can be made at the transition between each stage as probabilities of success are determined.

Thirdly, issues of sources and scale of funding must be solved. Fourthly, trial and error must be accepted, even encouraged in early stages of research.

Knowledge

Knowledge management is critical. Generating ideas, acquiring technologies and commercially exploiting them. Fully aligned with business strategy. Recognising and managing the tacit knowledge in people's heads is especially important. Also, a readiness to accept mistakes, learn and adapt is crucial.

R&D and Marketing

Although innovations can come from any part of an organisation, cooperation between R&D and Marketing and coordinating their activities is vital to complete the circle of anticipating what customers will value.

For services to help manage innovation and creativity, please contact Nuvistix.

Sustainable Innovation

Outcomes of Innovation

- *Economic*
- *Social*
- *Environmental*
- *Knowledge*

The outcomes of innovation can be stated in terms of the 'triple bottom line'⁹.

Behind this is the concept that in modern society organisations need to look for the sustainability that comes, not only from the traditional drive to be profitable, but also from the need to be socially and environmentally responsible.

Perhaps there should be a further bottom line, though? Generating knowledge itself ... fuelling continuous innovation.

<p>Economic Value, Lower Costs, Productivity, Growth</p> <p>Social Prosperity, Employment, Health</p> <p>Environmental Environmental Impact</p> <p>... Plus</p> <p>Knowledge</p>
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Nuvistix Innovation is a consultancy which brings a keen technical edge to an integrated portfolio of services to promote innovation and creativity.

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They include:

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