1.4 What is innovation?

One of America's most successful innovators was Thomas Alva Edison who registered over 1000 patents. Products for which his organization was responsible include the light bulb, 35 mm cinema film and even the electric chair. Edison appreciated better than most that the real challenge in innovation was not invention – coming up with good ideas – but in making those inventions work technically and commercially. His skill in doing this created a business empire worth, in 1920, around $21.6 billion. He put to good use an understanding of the interactive nature of innovation, realizing that both technology push (which he systematized in one of the world's first organized R&D laboratories) and demand pull need to be mobilized.

His work on electricity provides a good example of this. Edison recognized that although the electric light bulb was a good idea it had little practical relevance in a world where there was no power point to plug it into. Consequently, his team set about building up an entire electricity generation and distribution infrastructure, including designing lamp stands, switches and wiring. In 1882 he switched on the power from the first electric power generation plant in Manhattan and was able to light up 800 bulbs in the area. In the years that followed he built over 300 plants all over the world.[31]

As Edison realized, innovation is more than simply coming up with good ideas: it is the *process* of growing them into practical use. Definitions of innovation may vary in their wording, but they all stress the need to complete the development and exploitation aspects of new knowledge, not just its invention. Some examples are given in the Research Note box below.

If we only understand part of the innovation process, then the behaviours we use in managing it are also likely to be only partially helpful – even if well intentioned and executed. For example, innovation is often confused with invention – but the latter is only the first step in a long process of bringing a good

RESEARCH NOTE What is innovation?

One of the problems in managing innovation is the variation in what people understand by the term, often confusing it with invention. In its broadest sense the term comes from the Latin *innovare* meaning 'to make something new'. Our view, shared by the following writers, assumes that innovation is a process of turning opportunity into new ideas and of putting these into widely used practice.

- 'Innovation is the successful exploitation of new ideas' – Innovation Unit (2004) UK Department of Trade and Industry.
- 'Industrial innovation includes the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment' – Chris Freeman (1982) *The Economics of Industrial Innovation*, 2nd edition, Pinter, London.
- '. . . Innovation does not necessarily imply the commercialization of only a major advance in the technological state of the art (a radical innovation) but it includes also the utilization of even small-scale changes in technological know-how (an improvement or incremental innovation)' – Roy Rothwell and Paul Gardiner (1985) Invention, innovation, re-innovation and the role of the user. *Technovation*, **3**, 168.
- 'Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or service. It is capable of being presented as a discipline, capable of being learned, capable of being practised' – Peter Drucker (1985) *Innovation and Entrepreneurship*, Harper & Row, New York.
- 'Companies achieve competitive advantage through acts of innovation. They approach innovation in its broadest sense, including both new technologies and new ways of doing things' – Michael Porter (1990) *The Competitive Advantage of Nations*, Macmillan, London.
- 'An innovative business is one which lives and breathes "outside the box". It is not just good ideas, it is a combination of good ideas, motivated staff and an instinctive understanding of what your customer wants' – Richard Branson (1998) DTI Innovation Lecture.

idea to widespread and effective use. Being a good inventor is – to contradict Emerson* – no guarantee of commercial success and no matter how good the better mousetrap idea, the world will only beat a path to the door if attention is also paid to project management, market development, financial management, organizational behaviour, etc. Case study 1.3 gives some examples which highlight the difference between invention and innovation and that completing the journey is far from easy.

CASE STUDY 1.3

Invention and innovation

Some of the most famous inventions of the nineteenth century came from men whose names are forgotten; the actual names we associate with the products are of the entrepreneurs who brought them into commercial use. For example, the vacuum cleaner was invented by one J. Murray Spengler and originally called an 'electric suction sweeper'. He approached a leather goods maker in the town who knew nothing about vacuum cleaners but had a good idea of how to market and sell them – a certain W.H. Hoover. Similarly, a Boston man called Elias Howe produce the world's first sewing machine in 1846. Unable to sell his ideas despite travelling to England and trying there, he returned to the USA to find one Isaac Singer had stolen the patent and built a successful business from it. Although Singer was eventually forced to pay Howe a royalty on all machines made, the name which most people now associate with sewing machines is Singer not Howe. And Samuel Morse, widely credited as the father of modern telegraphy, actually invented only the code which bears his name; all the other inventions came from others. What Morse brought was enormous energy and a vision of what could be accomplished; to realize this he combined marketing and political skills to secure state funding for development work, and to spread the concept of something which for the first time would link people separated by vast distances on the continent of America. Within five years of demonstrating the principle there were over 5000 miles of telegraph wire in the USA, and Morse was regarded as 'the greatest man of his generation'.[31]

Innovation isn't easy . . . .

Although innovation is increasingly seen as a powerful way of securing competitive advantage and a more secure approach to defending strategic positions, success is by no means guaranteed. The history of product and process innovations is littered with examples of apparently good ideas which failed – in some cases with spectacular consequences. For example:

- In 1952 Ford engineers began working on a new car to counter the mid-size models offered by GM and Chrysler – the 'E' car. After an exhaustive search for a name involving some 20 000 suggestions the car was finally named after Edsel Ford, Henry Ford's only son. It was not a success; when the first Edsels came off the production line Ford had to spend an average of $10 000 per car (twice the vehicle's cost) to get them roadworthy. A publicity plan was to have 75 Edsels

* *'If a man has good corn, or wood, or boards, or pigs to sell, or can make better chairs or knives, crucibles or church organs than anybody else, you will find a broad-beaten road to his home, though it be in the woods.'* (Entry in his journal 1855, Ralph Waldo Emerson).

drive out on the same day to local dealers; in the event the firm only managed to get 68 to go, whilst in another live TV slot the car failed to start. Nor were these teething troubles; by 1958 consumer indifference to the design and concern about its reputation led the company to abandon the car – at a cost of $450 million and 110,847 Edsels.[31]

- During the latter part of the Second World War it became increasingly clear that there would be a big market for long-distance airliners, especially on the transatlantic route. One UK contender was the Bristol Brabazon, based on a design for a giant long-range bomber, which was approved by the Ministry of Aviation for development in 1943. Consultation with BOAC, the major customer for the new airliner, was 'to associate itself closely with the layout of the aircraft and its equipment' but not to comment on issues like size, range and payload! The budget rapidly escalated, with the construction of new facilities to accommodate such a large plane and, at one stage, the demolition of an entire village in order to extend the runway at Filton, near Bristol. Project control was weak and many unnecessary features were included, for example, the mock-up contained 'a most magnificent ladies' powder room' with wooden aluminium-painted mirrors and even receptacles for the various lotions and powders used by the 'modern young lady'. The prototype took six and a half years to build and involved major technical crises with wings and engine design; although it flew well in tests the character of the post-war aircraft market was very different from that envisaged by the technologists. Consequently in 1952, after flying less than 1000 miles, the project was abandoned at considerable cost to the taxpayer. The parallels with the Concorde project, developed by the same company on the same site a decade later, are hard to escape.

- During the late 1990s revolutionary changes were going on in mobile communications involving many successful innovations – but even experienced players can get their fingers burned. Motorola launched an ambitious venture which aimed to offer mobile communications from literally anywhere on the planet – including the middle of the Sahara Desert or the top of Mount Everest! Achieving this involved a $7 billion project to put 88 satellites into orbit, but despite the costs Iridium – as the venture was known – received investment funds from major backers and the network was established. The trouble was that once the novelty had worn off, most people realized that they did not need to make many calls from remote islands or at the North Pole and that their requirements were generally well met with less exotic mobile networks based around large cities and populated regions. Worse, the handsets for Iridium were large and clumsy because of the complex electronics and wireless equipment they had to contain – and the cost of these hi-tech bricks was a staggering $3000! Call charges were similarly highly priced. Despite the incredible technological achievement which this represented the take-up of the system never happened, and in 1999 the company filed for Chapter 11 bankruptcy. Its problems were not over – the cost of maintaining the satellites safely in orbit was around $2 million per month. Motorola who had to assume the responsibility had hoped that other telecommunications firms might take advantage of these satellites, but after no interest was shown they had to look at a further price tag of $50 million to bring them out of orbit and destroy them safely. Even then the plans to allow them to drift out of orbit and burn up in the atmosphere were criticized by NASA for the risk they might pose in starting a nuclear war, because any pieces which fell to earth would be large enough to trigger Russian anti-missile defences since they might appear not as satellite chunks but Moscow-bound missiles!