

# 5

## GENERATING CREATIVE CUSTOMER-FOCUSED IDEAS

...chance favours only the prepared mind.

Louis Pasteur

### INTRODUCTION

Companies that want to become better at innovation intuitively concentrate on generating more ideas through suggestions schemes and brainstorming. However, there is more to the second element of the Pentathlon than simply increasing the number of ideas generated by an organization. Innovation requires creativity, the application of knowledge, effective ways of recognizing customers' requirements and protection of the resulting ideas. Unfortunately, many of the commonly held views on creativity are incorrect. Too often creativity is simply perceived as 'completely new' ideas arising from 'eureka' moments. This overlooks the creativity required in solving known problems and the useful insights from the substantial research on individual and group creativity.

The potential contribution of customers and users in the search for innovative ideas should not be overlooked. Many researchers have recognized that customers are inept when it comes to articulating their needs. Therefore, it is necessary to move from traditional market research – which relies on direct questioning – to enhanced techniques, such as observation and indirect questioning. These can identify breakthrough ideas that either revitalize existing markets or create new ones.

In concentrating on ideas, creativity and knowledge this chapter aims to

- Explain how managers can enhance the levels of creativity in their organizations.
- Discuss the types of knowledge that are generated in organizations and how they can be harnessed to increase innovation performance.
- Give a detailed understanding of the best techniques for identifying customers' needs.
- Summarize the most effective ways to protect innovative ideas.



- Explain how the US company Texas Instruments manages creativity, knowledge and ideas.

## CREATIVITY

Managers in both the service and manufacturing sectors 'need training if they are to be effective sponsors [of creativity and innovation]<sup>1</sup> and should have an understanding of the following areas:

- The different types of business creativity.
- The factors which influence individual creativity.
- How group creativity can be managed.
- Key creativity techniques.

### Types of Business Creativity

It is important to differentiate between business creativity and innovation. 'Business creativity is not only original thinking but also thinking that is appropriate and actionable'.<sup>2</sup> In other words, original thinking can lead to inventions but until these are commercialized, they do not become innovations.

There are three types of business creativity: *exploratory*, *normative* and *serendipitous creativity*. Exploratory creativity is closest to most people's understanding of creativity: the identification of new opportunities. It is 'unconventional thinking, which modifies or rejects previous ideas, clarifies vague or ill-defined problems in developing new views, or solutions'.<sup>3</sup>

In normative creativity, original thinking is used to solve known problems. Identifying problems which create real business opportunities is not easy. Problems are often articulated in a vague or indirect way. Therefore, an important task for managers is to identify and clarify the problems that their employees should focus on. Research has shown that a key part of innovation is solving the inevitable problems that arise in developing technological solutions to customers' needs.<sup>4</sup> Normative creativity is often required for process innovation, where customers are dissatisfied with service delivery, or a manufacturing facility that is not producing high enough quality. In the service sector the opportunities for normative creativity are enormous, as solving customer issues is a major catalyst for service innovation.

Serendipitous creativity acknowledges the role of accident and good fortune in, for example, discovering a new application for an existing idea. The most famous example is the 3M 'Post-It', where a glue that was being developed for permanent fixing failed but for which a very successful alternative use was found. Serendipitous creativity, by definition, cannot be managed easily, although looking for ideas from different sectors or bringing in experts from other fields can help because 'the best innovators aren't lone geniuses. They're people who can take an idea that is obvious in one context and apply it in not-so-obvious ways to a different context'.<sup>5</sup>

Knowing the three types of business creativity gives managers a greater ability to increase innovation. For example, asking employees for ideas for new products and services gives them an exploratory task, whereas specifying a customer problem that the product or service needs to solve gives employees a normative task (which is easier to respond to). Depending on the task involved, the most appropriate combination of individual and group creativity techniques can be selected.

### Individual Creativity

Creativity can be the result of individual ideas, and in many organizations key individuals play an indispensable role. Individual creativity is a contentious subject in the academic literature. Some researchers take an *elitist* perspective and argue that most of the creativity in an organization originates from a few individuals. Others contend that creativity is a social process, and everyone has the potential to be creative under the right circumstances. We will discuss the factors that influence individual creativity and, then, how individuals' potential for creativity can best be unleashed in teams. The importance of linking individual to team creativity is well expressed in the following quote from a 2009 report from the Economist Intelligence Unit, 'Innovations may begin in the mind of a single individual, but if they are to generate valuable products or services they need to be developed by a community of thinkers'.<sup>6</sup>

From his extensive research, Mihaly Csikszentmihalyi a psychologist at the University of Chicago, stresses the importance of knowledge to make creativity possible. Both individuals and teams need experience, and access to relevant experts and information (*knowledge domains*) to be creative.<sup>7</sup> For example, in the complex field of pharmaceutical research, where hundreds of chemicals may be considered in the search for an effective medication, the volume of ideas being considered makes it necessary to have good data management – even highly talented individuals with good memories simply cannot remember all of the data that might be relevant. Similarly, with the growth of material being published, it is becoming increasingly difficult for scientists to have a grasp of more than their own specialized field. So, knowledge management is increasingly important to support creativity.

A myth has developed that individual creativity results from a flash of inspiration and the metaphor of the light bulb – invented by the American Thomas Edison – has become inseparable from creativity. However, one element of the metaphor is the instantaneous way a bulb lights and, for many, this stands for how creativity happens: without precedent, or planning. The view that creative ideas emerge spontaneously originates from the romantic era, where poems and other great works of art were credited by their authors to moments of inspiration (for example, Samuel Coleridge claimed that he wrote his famous poem *Kublai Khan* in one attempt), rather than through hard work over a period. Closer scrutiny of the many similar stories about spontaneous creativity shows them to be untrue (and earlier drafts of the poem were found in Coleridge's



papers after his death). The quote at the beginning of this chapter from Louis Pasteur also indicates the role of knowledge and hard work in creativity, in contrast to pure serendipity.

Just as creative individuals are normally extremely knowledgeable and hard working, they might also be expected to exhibit definite personality traits. Much of the research looking for the typical traits of creative individuals is inconclusive and the search for *the profile* of a creative person is probably similar to alchemy. Csikszentmihalyi's work does show, however, that extremely creative individuals have 'complex personalities', by which he means that such people display contradictory traits. For example, they may switch quickly from being humble to being proud, introvert to extrovert, and traditional to being rebellious. This may make the job of managers harder but if this is the price to pay for more highly creative individuals, then it almost certainly is worthwhile. The work of

Csikszentmihalyi and others shows that managers should nurture the creativity of individuals by

1. Giving them full access to the knowledge domain in which they are working. This means ensuring that company research scientists visit the leading conferences in their field and even allowing them to spend time at universities each year. In service, it would mean having key individuals visit leading service companies in other sectors, to gain a different perspective.
2. Motivating them to develop a passion for the subject on which they are concentrating.
3. Providing the time for them to immerse, even indulge themselves in the issues. Initially the process of creativity is divergent, when ideas, information and alternatives are being collected. Then the process becomes convergent, as some possibilities are rejected. Providing sufficient time is often a very difficult point because of the pressure for results in business. Managers need to be aware of the importance of avoiding extreme time pressure, as this is detrimental to creativity.<sup>8</sup>
4. Avoiding uncertainty. For example, the prolonged threat of a downsizing has a massive negative impact on personal creativity.<sup>9</sup>

### Team Creativity and Culture

The level of creativity in an organization is not just dependent on individual creativity. Companies need to create a culture of creativity in which innovation project teams can excel. As this is intimately connected with the management of people (the fifth element of the Pentathlon) we will save our main discussion of this topic for Chapter 8 – Creating an Innovative Culture. The right culture for innovation is necessary; otherwise creativity levels will be low (see Mini Case 5.1 on PA Consulting). The vast majority of innovation projects involve teams. The lone inventor, striving to develop a successful product, is a rare phenomenon. (Although James Dyson, the inventor of the bag-less vacuum cleaner, worked in isolation on countless prototypes, before finding the right design.)

Research shows that nurturing team creativity is largely a question of avoiding barriers to creativity. Teresa Amabile of Harvard has conducted a number of studies and identified the key issues as

1. Matching the right group of individuals with the right challenge. Too often, the match of people to projects is poor, or the team is not diverse enough.
2. Giving teams the autonomy and the means to meet the challenge they are given but not the freedom to choose the challenge themselves.
3. Focusing discussions on defining the nature of problems; such discussions often lead to successful innovations.
4. Developing project strategy through discussions with the employees themselves, as this achieves 'buy-in'.
5. Making suitable resources available (including time and money). A certain amount of time pressure can be positive but team creativity plummets when unrealistic schedules set by management lead to mistrust and employee burnout.
6. Building teams with diversity, shared excitement in achieving the goals and a climate where the contribution of all employees is recognized.
7. Ensuring timely and appropriate supervisory encouragement. For example, if management takes too long to respond to team proposals, this has a negative impact on team motivation.
8. Guaranteeing support from the rest of the organization, particularly for innovation teams working under time pressure. Similarly, protecting teams from organizational politics is important.

#### Mini Case 5.1

##### PA Consulting Group – Tending the 'Garden' of Ideas<sup>10</sup>

'Creativity is a free spirit...it is an elusive subject to harness effectively into the delivery of business benefits'. With this philosophy, John Fisher, Technical Director of PA Consultancy Group's Technical Division manages nearly two hundred engineers, scientists and technicians in Cambridge, UK. The Division develops both product and process innovations for clients – organizations that often have encountered difficulties with product development projects. Fisher perceives his role as tending the 'garden' in which creativity can flourish. This requires leadership (including the communication of challenging goals); managing the politics to free the time for individuals to focus on the technical issues; providing excellent resources in terms of equipment, services and support; and providing access to information. The Division has been extremely successful in developing products and processes fast, even though this has often involved the solution of problems that others have failed to solve. As a result, the Division has been behind a number of hugely successful product innovations for well-known companies.

Researchers warn that very strong company cultures – *cults* – can decrease creativity.<sup>11</sup> Pressure for uniformity or elitism can block creativity, especially



openness to others' ideas. At the team level, management must avoid *groupthink*, when a team develops an unrealistic view of the issues and disdains opposing views. Strong leadership can make groupthink more extreme.<sup>12</sup>

Team diversity helps creativity. Process innovation in manufacturing companies has largely been the responsibility of quality teams. Groups of manufacturing employees meet regularly to identify opportunities for improving the efficiency of processes. However, if the group consists only of manufacturing people, the ideas generated may be too narrow. For this reason, the JCB company which designs and manufactures earth-moving equipment (with manufacturing operations in the UK and Savannah Georgia) always includes representatives from other functional areas in their manufacturing quality meetings. For example, a sales representative is responsible for stimulating discussion on which of the process improvements being considered is likely to have a direct positive impact on customers.

### Creativity Techniques for Innovation

Many creativity techniques can be used during innovation projects. The choice of which technique is most appropriate depends on the type of creativity needed (for example, normative or exploratory), and the number of individuals involved. J. Daniel Couger from the University of Colorado describes 22 creativity techniques, with recommendations as to whether they are best used with individuals or teams, and whether they can be used for exploratory or normative creativity.<sup>13</sup> The constant use of just *brainstorming* can lead employees to lose interest and so it is disappointing to learn that a major survey of executives still found that brainstorming was still the most popular technique for generating ideas.<sup>14</sup> So companies that are aware of the different techniques have two advantages: they can choose the most suitable techniques to match the issue at hand and provide variety.

Arthur Koestler wrote a classic book on creativity in the 1960s and his central premise provides a useful tool for innovators.<sup>15</sup> When we think, we do so using frames of reference – using particular ways of thinking (rules, habits, associative contexts and so on) that have been useful in the past. These are the mental equivalent of the physical reflexes and movements, which our bodies apply, unconsciously, to particular situations. Frames of reference and physical reflexes are highly efficient tools but can be difficult to shake off. According to Koestler, the creative act is bringing a new, previously un-associated, frame (F2 – Figure 5.1) to bear on a topic with an existing frame of reference (F1). Frames of reference are similar to the philosopher Thomas Kuhn's concept of paradigms: patterns and rules that define boundaries, and shared sets of assumptions. Creativity techniques bring a new frame of thinking and we will discuss five techniques that can be very helpful for innovation projects.

#### Brainstorming

The original and most widely known creativity technique is brainstorming, which was developed in the 1950s for use with groups. A group of people are

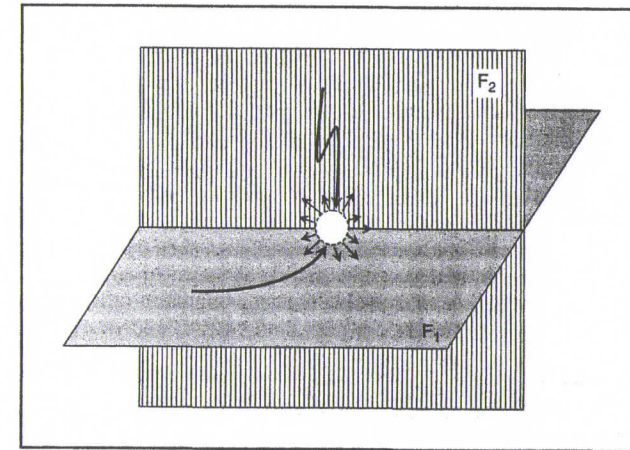


Figure 5.1 Creativity as the Intersection of Two Different Frames of Reference

asked to describe any ideas that come to mind as solutions to a problem (normative creativity), or as opportunities for new products, services of businesses (exploratory creativity). The ideas are written on a flip chart where everyone can read them and one idea leads to another. An experienced moderator typically records the ideas and reflects these back to the group to stimulate further discussion. The evaluation of each idea is suspended during the idea collection phase, so that potentially good ideas are not prematurely rejected (thus avoiding 'it will never work' judgements). An appropriate use of brainstorming would be, for example, to identify the reasons why certain customers are unhappy with a product whereas others are very satisfied.

Brainstorming is based on the assumption that people are naturally creative and that by deferring judgement on the quality of ideas until a sufficient quantity has been collected, means that some really good ones can be selected. One limitation of brainstorming is that certain people may dominate the discussion and so in the more effective variation *brainwriting*, ideas are written down by individuals before they are shared with the group.

#### Left-Right Brain Alternations

This technique ensures a 'whole-brain' approach to identifying an opportunity or solving a problem. Typical left-brain functions include speaking, writing, calculating, logic and deliberating, and so on. In contrast, our right brains control our abilities for intuition, spatial perception, art and visualization. A creativity task can be formulated to drive thoughts from both our left and right brains and two columns on a flip chart are used to summarize the contrasting ideas.



For example, the improvement of a service product can be analysed from a left (analytical) perspective, asking such questions as: What is the core product? How quickly is it delivered? What are the key performance indicators? In contrast, the right brain (emotional) approach would lead us to ask questions such as: How does the customer perceive our service? How do they feel about the service? The contrast between the insights gained from the left and right brain focused questions help to generate new ideas.

### Five Ws, One H Technique

This is a versatile technique that can be used at all stages of innovation. It helps enhance our understanding of a problem or an opportunity by asking 5 'W' questions ('who', 'what', 'where', 'when', and 'why?') and one 'H' ('how?'). Specific W and H questions are developed for the topic and the answers to the Ws tell us more about the issues. The answer to the H question provides ways to implement the ideas generated by the Ws. The technique is very useful for investigating reports of product problems.

A medical electronics company received a limited number of complaints that a widely sold blood pressure measuring device was not working properly. Investigation using the Five Ws One H technique helped understand the problem better. The 'where' and 'why' questions prompted an analysis of what was different about the hospitals that were filling complaints, compared with the majority of hospitals that had no problems. It emerged that the device worked well, except if the patient was shivering. The hospitals making complaints were found not to heat their recovery rooms (where patients are placed following operations), as a warm ambient temperature slightly slows the recovery from an anaesthetic. Most hospitals heat their recovery rooms to near normal room temperature. The H question was: how can the device be made to work when the patient is shivering? The answers to this led to improvements in the device and accurate blood pressure measurements in all conditions.

#### Mini Case 5.2

##### Nokia – Going to the Gemba<sup>16</sup>

One of the world's leading manufacturers of mobile telephones, Nokia, has recognized the importance of observation in understanding customer culture. The UK operation that is responsible for developing some of the company's products was aware that the Japanese market has different characteristics. Rather than employing a market research company, management decided that it was important for members of the new product development team to see the issues first-hand. Therefore, sales, marketing, R&D and managers were all paired up with Japanese colleagues. These pairs observed Japanese people using mobile phones in public places and gathered opinions, which meant that issues such as the delicacy of approaching people on the street had to be considered.

In Japanese quality management, the word *Gemba* means, 'where things actually occur; it is raw, untainted information'<sup>17</sup> and it is used to stress that managers must

spend sufficient time on the production floor, if they are to learn how to improve production efficiency. Nokia's use of the term *Gemba* is analogous to the way anthropologists talk of the *field*.

Sending new product development employees into the *Gemba* to conduct the market research had the advantage of widening commitment but most of the employees were not experienced in market research. Therefore, Nokia produced a 'Training Guide' for the team: this consisted of an introduction to the objectives of the research; an explanation of the importance of the *Gemba*, guidelines for observation; guidelines for approaching and interviewing people; and obtaining volunteers for focus groups. Following the procedures in the Guide, Nokia employees collected photographs of the locations where they made their observations; the answers to a semi-structured questionnaire (a contextual interview) and short field notes following a set format.

The Nokia case demonstrates three important issues. First, the importance of having market research conducted by the NPD team and not just by a market research company. Second, the need to provide clear guidelines for the team involved, to ensure that observations are conducted systematically and consistently. Third, the reluctance of Japanese people to voice their opinions to strangers shows that cultural issues need to be addressed.

From the information that Nokia have published, it appears that the primary limitation of their research was that those involved had no previous experience of systematic observation. Although the Training Guide was prepared, it is difficult to learn systematic observation without practice. Inexperienced researchers can learn much more from working with skilled observers who are coding video tapes of consumer behaviour. An important part of any ethnographic research project can be the training of the team. Often the best way is to have the most experienced researchers make the first visits and use the data collected as an intricate part of training of the rest of the team.

### Attribute Association

Attribute association can be used to solve a known problem with a product, process, or service (normative creativity), or identify new opportunities (exploratory creativity). The starting point is to create a list of the attributes of the product, service or process. This can be based on a company's internal views, or it can be based on market research exposing the customer's perception. For a vacuum cleaner, the list of attributes would include the ability to clean carpets, smooth surfaces, stairs, corners, and so on, plus other factors such as the manoeuvrability, design, and so on. Each of the product, service or process attributes is then reviewed using one or more of the approaches summarized in Table 5.1<sup>18</sup>; for example, can a useful attribute be multiplied?

The process of reviewing and modifying the attributes requires practice and there are no hard and fast rules for which of the approaches given in Table 5.1 is the most appropriate for a particular service or manufactured product. Complex products will most benefit from subtraction or task unification. Of course, the review of product attributes does not simply have to be conducted internally; observing users can give other insights (see Mini Case 5.2 on Nokia).



Table 5.1 Modifying Attributes

Approach	Explanation	Service and Manufacturing Examples
1) Modifying the nature of attributes	Also called <i>product morphology analysis</i> , this approach takes the main product attributes and sees how these can be modified.	<ul style="list-style-type: none"> <li>Home insurance normally covers the costs of repairs. The German Allianz Group has gone further and offers a home 'breakdown' service, with fast call-out of qualified tradesmen guaranteed for any household problem (see Mini Case 4.1).</li> <li>Originally, domestic coffee machines had a simple glass pot to hold the freshly brewed coffee. However, companies such as Braun have changed this attribute to a vacuum flask, which keeps the coffee warm until needed.</li> </ul>
2) Subtraction or simplification of attributes	Removing certain attributes may simplify a product and make it more attractive to certain segments. This is an attempt to prevent what some writers have called <i>feature creep</i> – the tendency for development teams to always add more features to products.	<ul style="list-style-type: none"> <li>Some mobile telephone companies have successfully marketed a 'receive calls only' contract, which is popular with parents who want to be able to contact their children but do not want them making outgoing calls.</li> <li>Not every subtraction attempt will be successful or positively perceived by customers. For example, the colourless Crystal Pepsi failed when it was introduced to the market in 1993.</li> </ul>
3) Multiplication of attributes	An existing product attribute is copied and offered, with a modification of the function of the repeated attribute, multiple times in the product. The multiplication leads to a specific benefit.	<ul style="list-style-type: none"> <li>A classic example is the Mach 3 razor from Gillette. The three blades all cut but the first two, which are set at different angles, drag across the skin to raise the beard for cutting by the second or third blade.</li> <li>A service example is Europcar's multiple rental agreement. Busy executives can purchase rental agreements of, for example, five days a month but these can be multiple rentals, such as one-day at five different airports.</li> </ul>
4) Division of attributes	This essentially looks at the product architecture and how physical or functional components are grouped together.	<ul style="list-style-type: none"> <li>In the automotive sector 'mechatronics' (the combination of software-driven electronics and mechanical components) is making a big impact. Companies such as DaimlerChrysler are moving previously mechanically controlled functions into software, to optimize vehicle performance.</li> <li>Dial4 Flight, an Internet retailer of travel and tourism services, has carefully divided its service augmentation between its website and its call centre to give a personalized service (see Mini Case in Chapter 3).</li> </ul>
5) Unification of attributes	Assigning new functions to existing attributes. This can, for example, also lead to simplification.	<ul style="list-style-type: none"> <li>The US lawnmower manufacturer Toro has designed a cutting blade that circulates and cuts grass into much smaller pieces. Therefore, the pieces can be left on the lawn and the need for a grass-box has been removed. Effectively, a mixture of task unification and simplification.</li> </ul>

Source: Goldenberg, J., Horowitz, R., Levav, A. and Mazursky, D., 'Finding Your Innovation Sweet Spot', *Harvard Business Review*, Vol. 81, No. 3 (March 2003), pp. 3–11; Altshuller, G., *And Suddenly the Inventor Appeared* (Worcester, MA: Technical Innovation Center Inc, 1996) and supplemented by examples collected by the authors.

## TRIZ

No discussion about the use of innovation and creativity tools and techniques would be complete without stressing the value of TRIZ, a creative form of problem-solving developed by the Russian Genrich Altshuller.<sup>19</sup> The acronym TRIZ is based on the four Russian words for the Theory of Inventive Problem Solving. Altshuller, who worked in the Moscow patents office, based his ideas on his study of patents, and the work has since it started in the 1940s analysed over 2.8 million international patents.

Patents document how particular problems are solved and looking at large numbers of patents allows particular patterns to be identified. First, patents can be grouped by the generic problem they are solving – for example, an automotive patent might be specifically concerned with engine temperature control but at a generic level it is concerned with cooling. Altshuller grouped patterns by generic problems and found that, based on the underlying physical properties of materials, there are typically a limited number of ways to solve a particular problem. So the first advantage of a TRIZ database is that engineers involved with finding a specific problem can look up all the generic ways to approach the issue. In this way, rather than relying on brainstorming (which is dependent on the knowledge around the table), problem-solving based on a TRIZ database ensures that no possible solution is forgotten and provides example ways that problems have been solved (in example patents). In explaining TRIZ we often say that using the database provides ready access to the knowledge of previous generations of scientists and engineers.

The second advantage of TRIZ is that design trends can be identified and so opportunities for improvement can be spotted. For example, design tends to start with straight lines and forms and, over time, more complex lines and emerge. Comparing the type of products in a particular industry against these trends can bring useful ideas. The Mars group uses TRIZ regularly and a good example is the packaging of the ubiquitous Mars Bar. The wrapper used to have straight lines and was sealed like a parcel. Consequently, it was awkward to open. Nowadays, the ends of the wrapper have a serrated edge, which means that they can be torn open easily.

The third way that TRIZ helps is by providing insights into how *design trade-offs* can be managed. Say for example, a particular component needed to be strengthened to withstand wear but could not be heavier. TRIZ matrices allow designers to look at the ways in which this particular trade-off and many others have been solved previously. Once again, the theory of creative problem-solving provides access to a body of knowledge summarizing millions of inventions. Somewhere, sometime, the technical problems facing a product development team have been solved previously and so learning from this can be quicker and more effective than starting from scratch.

The Cold War led to TRIZ being largely unknown in the West until relatively recently. Now, it is being widely applied as a way of finding quicker solutions to product design problems. Slowly TRIZ is also being adopted into the service



domain,<sup>20</sup> although currently there are no comprehensive databases of ideas available as there are for patents.

## MANAGING KNOWLEDGE

Csikszentmihalyi's work showed that creativity is dependent on knowledge. Over the past 20 years much has been written on *knowledge management* – how an organization can stimulate and effectively utilize knowledge. From this vast field, we have selected two topics that we think are fundamental for those responsible for managing innovation. These are the nature of knowledge, and how knowledge can be captured and transferred.

### Nature of Knowledge

Knowledge has two main forms: *explicit* and *tacit*.<sup>21</sup> Explicit knowledge (which is also known as *articulated*, or *declarative knowledge*) is formal and systematic, easily communicated and shared. It can be *codified* – summarized in a written or symbolic format that can be easily shared. Examples of explicit knowledge are instructions manuals, textbooks and service operations or manufacturing *standard operating practices* (SOPs). In contrast, tacit knowledge is hard to express, formalize or write-down. It is highly personal, often based on individuals' mental models (which they may not even be aware of themselves), and is usually taken for granted.

A common illustration of tacit knowledge is the master craftsman who can create a perfect artefact but cannot readily explain all of the steps taken, or the particular ways the materials are chosen, formed and worked. Master craftsmen have a high level of knowledge, most of which is not written down. Tacit knowledge is practical, context specific, and not easily shared as it is 'in the heads' of certain individuals. It can be very valuable to a company, as it is difficult to copy but, since it resides with individuals it is lost if they leave. Another example of tacit knowledge is the experienced cook who has a favourite dish that he or she can cook without weighing the ingredients or timing the stages of cooking. In order for the dish to be cooked by someone else, the recipe needs to be prepared, and the timings, weights and other details codified. Customers' tacit knowledge of how they use products can lead to breakthrough products (see Mini Case 5.3 on Miele).

The two types of knowledge reside in various locations within an organization. Databases, computer systems, publications and the Internet are repositories of explicit knowledge. Sometimes, however, what tends to be stored is information as opposed to knowledge. Information alone, without interpretation, recognition of its validity or experience is of limited use. Also, the sheer volume of data can sometimes limit its usefulness. In contrast, tacit knowledge resides with individuals, their expertise and heuristics ('rules of thumb'). Stimulating interaction between such individuals, including discussions on their 'routines for doing things' is a way for managers to stimulate tacit knowledge.

### Mini Case 5.3

#### Miele – Listen and Watch Teams<sup>22</sup>

The mother was observed carefully 'hoovering' her child's mattress three times. When asked why, she said, 'Because then I know it's clean'.

Seizing an opportunity is what a German household products manufacturer has done in recognizing the influence on their markets of the growing number of people with allergies. The Miele company has introduced a vacuum cleaner that indicates when the floor being cleaned is dust-free. A hygiene sensor at the nozzle has a 'traffic light' indicator, which turns from red, through amber, to green as cleaning progresses. This sensor is a breakthrough feature for the increasing number of people who have allergies: because it allows the user to know when a room really is clean, or that an allergic child's mattress is free of dust and house mites have been eliminated. Interestingly, the feature was not developed in response to an explicit customer request. Rather, it was the subtle recognition that people with allergies spent more time cleaning; often vacuuming several times just to be certain a child's room was dust-free.

The market research behind this product was conducted in close cooperation with the *Deutscher Allergie- und Asthmabund* (German Allergy and Asthma Foundation – DAAB), an association for people with allergies. Through an innovative approach to its market research, Miele not only recognized the need for a hygiene sensor but also identified an important new opportunity: products specifically designed for people with allergies. People with allergies also have to be careful with their washing. Consequently, Miele has introduced a new washing machine, which has a special programme for washing pillows and a rinsing process to remove detergent residues. In addition, a tumble drier has been designed to minimize static electricity, as it exacerbates allergies.

Both these products were based on market research and ideas generated from working closely with the DAAB and customer groups. As Olaf Dietrich, Marketing and New Product Development Manager Vacuum Cleaners says: 'We are in regular contact with users and have a "listen and watch" philosophy at Miele. By this we mean that we realize that it is essential for not only marketing but also engineers to actually see the issues first-hand. Only if you are present do you really understand the issues'. The links established with the DAAB and other similar organizations also mean that Miele has established a lead over its competitors and is making its innovations harder to copy.

Core to Miele's approach is regular and intensive customer contact and the application of marketing and technical knowledge. 'For us, market research is all about understanding the customer's real problems. Once we have identified these, we use cross-functional teams to determine suitable solutions', says Mr Dietrich.

To manage tacit knowledge to support innovation, four recommendations can be given:

1. R&D and other managers involved in new product development need to ensure that the learning from innovation projects is identified. Lists of lessons learnt can help but promoting informal interactions between teams and departments can spread the knowledge more effectively.



2. Certain key solutions, approaches and the like will need to be documented in a way that the organization does not lose vital information if individuals leave.
3. Customers' tacit knowledge needs to be recognized and captured.
4. When certain individuals have tacit knowledge that is vital, companies need to ensure that it is shared with colleagues.

### Capturing Tacit Knowledge

A leading researcher in the field of tacit knowledge has been Ikujiro Nonaka of Hitotsubashi University in Tokyo.<sup>23</sup> He recognized the importance of making tacit knowledge accessible, particularly in R&D settings, and identified transfer mechanisms such as *socialization* and *externalization*.<sup>24</sup> Tacit to tacit knowledge transfer is called socialization. The most commonly quoted example is the apprentice who over several years learns from the master through observation, discussion, and trial and error under the master's supervision. Once the apprentice has learned, their knowledge is also largely tacit. In an organization, managers can promote socialization by creating a work environment in which less experienced employees observe and learn from their most experienced colleagues. For example, some R&D departments have new project managers 'shadow' senior colleagues.

An example of converting tacit knowledge to explicit knowledge is music. Troubadours, the travelling medieval musicians, learnt both their music and texts through apprenticeships, travelling for years with older musicians. However, the sponsorship of Pope Gregory led to the development of an effective written notation. This enabled the spread of songs and music including the chants, which are consequently called Gregorian. Further developments such as the metronome allowed accurate capture of how fast the composer intended a piece of music to be played. Externalization is the name given to the process of converting tacit to explicit knowledge and this may require the development of new symbols and methods of codification, as was the case with music. Individuals with tacit knowledge may be reluctant to support the process of externalization because of the time required for this task. Evotec OAI, a German-owned provider of chemical services to the pharmaceutical sector, found that arranging informal weekly tutorials where their top scientists explained how they had solved specific problems, allowed experience to be externalized and passed on to newer colleagues. (This is also much easier than asking the most experienced scientists to document their knowledge in writing.) Metaphors, analogies and models are often effective means by which insider knowledge can be made understandable for outsiders. Our own research shows that engineers' knowledge can be stimulated by having them base their discussions of problems around metaphors and stories.<sup>25</sup>

Another key concept of knowledge management is *Communities of Practice* (CoPs). These are groups of people who share a common context to their work, use common practices, share identities and can provide the social context for

transfer of knowledge across organizational boundaries. For example, engineers form a community with a common background, similar experiences and ideas that can make the communication between engineers in different organizations more effective than between engineers and marketing people within one organization. CoPs are important as they can be viewed as the means by which companies can profit from their employees' exchange of knowledge with broader communities. For example, the ideas for a 'Graphical User Interface' passed through the community of engineers from the Xerox Corporation to Microsoft, where they finally were implemented in the ubiquitous Microsoft 'Windows'. Hallmark Cards, the US greeting-card company, has created what it calls 'customer communities of practice'.<sup>26</sup> Ideally, about 100–150 interested customers are linked via a website and encouraged to exchange ideas, comments, experiences and diaries. Hallmark's approach is a useful example of how Internet technology is being used to stimulate customer ideas. Similarly, Beiersdorf the German company which developed Nivea skin care products, uses its website to collect ideas directly from consumers and the idea of using virtual communities to improve NPD is gaining popularity.<sup>27</sup>

Capturing tacit knowledge from key employees is important, as is tapping customers' tacit knowledge on products and services. This latter point will be discussed later in this chapter, as we describe how to develop deep customer insights. Once knowledge has been captured, it needs to be transferred appropriately, to support innovation.

### Promoting Knowledge Transfer

Both internal and external tacit knowledge can be helpful in innovation. The knowledge that certain individuals, or groups of individuals, hold can be important in solving problems, be it technical or commercial. Customers have tacit product knowledge that needs to be tapped using sophisticated market research techniques. Although it is intuitively easy to understand what tacit knowledge is, it is more difficult for managers to take advantage of tacit knowledge that is internal to a company, or external.

An anecdotal study of product design consultants IDEO in California showed that it brokered knowledge through four steps.<sup>28</sup> First, by bringing together people with knowledge of different markets, countries, products and technologies, the chance of unique ideas emerging is higher. Second, ideas need to be kept alive and providing easy access to information is important but simple Internet databases are not sufficient. Collections of tangibles, prototypes, toys and multitudes of other items are kept prominently in the company's offices, to remind people of ideas and stimulate further ones. Third, IDEO focus on creating new uses for old ideas. Fourth and finally, constant testing using prototypes will show what works and what can be commercialized.

The best-known theoretical contribution to the knowledge management debate is organizational learning. This is 'the capability, which enables an organization to acquire and process new information on a continuous basis to elevate

FURT  
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S  
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knowledge and improve decision making'.<sup>29</sup> Peter Senge<sup>30</sup>, an expert on organizational learning, identifies five key elements of learning organizations. They

1. Promote and value the *personal mastery* (expertise) of individual employees. Recognition of individuals helps generate a high level of commitment to the organization and its learning.
2. Develop *mental models*, which illustrate the way in which an organization and its processes work. Drawing and discussing key processes helps discover new ways of thinking.
3. Promote *team learning*, so that teams continuously adapt successful practices from other teams, both internal and external to the organization.
4. Have a *shared vision*, which is the collective form of personal mastery. This stimulates the organization's learning, which is only possible if it deeply matters to employees.
5. Utilize *systems thinking*, the ability to understand the cause and effect relationships inherent in organizational processes. It is the cornerstone of organizational learning and interlinks the other four elements.

As more becomes known about tacit knowledge and its generation and transfer, it is likely that managers will be provided with more concrete tools and approaches.

## IDEAS AND INNOVATION

Innovations often fail. One study found that 34 per cent of new product developments do not fully reach their business objectives,<sup>31</sup> another study found the figure to be 90 per cent.<sup>32</sup> These studies clearly show that new products must be differentiated from existing ones. So product innovation is challenging and so is process innovation.<sup>33</sup> Companies that are successful at selling and implementing process innovations (for example, production line equipment) have been found to interact more intensively with their buyers.<sup>34</sup> Service products without original features (either in the service product or augmentation) have high instances of market failure. So, in product, service and process innovation it is essential to obtain effective customer input through market research.

### Identifying Customer Needs – Traditional Approaches

Traditional market research uses *surveys*, *focus groups* and direct questions to obtain customers' inputs. However, customers and users may not be able to recognize or articulate their needs, as their ability to comment on the products and services is limited by their prior experience. Requirements that customers find difficult to articulate are termed *hidden needs* (or *emerging needs* or *latent needs*). Increasingly companies have found that traditional approaches lead to disappointment, as the output of such market research leads to incremental improvements rather than the breakthroughs that management hopes for.<sup>35</sup> The

importance of new approaches to understanding customers has also been found in the service sector.<sup>36</sup>

In surveys, current knowledge of products, markets and customers is used to frame the questions to be asked and a suitable sample is determined. In selecting a sample, companies strive to identify a representative group of customers whose answers will be indicative of the whole market. It should be noted that in some markets the customers and users may be different persons and, in addition, the purchase decision may not be made by a single person but rather by what is called the *decision-making unit* (DMU) – this can consist of several people. In business-to-business markets particularly, the DMU can be complex as the individuals involved can have different expectations and requirements. Survey methodology is well known and will not be discussed here. Suffice to say that the design of a good questionnaire is not easy and, to be effective, questionnaires need to be *piloted*. For an overview of the crucial aspects of designing and using questionnaires, refer the classic texts on the subject by Oppenheim<sup>37</sup> and Dillman<sup>38</sup>.

Focus groups are small groups of customers or users who have sufficient experiences in common to discuss a specific topic, related to products or services.<sup>39</sup> Normally, they are invited to meet at a neutral location, the discussion topic is introduced and visual examples of the subject matter are often on display. The discussion is stimulated with a broad question posed by the moderator, who also ensures that all participants contribute equally, and that all topics are discussed. Focus groups mix survey and interview techniques with, often, observers being hidden behind a two-way mirror. Video recordings may also be used. Once the data have been collected, the analysis of surveys or focus groups leads to a list of product attributes required by customers. Traditional methods are useful but they need to be combined with techniques to identify hidden needs.

### Hidden Needs Analysis

The recognition of the limitations of surveys and focus groups has led to a range of enhanced techniques, which we will collectively term *hidden needs analysis* and Figure 5.2 shows how these techniques can be used in combination. The first point to note is that an organization consciously decides that it wants to identify radical product attributes and not just incremental ones. This decision means that, in addition to the traditional survey and focus group research, techniques such as *repertory grid analysis*, *empathic design* and *lead users* can be used in combination.

Ideas should be tested early on and in a practical way. Once potential product attributes have been identified, simple prototypes can be tested with customers and users. Such approaches allow intense interactions with customers; *experimentation*, *rapid prototyping* and attribute association all allow ideas to be further enhanced by obtaining customer reactions. This, in turn, leads to better product definition and then these product attributes can be prioritized using *conjoint analysis*. As shown by Figure 5.2, hidden needs analysis should lead to more



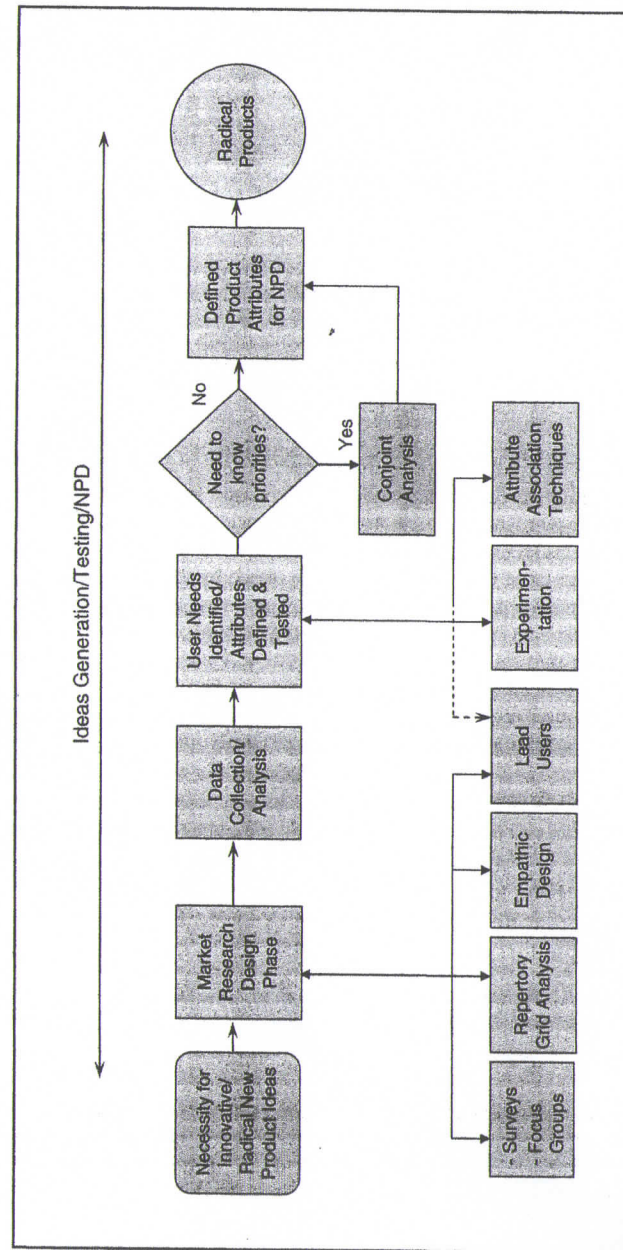


Figure 5.2 Hidden Needs Analysis in Product Development

radical products but there are no guarantees. There are an increasing number of published examples where companies have based successful product innovations on addressing hidden needs that they have identified (but this is an area where there is an urgent need for researchers to investigate how often such approaches lead to breakthrough products).

Surprisingly, the adoption of enhanced market research techniques has been slow. A survey of 70 Finnish companies producing business-to-business products showed the usage to be very low: 58 per cent of respondents do not use any technique and 27 per cent use only one technique.<sup>40</sup> The reasons these companies do not use innovative approaches to market research were management did not have the resources and perceived the data difficult to collect and analyse. Specialized consulting companies, such as IDEO in California, and PDD and WhatIf! in London, are the vanguard. We will look at each of the enhanced techniques in detail starting with repertory grid technique, so as to understand their potential for discovering hidden needs.

#### Repertory Grid Technique

Repertory Grid Technique is a powerful market research tool for identifying customer needs. The technique was developed for use in psychology. It enables interviewees to articulate their perceptions on products and services and taps their tacit knowledge. The technique is a structured form of interviewing which leads to a matrix of quantitative data – the *repertory grid*. Surprisingly, even though the potential of the technique has long been recognized, it is seldom used. This is partly due to the skills that an interviewer needs to conduct interviews.

To understand how the technique works, consider how an information technology (IT) service provider might use it. Such providers install and maintain computer networks for companies, including such tasks as upgrading personal computers and training employees in the operation of software. An IT service provider could use repertory grid analysis to gain creative ideas for improving its service offerings (consisting of both the service product and the service augmentation). Interviewees would be members of client companies who have experience of the services that they had outsourced (for example, purchasing managers). The interviewee would be asked to name six outsourced services with which they are familiar – these we will call service products A, B, C, D, E and F. The services are what are termed the *elements* of the test and each is written on a separate (postcard-sized) card, as shown in Figure 5.3(A). A wide range of services can be selected and Table 5.2 shows that the interviewee has selected a range, including facility management and financial auditing. The IT service provider's own service is also on the list, as is one direct competitor (Service E).

Note that the cards have been pre-numbered in a random sequence (5, 1, 4, 3, 2 and 6), to enable the selection of random sets of cards. From the figure it can be seen that the name of the first service ('A') has been written on the card numbered '5', whereas Service B is written on the card numbered '1'. After



**Table 5.2** The Augmented Service Offerings  
Chosen by the Interviewee

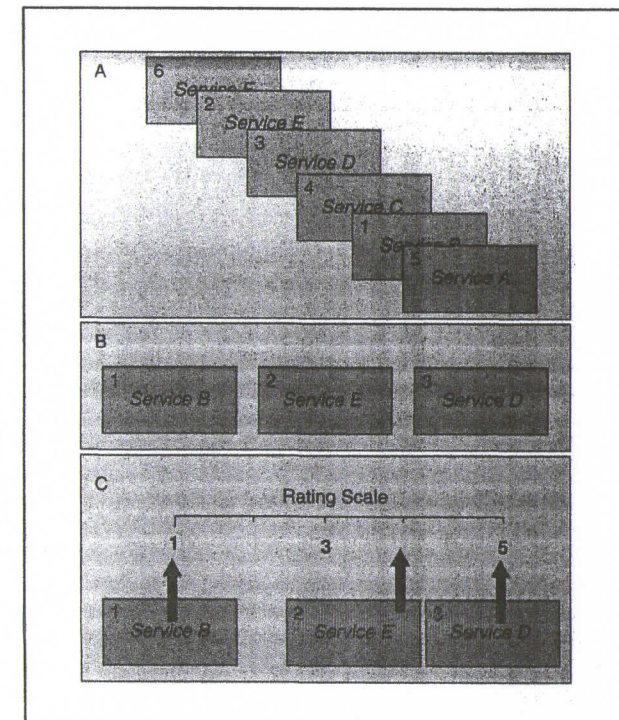
**Service Products**

Service A – Facility management (security and cleaning)  
Service B – IT Services (IT Service Provider)  
Service C – Data warehousing  
Service D – Financial auditing  
Service E – Competitor's IT Services  
Service F – Employee training seminars

the cards have been annotated with services, the interviewee is presented with a set of three cards (termed a *triad*). Figure 5.3(B) shows the triad consists of Cards 1, 2 and 3, corresponding to Services B, E and D respectively. The interviewee is asked: 'Why is using two of these services similar and different from the third?' A typical response – a service attribute – could be that two of the service providers are 'easy to work with, good communications', whereas working with the third 'is difficult'. The way in which the interviewee differentiates between the elements in the triad reveals how they perceive the different services. Each of the three services is then rated against this first attribute. As shown in Figure 5.3(C), this is normally on a 5-point scale on which Service B has been highly rated on 'easy to work with' (a '1'), whereas Service D was given a minimum rating ('5').

Further triads are used to identify further attributes. The interviewee is not allowed to repeat attributes and so each new triad elicits at least one new attribute. As each attribute is determined, the interviewee is asked to explain what they mean by, for example, fast response and they will give details such as timings and the actions they expect. All this is recorded, as it gives insight into the customer's needs. Following each construct, the interviewee is required to rate all the services against it using the same 1–5 rating scale. These ratings form the repertory grid, as shown in Figure 5.4.

In Figure 5.4, the six elements of the test – Services B to F – are shown across the top of the grid. Down the side are the attributes identified during the interview. The stars around the ratings indicate which cards were in the triad that elicited particular attributes. For example, the first attribute was elicited using a triad consisting of Cards 1, 2 and 3 (indicated by the ratings with stars: \*1\*, \*4\*, \*5\*). It can be seen that the Service B is rated as '1' ('easy to work with, good communications') but Service D is difficult to work with and received a rating of '5'. Looking at the ratings, it can be seen that on the attribute 'fast response' Service C is rated mid-scale ('3') but rated as poor ('5') on the attribute 'absolutely reliable service (guarantee)'. The ratings tell us not only about how an interviewee perceives services; they also give us information on the importance of particular attributes. For example, the ratings on the attribute 'clearly defined service product' are not as widely spread (they only range from 1 to 3) as those for 'good value for money' (where the ratings range



**Figure 5.3** Example of a Repertory Grid Interview

A) The Elements of the Test – Services – Written on Cards; B) The First Triad presented to the Interviewee; C) The Rating of the Services in the First Triad

from 1 to 5). This shows that this latter attribute differentiates more strongly between the elements. Hidden needs tend to be indicated by low ratings for all elements.

The grid can also be used to derive a *cognitive map* of an interviewee's perceptions of products and services. Deriving and interpreting this map is beyond the scope of this discussion but it can give further insights for product and service designers. Further details can be found in the book *Essential Skills for Management Research*.<sup>41</sup>

Repertory grid technique can also be used to generate ideas for manufactured products. The Hewlett-Packard Medical Products Group first used repertory grid interviewing over ten years ago and it helped the company identify the emerging importance of product attributes such as 'easy to set up' and 'easy-to-clean' in the medical equipment market.<sup>42</sup> A focus was placed on these factors in all subsequent developments. Mini Case 5.4 on Equant gives an example from the service sector.



ATTRIBUTES	CARD 1 Service B	CARD 2 Service E	CARD 3 Service D	CARD 4 Service C	CARD 5 Service A	CARD 6 Service F	POLES
Easy to work with, good communications	*1*	*4*	*5*	5	1	1	Difficult
Fast response to problems	1	4	5	*3*	*4*	*4*	Slow
Professional employees	*2*	5	*3*	4	*1*	1	Little knowledge
Clearly defined service product	3	*2*	1	*3*	1	*1*	Poorly defined ...
Service is good value for money	*3*	*3*	5	1	*5*	5	Expensive
Absolutely reliable service (guarantee)	5	4	*4*	*5*	5	*5*	Difficult

Figure 5.4 A Repertory Grid on Outsourced Services

## Mini Case 5.4

## Equant – Repertory Grids in Practice

One company that has used the repertory grid technique extensively is Equant, the world's largest data network provider – offering network design, integration, maintenance and support services in over 180 countries. The company always placed a high emphasis on being 'customer-focused' and regularly reviewed the results of customer satisfaction surveys, comparing their performance to competitors'. Although such surveys provided useful 'benchmarks', Equant recognized that they did not measure performance against the criteria, which were most important to customers.

In late 1990s, the company offered excellent network performance and global service availability. Consequently, it received better ratings than its competitors in surveys and this could have led to complacency. However, a project was launched to investigate whether there were aspects of service quality that were important to customers but were not covered by the surveys. Liam Mifsud, Business Support Manager at Equant, designed and conducted repertory grid interviews, in which the elements of the grid were a range of the customer's current service providers. Interviewees (IT Directors and Managers) were asked to name nine suppliers that their companies did business with, and these elements were presented in triads. The constructs elicited typically included a wide range of service quality criteria (far wider than those covered by the customer satisfaction surveys).

The results showed that customers' perceptions of service quality were not solely based on technical measures (such as coverage or network performance). Equant were able to identify ten new criteria on which their performance was being judged. For example, customers emphasized intangible elements of service quality, such as the responsiveness and flexibility of account management teams, and the quality and competence of the support staff they came into contact with. 'This provided us with a valuable means of understanding the changing needs of customers', says Mifsud.

## Empathic Design

Dorothy Leonard-Barton from Harvard Business School has promoted empathic design and defines it as 'the creation of product or service concepts based on a deep (empathic) understanding of unarticulated user needs'.<sup>43</sup> The terms *ethnographic* or *anthropological* market research are also sometimes used, indicating that the data collection and analysis methods are largely drawn from these disciplines. The foundation of the technique is *systematic observation* but it also includes *discrete observation*, *contextual interviews* and what we will term *empathy building*. Empathic thinking should lead organizations to design products and services for people in developing countries and not just the affluent Western consumer (see Mini Case 5.5 on SEWA).

## Systematic Observation

This technique assesses the use of products directly, rather than relying on customers' reported perceptions (as, for example, are derived in surveys).<sup>46</sup>



## Mini Case 5.5

SEWA Banks – the Availability of Finance<sup>44,45</sup>

It is a shocking statistic but more people in India have to live on less than \$1 a day than the entire population of the US. The cash-poor segment of the market is ignored by institutions in many countries but the emergence of India as a powerhouse for low-cost innovation is changing views. The 'bottom of the pyramid' or 'base of the pyramid' market as it is called is now attracting significant interest from companies. However, to successfully develop products that meet the needs of such customers will require companies to develop a deep understanding of the people in developing markets. Innovations in products and services are starting to be offered that until recently would have been thought unimaginable. In products, the Tata Nano car is poised to be a low-price breakthrough but, in some ways, it is in the heady world of finance that even more dramatic changes have taken place.

Microfinance – small loans for very poor people – has been very successful through the Grameen Bank in Bangladesh and SEWA in India. The SEWA Bank is a by-product of the Self-Employed Women's Association (SEWA), and it specializes in loans specifically for women, as women have been found to utilize loans more effectively than men and save some of their earnings. The Bank has a membership of over 10 million women in 7 Indian states. Enabling poor people to save and borrow has allowed many small businesses to flourish and the Bank now offers a wide range of services.

Microfinance is poised to develop further. As low-cost ATM technology becomes widely available (through Internet kiosks known in India as *sanchalaks*), insurance and other financial services previously unavailable to the poor will also enter the market. And as the *sanchalaks* and other IT solutions proliferate (for example, Vortex Engineering, an Indian technology company, has designed an ATM that does not need air conditioning and comes at a quarter of the normal cost of a terminal), access to healthcare and other services is likely to improve for the poor.

Systematic observation is time-consuming, the analysis is complex and difficult to learn, and significant preparation is needed.<sup>47</sup> It is for this reason that market research companies are increasingly hiring ethnographers, whose training enables them to observe and interpret effectively (that is accurately, unambiguously and in an unbiased way).

The key to effective observation is the preparation of a good *coding scheme*. Such a scheme is based on the research question: what is the observer looking to understand? Usually, in product innovation studies, observation aims to understand how customers use products in their day-to-day environment and to identify the unarticulated problems they face with these products. For example, a manufacturer might watch housewives operating washing machines in their own homes and this would yield a large amount of data on where (in the house), how (the process), and when (time of the day) washing machines are used. In the service sector, observations can be used to determine the typical stages of consumption of a service. The coding scheme gives the observer points to watch

for and should prevent them missing key actions. This is particularly important, as the clues to unarticulated needs may be non-verbal.

Table 5.3 gives a generic coding scheme for observation and has seven categories of data: from the observed triggers for product usage up to the unarticulated needs. The table gives the main types of events to look for and the additional columns can be annotated with the timings of when these are observed and additional notes. It can be seen that the seven categories of data force the observer to not only look at how the product fits into the user's overall environment but also to look for signals that indicate unarticulated needs. For example, identifying the triggers for use can give insights. For a vacuum cleaner, the trigger for

Table 5.3 Generic Coding Scheme for Observational Studies

Data categories	Events to look for	Observed?	Timings	Notes
1) Triggers for acquiring the product or service	• Why, when and how?			
2) Triggers for product usage	• Who, what, where, when, why, how?			
3) The environment	• Physical layout/objects • Actors • Activities/events • Time sequence			
4) Interactions with user's environment	• Physical interactions • Social interactions			
5) Product usage	• Wasted time • Doing things right • Doing things wrong • Misuse • Confusion • Dangerous situations (for example, physical or data)			
6) Intangible aspects and unarticulated needs	• Emotions • Frustration and wasted time • Fears and anxiety • Linguistic signals • Extralinguistic signals • Non-verbal signals (for example, body language) • Spatial signals			
7) User customization	• User modifications of the product • User modifications of the (normal) process			

Source: Compiled by the authors from Leonard-Barton and a variety of other sources.



use could be the weekly clean of rooms, or something spilled. The latter trigger for use brings different requirements such as speed, which may influence product design. (The Black & Decker Company created the well-known hand-held 'Dustbuster' vacuum cleaners to address this need.)

As indicated by Table 5.3, frustration with services or products can indicate that a current design does not meet the user's needs, or it may indicate a poor user interface. A good observer will look for signs of frustration such as subtle *extralinguistic* signals (for example, the speed and emphasis in speech), *non-verbal* signs such as body language, and *spatial signals* (for example, the proximity of a user to others or objects). Another clue to unarticulated needs can be that users have modified the equipment to better meet their needs. Users may also modify their working pattern to get around the limitations of current products or services. Due to the multidimensional nature of good observation, often the best solution is to make video recordings, which can be viewed offline by a number of people all looking for the different clues. The disadvantage of video recording is that it may influence the user's actions.

#### Mini Case 5.6

##### Clarks – These Boots Are (Really) Made for Walking<sup>48</sup>

Clarks Shoes has been renowned for the quality and comfort of its products for over 175 years. The company was aware that the market for leisure footwear was significant and growing fast, and decided to enter what was for them a new market – walking boots. As this was a market about which they had no detailed knowledge of customer needs, they worked closely with PDD, a London-based market research consultancy. Product Manager Chris Towns said, 'I needed to understand the buying habits, end use and expectations of our new consumer. Understanding the motivations of walkers can only be guessed at from within the confines of your own office'.

PDD specialize in ethnographic studies and they conducted contextual interviews with walkers in UK national parks, home interviews with people who were members of walking and rambling clubs, and observed customers buying walking boots. The insights obtained from this market research allowed Clarks to clearly identify their target segments and, for each of these, to understand customer priorities. For example, 'comfort', 'fit' and 'safety' were quickly identified from interviews as important product attributes. However, the contextual interviews in the national parks allowed the design team to understand the real meaning of each of these terms and develop product characteristics to meet them. Much of the development involved experimentation with prototypes and this was conducted directly with walkers. Similarly, systematic observation of customers in shops found that they always feel the tongue of walking boots before they tried them on. Therefore, it appeared that the tongue was a feature of a boot that customers closely associated with comfort. This insight led the Clarks team to produce a particularly well-padded tongue in their final product. The Clarks range of 'Active' walking boots has been well received by both hobby and professional walkers and ramblers and is selling well.

The massive amount of data collected in systematic observation must be analysed and summarized in a form that is useful to management. New technology is helping here and the market research consultants PDD in London produce databases of key video clips, categorized by customer segment, for their clients. This database can be made available on a company's intranet to any department involved in product development. This helps to spread the understanding of the customer's world throughout the innovation project team (see Mini Case 5.6 on Clarks Shoes).

Another approach to analysing observations is to identify typical scenarios of how products are used, with associated problems and issues. Descriptive statistics on the number of times particular events occur, for example, can also be a useful way of summarizing data. Simple drawings and storyboards can also be used to summarize triggers for use and problems encountered. Storyboards are useful communication tools with both users and internally, to help the whole of the NPD team understand users' needs.

#### Discrete Observation

This approach, in which users are observed without their knowledge or permission, is only viable for consumer products and services that are used in public. For example, Nokia in Japan have had employees observe how users operate their products in public. Similarly, car manufacturers have built miniature cameras into cars at shows to observe how potential customers react to their new products. Using discrete observation raises ethical issues and the type of usage that can be discretely observed might not be typical. As discrete observation often deliberately eavesdrops on users' conversations, it has been colloquially dubbed capturing 'the murmur of the customer'.<sup>49</sup> It should be kept in mind that people normally quickly become aware that they are being observed and often react negatively. Obtaining permission in advance is safer.

#### Contextual Interviews

Contextual interviews are conducted in the user's environment but observation and a number of semi-structured questions are used, to understand the situation in which products are used. Questions collect background information, and then stimulate users to describe their actions. Typical questions are: 'Can you please describe what you are doing?' and 'When is that necessary?' Essentially, this produces verbal data on product usage that might not be generated in pure observation. Having people describe their actions can also unearth their tacit knowledge. Once again, video recording is commonly used. Contextual interviews are particularly useful for gaining insights into how the customer feels during the service delivery process and gaining ideas for improvement.

The London consultancy WhatIf! has made contextual interviewing easy for the manufacturers of consumer products, by negotiating access to all of the residents in one (long) street in Birmingham. All of the houses in 'The Street' can be visited with minimal notice and product managers have been able to both



observe their products in use and ask questions. Intel has a number of projects which make use of contextual interviewing and employ a team of ethnographers, sociologists and behavioural scientists based in Oregon,<sup>50</sup> responsible for identifying the social backgrounds to product usage.

### Empathy Building

Most authors concentrate on the data collection and analysis aspects of empathic design. However, the other side is the need to ensure that product designers develop not only an understanding of customers and users but also fully empathize with them. As yet, there is no formal methodology for this but a number of examples from industry demonstrate the approach. When the Ford Motor Company developed their Focus model, one target segment was elderly people. In order to get the engineers to understand the difficulties that older people have in getting into and out of cars, designers wore padded suits that reduced their ease of movement and simulated the restricted movement of later life. Similarly, a mobile telephone design team also working on a product for elderly people had its engineers wear thick gloves and glasses smeared with Vaseline for a week, to help them understand how difficult it can be for pensioners to operate today's products. No doubt in coming years the way in which companies attempt to generate true empathy will develop further. It is a case of finding ways in which the designers can 'step into the customer's shoes'.

### Lead Users

Another approach to uncovering hidden needs was developed by Eric von Hippel at MIT. *Lead users* are groups of customers or users that face more challenging requirements than most of the current marketplace (see Mini Case 5.7 on Lego). Their needs can be ahead of the market, by months or by years but they become mainstream over time. As the market vanguard, lead users face urgent, challenging needs and can benefit significantly from solutions to these. One word of caution is necessary – the theory on disruptive technology discussed in Chapter 4 shows the drawbacks of solely concentrating on existing customers needs. Organizations need to be cautious because extreme needs might not be interesting for mainstream customers. However, if applied correctly, lead-user technique looks at the needs of demanding users, collects ideas from users of similar products and services in other markets, and checks the mainstream market for the relevance of the ideas generated.<sup>51</sup>

In contrast to traditional market research, where the sample is chosen to be representative, lead users face particular issues and are not representative of normal users. The selection of a lead-user group normally follows four steps. First, a screening process is used with existing users to identify which of them have more demanding needs. Figure 5.5 illustrates the process in which the starting point is screening normal users. From these, the *extreme users* are at the top of what can be perceived as a pyramid of users. They are extreme in terms of the demands

### Mini Case 5.7

#### Lego – Mindstorming Better Product Ideas<sup>52</sup>

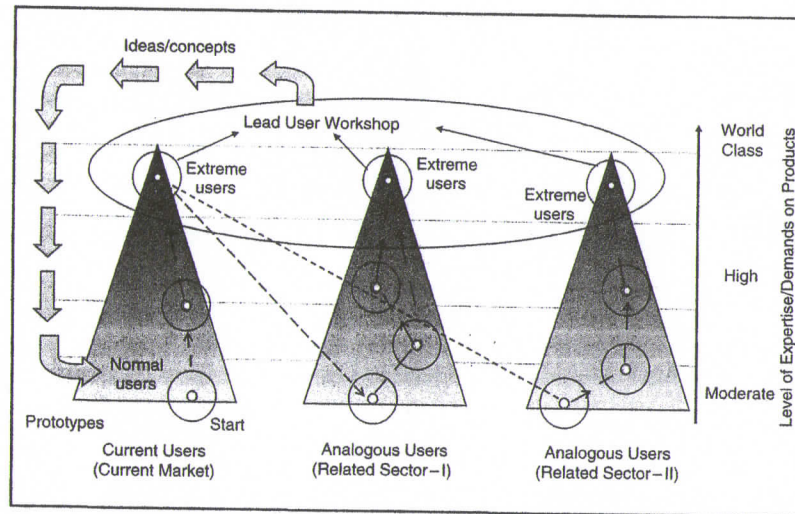
Since its introduction in 1998, the Lego Mindstorms robot kit has been a huge success, selling upwards of 40,000 units a year. The kit includes a large robot brick that can be used in combination with a range of motors, lights, bricks and sensors to build highly intelligent devices – for example, a robot that can manipulate and solve Rubik's Cube. Writing the control programs for such devices is a complex and challenging task, which is conducted on a laptop. The market for Mindstorms has developed into two distinct segments: parents buying the \$200 kit for teenagers hooked on engineering; and adult enthusiasts ('geeks') who love programming in their spare time. Geeks love to exhibit their creations at the annual Lego 'Brickfest' conference.

When Lego decided to improve the Mindstorms product, they turned their attention to the geeks and chose to involve some of them in the new product development from a very early stage. After signing a non-disclosure agreement, four geeks were invited to exchange their ideas about the existing product in a secure chat room, hosted by Seren Lund, the director of Mindstorms. Over the next year, the four lead users were in regular contact with Lego, giving a wealth of ideas about how to make significant improvements to Mindstorms. Involving the four enthusiasts at such an early stage led Lego to develop a very different product, based on their suggestions. The new product, which was introduced in August 2006 looks very different and is not backwards compatible. The new robot brick has more computing power, uses an improved programming language, and comes with a vastly improved array of motors, sensors and (new style) bricks. Interestingly, although the four dedicated enthusiasts were fundamental to the project and had a very strong influence over the final design, they were not paid by Lego – the prototype kits they were given, the peer recognition they received, and the opportunity to influence the new product were enough motivation for them.

In the original Mindstorms development, Lego had learned the difficulties in managing a project including electronics and software (both of which are a mile away from plastic bricks). Therefore, making radical improvements to the Mindstorms software was outsourced. The shock came when within weeks of the product being introduced, a Stanford graduate had reverse-engineered the robot brick and posted all his findings about its control and software on the Internet. Lego considered legal action but decided that this would be counter to the spirit of Mindstorms. Now the software licence that comes with every kit includes a clause allowing hacking. Consequently, the worldwide community of Mindstorms enthusiasts has grown fast and Lego's philosophy of deeply involving customers in NPD is here to stay.

that they place on products or services and also, normally, in their expertise in dealing with the particular challenges they face. For example, extreme users may have the ability to modify standard products or processes in order to cope with the particular challenges of their working environment.<sup>53</sup> Once the extreme users have been identified, the important next step is to identify analogous fields where similar but even more extreme challenges are faced than the ones in the current market.





**Figure 5.5** Selecting a Lead User Group

Source: Adapted from von Hippel, E., Thomke, S. and Sonnack, M., 'Creating Breakthroughs at 3M', *Harvard Business Review*, Vol. 77, No. 5 (September–October 1999), pp. 47–57.

To understand the process, consider the example of 3M, where lead users helped develop improved medical drapes. Drapes are adhesive films applied to the skin to minimize infections during surgery. The key attributes of the product were discussed with normal users – these were adhesion to skin and infection prevention. The discussions also identified that an increased risk of infection was a worrying trend in many hospitals. Next, extreme users were identified as surgeons who had to deal with higher risk of infection than in normal hospitals. Here both military field surgeons and surgeons working in developing countries with lower hygiene levels were consulted. Discussions with these extreme users identified two related sectors. The problem of infection is also an issue for veterinary surgeons, who have to operate on animals in non-hygienic environments and have problem fixing drapes on fur and hair. Finally, an unusual second set of *analogous users* was identified – Hollywood make-up artists, who have to attach masks to skin.

Extreme users from the current market and those from related sectors form the full lead-user group. For each of the lead users identified, techniques such as observation and contextual interviewing should be used to understand their working environment and issues. One of the advantages of working with analogous users from related sectors is that they normally do not mind sharing their experience, as competitive issues are not involved, and so it is normal to organize a workshop with the lead-user group. This is used to not only tap their individual expertise but also to learn from the discussions that result from bringing together users from what can be very different sectors and backgrounds (referring back to Figure 5.1, this can be seen as the bringing

together of different frames of reference). The discussions are moderated and produce ideas for products that address the challenging needs lead users face. The development of these ideas into prototypes can also be conducted in close cooperation – called *co-development* – with the lead users, before the products themselves are tested with normal users. Hilti, a European manufacturer of industrial mounting equipment has found that the combination of a workshop and co-development was particularly effective and less expensive than their normal market research.

## Experimentation

Users are often unable to describe the sort of product solutions they require, as they do not have sufficient technical knowledge. A creative exchange of ideas between the user (their needs) and the designer (potential solutions) is needed.<sup>54</sup> This needs to be an iterative process, as potential solutions need to be tested and modified to be effective. Therefore, it is useful to produce both *physical* and *virtual prototypes* that can be tried out and discussed by users and customers. It is also sometimes called *co-development*, as noted earlier, and takes advantage of the much-improved technologies for the production of prototypes. Whether it is stereo-lithography development of physical models, computer simulations of car crash scenarios, or virtual reality mock-ups of products, which allow users to interact with them, there are many possibilities to make prototypes. Co-development is also being adopted by the service sector, as customer inputs are critical to good service product design. Allowing customers and users to try and test products at an early stage means that it is still possible to make changes to the final product or service design (for ideas on how this can be implemented, see the section on *Agile Project Management* in Chapter 7).

## Virtual Communities

The worldwide web has enabled groups of people with common interests to exchange their ideas easily and such virtual communities are being tapped by companies looking for ideas and even help with product development. *Online communities* have been defined as a group of customers that have a high level of interest and knowledge about a particular group of products.<sup>55</sup> At its simplest, the use of online communities involves online surveys that customers can voluntarily complete and which can give insights into their needs (obviously such questionnaires have limitations such as their validity). However, a range of interactions are now being used, from interactive question-and-answer games (which are designed to gain understanding of how products are perceived and used), to *user design software*, where customers can participate in the design process. *Open source software* is a prime example of where users and customers are intimately involved in product development but other examples are emerging. Facebook was able to have its website translated into different languages by allowing users to do the work and video game companies have also had their customers help in major development projects.<sup>56</sup> The term *crowdsourcing* is the popular term now



being applied to the use by companies of virtual communities. One of the main advantages to web approaches are that they can tap the collective intelligence of users<sup>57</sup> and so it is an emerging type of market research that is likely to be an important complement to the other methods we have described.

### Identifying Priorities – Conjoint Analysis

Essentially all of the techniques discussed up until now identify product or service attributes. Once these are clear, the priorities from the perspective of the customer can be determined using conjoint analysis, as indicated on Figure 5.2. Conjoint analysis (or *stated preference technique* or *trade-off analysis*) is one of the more widely applied scientific approaches to market research. Provided the product attributes have been appropriately elicited from customers, conjoint analysis is a very useful method for understanding the *utility* of each of them. Conjoint analysis can be used in the service sector to understand the trade-offs that a customer is willing to make between elements of the service product and service augmentation.

There are three main stages in conjoint analysis:

1. Identifying characteristics of each of the product attributes and hypothetical product descriptions;
2. Interviewing a suitable sample of customers;
3. Calculating the customer's perceived value of each attribute (the utility).

To understand this, we will consider the example of the development of a new laptop computer.

Various methods will have been used to identify product attributes and hidden needs. Let us assume that six attributes were identified in market research with business users: (1) Display size (2) Hard disk capacity (3) Processing speed (4) Physical size and weight (5) Connectivity (ease of integration with other devices) and (6) Price. An important question during product development is: on which of these attributes does the customer place most value? Only with this information can development priorities be effectively set. For example, how much effort should be invested in developing a large screen compared with attempting to reduce the overall weight?

The first stage involves the identification of levels for each of the attributes and the typical range of values of existing products. For example, the weight of a laptop is typically around 3 kg. Once the attribute measures and their ranges have been determined, the next stage is to prepare descriptions of a hypothetical set of products, as shown in Table 5.4. Naturally, attributes change over time and in a fast-moving market such as laptops, the price and performance will need to be checked regularly. There are many possible combinations of attributes and so many hypothetical products can be developed, although only three (Product A, Product B ... Product n) are shown in the table. The number of hypothetical products that need to be considered depends on the number of attributes and their possible levels. For example, with six attributes, each with at least three

Table 5.4 Attribute Levels

Product attribute	Product A	Product B	... Product n
1) Display size	14 inch	15.4 inch	17 inch
2) Hard disk capacity	400 Gbyte	320 Gbyte	250 Gbyte
3) Processing speed	2 × 2.26 GHz	2 × 2 GHz	2 × 2.4 GHz
4) Physical size and weight	3.5 kg	2.5 kg	2.1 kg
5) Connectivity	WLAN, network and internal modem cards. 3 USB.	WLAN, network card, infra red connections. 2 USB.	WLAN, 4 USB, multiple interfaces.
6) Price	1349	849	1799

levels (as shown in Table 5.4), results in  $3^6 = 729$  theoretical combinations (but far fewer will be used in data collection).

The next stage is to interview customers and to present them with alternative products. In the so-called *pairwise* version of conjoint analysis, the customer would be presented with simplified descriptions of Products A and B and would be asked: 'Which do you prefer?' Each product has advantages and disadvantages; although Product A has a bigger hard drive, it is more expensive than B and has a smaller display. Therefore, the customer makes trade-offs between the values of the attributes in choosing their preference. Next, the customer is presented with another two products and asked the same question. The process of presenting the products and collecting answers is made easier by conjoint analysis software packages (such as the widely used ACA developed by Sawtooth Software), where this is automated and many researchers now administer conjoint analysis via the Internet. The sample of customers to be interviewed needs to be representative of the target market.

The interviews collect a significant amount of data on how customers view attributes and make trade-offs. Conjoint analysis software takes this data and uses mathematical principles to determine the value or utility a customer places on each attribute. Figure 5.6 shows the typical output of conjoint analysis, for the attributes speed and hard disk capacity. A graph of the utility versus the attribute level is shown and the slope of this graph indicates the importance of the attribute. For example, the faster speed appears to be important to customers to a degree, as the  $2 \times 2$  speed has a lower utility than  $2 \times 2.26$  GHz but  $2 \times 2.4$  GHz speed is not perceived as significantly better. But the hard disk capacities of 250 and 320 Gbytes are not perceived as anything like the 400 Gbyte.

Utility graphs can be derived for all attributes and they give an understanding of how customers make their trade-off decisions, which in turn allows product development decisions to be made more effectively. In addition, analysis of the results pertaining to price can allow pricing decisions for new products to be



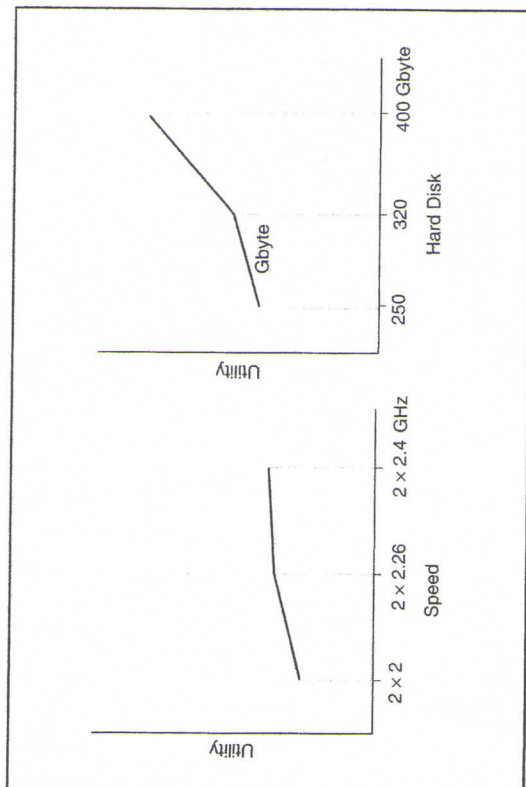


Figure 5.6 Conjoint Analysis Utility Graphs for a Laptop Computer

made. For readers who want to know more about conjoint analysis, it is recommended to consult the textbooks of Carroll et al.<sup>58</sup> and Gustafsson et al.<sup>59</sup> Referring back to Figure 5.2, conjoint analysis is shown as the last step in using market research for improved product development. It should be stressed that although conjoint analysis is a very effective method, it is critically dependent on the identification of product attributes that are pertinent to customers (including hidden needs). Conjoint analysis is nowadays also being applied via the worldwide web.

### Choosing the Correct Approach to Market Research

To help choose the most appropriate approaches for a specific piece of market research, Table 5.5 gives the advantages and limitations of the seven techniques discussed in this chapter. To achieve effective results and uncover hidden needs, a combination of techniques is almost always needed.

For example, one of Robert Bosch's business units which designs and manufactures production line equipment used observation of operators working in their customers' factories and repertory grid interviews, thus gaining insights into product requirements. A survey was then used to collect data from a representative sample of users and the results are now being incorporated into a new product design. Real customer insights are often the result of using a blend of the techniques.

Table 5.5 Different Approaches to Identifying Customer Problems and Requirements

Approach	Overview	Applications/Advantages	Limitations
1) Survey Research	<ul style="list-style-type: none"> <li>Use of direct questions to determine customers' views on what they think are their requirements.</li> <li>Open-ended questions allow respondents some freedom to give creative ideas.</li> </ul>	<ul style="list-style-type: none"> <li>Widely used method of collecting customer inputs.</li> <li>Can be applied as a postal survey, telephone or direct interviews.</li> </ul>	<ul style="list-style-type: none"> <li>Questionnaires are often thought to be easy to design. In fact, it is the opposite and many surveys are poorly designed and consequently produce equivocal results.</li> <li>Response rates are often low, which raises the question of whether the results are representative of the market.</li> <li>Respondents may find it difficult to articulate their answers to open questions.</li> <li>The somewhat artificial nature of the situation can limit the effectiveness.</li> <li>Particular individuals can dominate the discussions. Therefore good moderation is required.</li> <li>Some companies try to save costs by using inexperienced moderators; this wastes the potential of focus groups discussion.</li> </ul>
2) Focus Groups	<ul style="list-style-type: none"> <li>Small groups of selected users or non-users, paid to discuss product needs.</li> <li>Discussions are stimulated by an initial question and by having example products in the room.</li> <li>A moderator guides the discussions.</li> <li>Market researchers often observe the discussions through a two-way mirror.</li> </ul>	<ul style="list-style-type: none"> <li>Help to define customer problems and give background information, rather than identifying solutions.</li> <li>In vitro discussion of products (that is users are taken outside their normal environment).</li> </ul>	<ul style="list-style-type: none"> <li>The technique is not well known.</li> <li>Interviewees need to have experience with 5-6 different products and services to make the technique work.</li> <li>Interviewer needs specific training in the technique, although it is easy to apply.</li> <li>Time-consuming interviews.</li> </ul>
3) Repertory Grid Technique	<ul style="list-style-type: none"> <li>Users of customers undergo a structured interview.</li> <li>Interviewees are stimulated to identify product attributes by being asked to compare products and/or services.</li> </ul>	<ul style="list-style-type: none"> <li>Repertory grid technique is powerful at enabling users and customers to articulate their issues.</li> <li>The technique taps tacit knowledge of hidden needs.</li> </ul>	

Continued



## PROTECTING IDEAS

In order to gain the maximum advantage from their innovations, companies need to protect and exploit their knowledge. The most obvious mechanism for protecting innovations is patents: a 'legal right granted to exclusive commercial use of an invention, normally for a limited period of time'.<sup>60</sup> Most countries in the world have laws that protect intellectual property – ideas, designs, works of art, literature or music – and allow their originators to establish and defend their ownership of them. The field of *intellectual property rights* (IPR) is complex, constantly changing and varies to some extent from country to country. IPR is a matter of civil, not criminal law and companies must police their own IPR and take action at their own expense to protect it. In this section we will concentrate on the aspects of importance to managers, but we stress the importance of taking legal advice before making serious commitments.

There are many kinds of IPR but only the four main kinds need concern us: *copyright*, *design right*, *trademarks* and *patents*.

## Copyright

Copyright protects writing, music, computer programs, electronic circuit layouts, web pages, photographs, works of art and so on from unauthorized copying for commercial use. It protects the overt content or appearance of the work but not its meaning (if any). So a particular drawing of an invention would be covered by copyright but not the invention itself, and another drawing of the same thing, not obviously copied from the first would not be protected. Limited copying for personal use or study is allowed: typically one chapter of a book, one article from a journal, a short excerpt from a piece of music. In the UK, copyright for musical and artistic works lasts for 70 years. For published editions the term is 25 years. There is discussion as to whether copyright will be used to protect fashion designs (see Mini Case 5.8 on Versace).

Copyright is created automatically when the work is complete and requires no registration or payment. Generally, the copyright for anything done by an employee in the course of his or her job would belong to the company, but there may be ambiguity about work done by contractors or freelance workers. Always clarify who owns the IPR in innovation projects; it can be embarrassing to find that a subcontractor owns the copyright to the manual produced for you, the artwork for your sales campaign, or the computer program that runs your new product.

One defence against an allegation of copyright infringement is that the work was separately created and appears the same merely because there was little choice in how the function could be performed. This may be plausible in software and so some programmers deliberately include sections of code that have no real function as a way of proving if their program has been copied.

Table 5.5 Continued

Approach	Overview	Applications/Advantages	Limitations
4) Empathic Design	<ul style="list-style-type: none"> <li>A range of approaches of which the main ones are systematic observation, contextual interviews and putting product designers 'in the shoes of users'.</li> </ul>	<ul style="list-style-type: none"> <li>Becoming more popular.</li> <li>Gives an in-depth understanding of customers' and users' product use models.</li> <li>Contextual interviews are in vivo and the environment gives valuable information.</li> </ul>	<ul style="list-style-type: none"> <li>Systematic observation is not easy and using specialists may be the best approach (otherwise base studies on a suitable coding scheme developed from Table 5.3).</li> <li>Vast amounts of qualitative data may be generated, which requires effective analysis strategies.</li> </ul>
5) Lead Users	<ul style="list-style-type: none"> <li>Identification of users that have extreme needs in your current market. Further identification of analogous users in related sectors. It is usual to run a workshop with extreme and analogous users, to develop product concepts.</li> </ul>	<ul style="list-style-type: none"> <li>Workshop brings together very different users and stimulates creative discussions.</li> <li>Can be combined with experimentation, to test the concepts identified in the workshop.</li> </ul>	<ul style="list-style-type: none"> <li>Difficulties in identifying lead users. Workshops are time-consuming and lead users may need to be motivated to give their time.</li> <li>Workshop is outside the normal working environment (although it can be combined with a visit to a lead-user environment).</li> <li>May require expensive virtual prototyping equipment.</li> <li>Superficially, services cannot easily be prototyped. However, leaders such as HSBC Bank prototype their services and collect reactions.</li> </ul>
6) Experimentation	<ul style="list-style-type: none"> <li>Customers are presented with early prototypes of products (or services) and base their suggestions on these.</li> <li>Seeing and using a tangible product often enables customers and users to articulate their views better.</li> </ul>	<ul style="list-style-type: none"> <li>Observing in a realistic scenario how customers react to tangible product ideas.</li> <li>Can be an extension of the lead-user approach.</li> </ul>	<ul style="list-style-type: none"> <li>If the wrong attributes are fed into the analysis, then the prioritization will not be useful (it will encourage a continuing focus on incremental products).</li> <li>The somewhat artificial nature of the findings.</li> <li>Relatively complex method that usually needs expert support.</li> </ul>
7) Conjoint Analysis	<ul style="list-style-type: none"> <li>Identifies the trade-offs customers make in deciding between different products.</li> <li>Customers are presented with descriptions of products or service products and must choose their preferences.</li> </ul>	<ul style="list-style-type: none"> <li>Identification of the product attributes that customers perceive as their key priorities.</li> <li>Development of pricing models.</li> </ul>	

Source: Compiled by the authors.



## Mini Case 5.8

Versace – Fashion Copyright or Right to Copy?<sup>61</sup>

The spring collections of leading designers such as Versace are eagerly awaited by not only the pundits of the fashion world but also by the many copycat retailers that produce similar designs at lower cost. Versace designs that are priced at upwards of \$5000 are regularly copied by companies such as A.B.S and Eci, which sell dresses at around \$400. Then there are the many counterfeiters that simply try and make copies that are not easily identified as such, and are sold at a fraction of the price of the original. Counterfeiting is illegal in most countries but protecting the basic cut and design of a dress from the 'knockoff' industry is more difficult. The European Union offers three year copyright-like protection for 'original fashion designs' and the US is considering similar legislation. However, in a \$100 billion industry where inspiration often comes from the past, or from different cultures, or from the competition, the effectiveness of legislation is probably going to be limited.

## Design Right

*Design* means the appearance of all or part of a product, especially its shape, colour, texture or ornamentation (or a combination of them). Design protection can prevent another company copying the product directly, or marketing an apparently identical one, even if they can show that they designed it themselves. It is a useful way to protect an original piece of design, and the brand recognition that may go with it, such as the Coca Cola bottle shape. In services, aspects of the servicescape can be used to strengthen the brand, such as McDonald's double arches.

In many countries an *unregistered design right* exists that protects against copying but not against separate creation. More powerful is the *registered design right*, which gives a monopoly right to the design for up to 25 years, and can apply internationally. The design has to be registered through a Patent Office and it is granted only to designs that are novel and would be viewed as 'fresh' by an 'informed user'. Expert advice is essential. There is a one-year period of grace after public disclosure so it is possible to test market a design before registering it.

## Trademarks

A trademark is defined as 'any sign capable of being represented graphically, which is capable of distinguishing goods or services of one undertaking from those of other undertakings'.<sup>62</sup> It can be a name, a symbol, a special font or script, a colour, or – more often – a combination of them. There are many familiar examples. A registered trademark can be obtained through the Patent Office and typically costs up to €100. Protection is granted separately for different categories of product so that the same mark may be used by quite different

companies provided their activities do not overlap. Separate protection is needed in each country but there are arrangements to extend cover to many territories for quite modest fees. Failure to trademark in different countries can cause problems. For example, the international clothing company La Chemise Lacosta has a right facing crocodile. Crocodile International, a Singapore-based clothing manufacturer, registered its own left-facing crocodile motif across Asia in the 1960s. Now with Lacosta trying to dominate the high-end Asian market, the two companies have become locked in a number of legal actions.<sup>63</sup>

A trademark may not be purely descriptive (like 'bread' or 'washing powder'), or too similar to another one already in use for the same category of product. So it is important to check the availability of the proposed name of a new product or service if you want to trademark it later.

There are two reasons for seeking protection for a trademark in a particular country. One is to be able to prevent other companies using it and so 'passing off' their products as yours. The other is to establish your own right to use it; because, unlike other types of intellectual property, trademarks are, by and large, granted to the first applicant in each country (the USA and Canada are notable exceptions). So if you do not register early you may lose the chance to do so later.

## Patents

Patents are the most powerful and influential way to establish ownership of an innovation because they protect the idea itself. A patent grants the legal right to exclusive use of an invention in exchange for a fee and a full disclosure of it, including a clear description of how it can be embodied. Protection typically lasts for about 20 years, depending on the country, but often with renewal fees to be paid at intervals, which get steeper as time goes on.

Patents are granted separately in each country where protection is required (though a single patent covers the European Community), so such protection can be expensive. The initial costs for writing a patent and processing it as far as a successful grant is typically several thousand pounds per country (and may take several years) followed by renewal fees of a further five or ten thousand over the first 10 or 12 years. The decision to patent is not one to be taken lightly.

## What Can Be Patented?

To be patentable, an idea must pass four tests. It must be *novel*; it must involve an *inventive step*; it must have a *practical application*; and it must not be in an *excluded category* (which includes, among other things scientific theories, mathematical methods, and – with some restrictions – methods of doing business). The most demanding test from the management point of view is the first, which requires that the invention has never been publicly revealed before the filing date of the patent. (Patenting services is consequently difficult). A patent application for a means of raising sunken ships by filling them full of small airbags was refused because the idea had been shown (using table tennis balls) in a Disney



cartoon in the 1940s. The Patent Office will search existing patents but this does not guarantee that the idea has not been published in some other way. Of course it also means that the inventor must keep the invention secret until a patent is filed.

### *Infringement of Patents*

If a company manufactures or offers for sale a product incorporating a patented idea they are said to infringe the patent. The owner, or licensee, of the patent can force them to stop and may be able to extract substantial damages, particularly if the infringer was aware of the problem. This is the primary power that a patent gives. However, infringement is a quite separate matter from patentability. For example, suppose long ago 'Company X' invented the first chair with a back and was granted a patent on it. If 'Company Y' already had a patent on a stool (an essential constituent of a chair) then Company X would infringe this if they actually sell any of their chairs. They will need to seek a licence from Company Y before they can market their product. But their own patent could still be valid, and Company Y (or any other) would have to seek a licence from them to market a chair.

A company that wants to use a patented idea has a number of options. One is to seek a licence to use it. Another is to challenge the validity of the patent, particularly if it can find a prior disclosure of the idea. The third, which is often possible, is to work round the patent by finding a way to perform the same function but outside the legal scope of the patent. The full disclosure required in the patent document often helps competitors 'design-around' the patent and copies proliferate.<sup>64</sup> A survey of 600 European companies showed that 60 per cent had suffered from copies of their products but only 20 per cent went to trial.<sup>65</sup>

### *The Business Use of Patents*

Patents have four main uses in a company. The first, as noted above, is to enforce a monopoly by taking legal action to prevent others using the idea. This can create a competition-free and possibly very lucrative market. The second is to licence the patent to others in return for a fee, or royalties, or both. The third is as a bargaining counter in relations between companies: large companies often agree to swap rights to each other's patent portfolio, each one using its own IPR to gain access to that of the other. Finally, small companies use their patents as objective proof of their technical depth and inventiveness so as to enhance their value on sale or flotation.

One of the drawbacks of the patent system is that it is less useful for small companies than for large. A survey with results from European SMEs found that patents are used less than they might be, although many respondent companies had suffered financially when copies of their products and services were made, often by larger companies.<sup>66</sup> The perceived limitations were that patent protection took a lot of effort to acquire and, in practice, gave only limited protection because legal action was expensive and seldom successful. Because of this,

both SMEs and larger companies often adopt other strategies to protect their knowledge. One is simply to keep the knowledge secret, an effective strategy for process innovations or others that are not visible to people buying the product. As discussed in the sections on the scope of innovation, the matching of product innovation with process innovation is often a good way to protect knowledge because innovative process technology 'can block or stymie would-be imitator's push into the market'.<sup>67</sup> It is also normally hard to apply patent protection to services and often the best approach is to concentrate on developing a unique augmentation. Other measures are discussed in Mini Case 5.9 on Micro Scooters and also in Sidler, the main case study in Chapter 9.

### Mini Case 5.9

#### Micro Scooters – Success, Even When Patents Don't Help<sup>68</sup>

Its popularity may have waned but the urban scooter was a smash hit that continues to be popular with teenagers. What used to be considered as simply a child's toy has become a high-tech product, aimed at a range of age groups. The story behind this phenomenally successful product is an interesting one, which shows the need for innovative marketing, fast product development and the limitations of international patent protection. Surprisingly, the product idea itself almost failed to get to market.

Wim Obouter is the Swiss inventor of the original Micro City-Scooter. He studied international marketing in the US and had worked in both financial services and the manufacturing sector in Switzerland. However, it was his love of sports – windsurfing and cycling – that helped him to identify a niche in the transport market. Over ten years ago, Wim recognized that, when he wanted to go out for a drink or a meal in the evening, it was often too far to walk but not far enough to warrant getting his bicycle out of the cellar, or to drive. Later he was to coin the phrase *micro-distances* for these sorts of journeys. As he often travelled micro-distances, he set about designing a solution to the problem. He considered a skateboard but decided on a scooter, as it would be easier to ride. So he handmade himself a simple scooter that turned out to be 2–3 times faster than walking and which could be folded together, so that it would be easy to take into a bar. This prototype worked well and turned heads in Zürich. 'When I was on it, people always used to stop and stare at me. So much so that I started to think that it wasn't very "cool" to be seen riding a scooter! So I stopped riding it during daylight hours'. Soon the prototype fell into disuse and the whole idea might have died, had not Wim still believed that there was a need for such a product.

Over the next few years, the idea did not die entirely and Wim even wrote a marketing plan. In this he described a market need for not only an updated children's toy but also for a lifestyle product, which addressed the micro-distance issue. However, friends and colleagues were sceptical. They told him that he had a 'respectable job in a Swiss bank so why on earth was he playing around with ideas for children's toys?' So the prototype was literally shelved – it was left unused in Wim's garage.

That was until the summer of 1996 when, by chance, the prototype was spotted by neighbours' children, who asked if they could try it out. They were hooked immediately. From then on, throughout the summer, up to twenty kids per day took turns to use the scooter – 'they just kept coming to borrow it and my wife kept saying there

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really is something in this idea'. Finally, Wim had proof that the city-scooter had great potential for the kids market, although he still felt convinced that the potential was far greater. The success with the local neighbourhood finally convinced him and his wife to take the idea further. At the time, the launch of the Smart car with its advertising slogans of 'Reduce to Max' and 'The Future of Mobility' inspired Wim to make a video of his prototype and approach the car manufacturer. The Smart organization was impressed and considered integrating a scooter within the boot of the car as an ideal combination – a city car with the city-scooter for the last lap of the journey. Later, however, this decision was reversed at the time that the Smart project – a cooperation between Swatch and Daimler – experienced problems. Therefore, Wim was forced to look for an alternative route to market.

When Smart backed out, Wim turned to Far East manufacturers looking for a source of funding. He found a partner company with enough faith in the project to fund the tooling and other set-up costs and who helped find a Japanese retail partner willing to try the product – with an opening order of 20,000 scooters. These sold immediately and the market grew quickly to sales of 75,000 units per week – almost an instant success.

City Bug UK Ltd handled the UK marketing. One of the partners, Seth Bishop, says they quickly realized that 'the product was great but it would attract competitors quickly. And without many international patents it would need a strong brand to maintain a market leadership position'. This was difficult because City Bug did not have the 'marketing spend' of a big company. Therefore, they adopted what some marketing professionals now refer to as 'stealth marketing' – finding novel ways to reach their target segments, without resorting to conventional advertising. The marketing plan concentrated on establishing the profile of Micro as a premium product. 'We wanted it to achieve cult status quickly, to make it stand apart from the copies'. Therefore, the marketing team concentrated on getting fashion journalists interested so that they would write articles in magazines such as *The Face* and selecting distribution channels such as design shops as opposed to retail chains. From the start, the Micro product was promoted as a top design.

The Micro product is manufactured in China and Wim knew that, by the time production of the Micro had ramped up, the word would have spread and a host of Asian copies would be inevitable. However, he knew that high labour content of his product would make it uneconomical to produce in Switzerland. Also, he saw a need to increase production volumes fast and his experience in the manufacturing sector told him that the length of time required to gain approval and build new facilities in Switzerland would be disadvantageous. The downside of Asian manufacturing is the speed and frequency with which copies emerge and, as he later discovered, it is impossible to use patents as a protection mechanism.

With hindsight, Wim sees two issues with patents: the time required before cover is achieved and the investment needed to enforce them. Typically it takes up to two years to be granted a patent. During this time, a host of copies will be on the market, many from countries where patent rights are difficult, or even impossible to enforce. 'The difference between innovation in my markets and, for example, the pharmaceutical sector is time-scales. Product life cycles are typically six months for me and so the market moves much faster than the bureaucracy of patents. And so I need to compete through constant product innovation, not through law suits'.



With over 15 million units of the Micro brand sold since 1999, the product is an outstanding success. For the future Wim intends to innovate in both the product design (for example, sophisticated suspension mechanisms and ABS brakes are planned) and the brand. Finally the product has achieved the 'cool' image and broad market appeal that Wim intended.

The key points for managers are as follows:

1. When launching a product with new features, check carefully whether some could be patented. This must be done, and a patent filed, before the product is shown to any third party (unless covered by a confidentiality agreement);
2. Check new product features to make sure they do not infringe other patents. This requires a professional search of patent databases;
3. Leave enough time to act on the results of these investigations before the product launch;
4. Encourage staff to patent ideas that may be valuable but choose the countries to file in with care because of the considerable cost;
5. When subcontracting any work that may result in registerable IPR, ensure that the contract defines who will own it;
6. When licensing a patent or when starting a joint venture that may lead to patents, establish who is responsible for filing costs and maintenance fees; for choosing countries to file in; for detecting and taking action following infringements; and for defence of the patent if attacked. And establish what the rights of all parties are if the patent is successfully challenged or worked round.

## SUMMARY

This chapter covered the second element of the Pentathlon – managing ideas. It explained how creativity is often misunderstood and managers need to look for effective ways to stimulate constant creativity through the exchange of information and knowledge. One of the key areas of knowledge is capturing the elusive voice of the customer. Here, traditional market research has serious limitations and, therefore, companies need to understand and adopt appropriate enhanced approaches. Overall, this chapter explained

- The nature of individual and team creativity with ideas on how to stimulate creativity levels.
- Some of the most useful techniques to invigorate the process of generating ideas for new products and new services.
- The main types of knowledge and how they can be best utilized and, as necessary, protected.



- The most appropriate ways to conduct market research into customers' and users' needs, so that radical innovations can be developed.
- If the strategic goals of the organization focus on achieving product and technology breakthroughs, then creative links need to be made between the strategy and the generation of ideas. This is the subject of the main case study for this chapter, which looks at Texas Instruments.

#### MANAGEMENT RECOMMENDATIONS

- Foster an understanding of the different types of creativity in your organization and use this to stimulate a constant flow of ideas.
- Encourage staff to recognize the importance of actively collecting ideas from outside sources.
- Take active steps to establish and maintain a 'culture of innovation' that supports idea generation.
- Promote the exchange of knowledge within and between innovation project teams. Recognize and protect knowledge that is vital to the organization.
- Employ an appropriate combination of market research techniques to identify your customers' hidden needs.
- Identify suitable ways to protect innovative ideas from competitors.

#### RECOMMENDED READING

1. Squires, S. and Byrne, B. (eds) *Creating Breakthrough Ideas: The Collaboration of Anthropologists and Designers in the Product Development Industry* (Bergin and Garvey: Westport, CT, USA, 2002). [Interesting perspectives on how product design studies can be improved through ethnographic methods.]
2. Couger, J. D. *Creative Problem Solving and Opportunity Finding* (Danvers, MA: Boyd and Fraser, 1995). [Comprehensive coverage of many creativity techniques and their applications. Unfortunately, gives little information on empirical research into creativity.]

#### CASE STUDY

##### Texas Instruments – Defining Innovation<sup>49</sup>

Before reading this case, consider the following generic innovation management issues:

- How does the chosen innovation strategy impact the management of ideas?
- If end-users do not understand the technology, how can they generate useful inputs for product designers?
- How can managers match market trends to technological advances?
- How can customers be encouraged to give ideas that are not simply based on improving current functionality?



Texas Instruments Incorporated (TI) is based in Dallas. It is a world leader in semiconductors, producing a wide range of digital signal processing (DSP) and analogue devices and has over 29,500 employees worldwide. In 2007, revenues of \$13.8 billion were earned, of which a massive \$2.15 billion (16 per cent) was invested in R&D – a clear demonstration of TI's commitment to technology and new products. Its products provide the processing capability for a multitude of consumer devices such as mobile telephones, digital stereo, car navigation systems, interactive toys and digital cameras. Developing technology that will satisfy the demands of manufacturers such as Nokia and NEC, technology experts themselves, constantly tests TI's ability to anticipate requirements. However, the company has a tradition of going beyond existing customer needs.

For example, TI is famous for developing the first integrated circuit (chip) in 1958. Back then, inventor Jack Kilby knowingly broke 'the customer is always right' rule. He was specifically asked by a customer to develop some discrete circuits but he thought of how, by packing these onto a single piece of silicon, a more efficient overall device could be manufactured. As a result of his foresight, the applications of electronics have multiplied and, today, millions of chips are produced every day. A brilliant idea, for which Kilby won the 2000 Nobel Prize for physics, and the sort of feat that is difficult to repeat. Today, just as in 1958, it is important to exceed customer needs. But how can radical ideas be generated?

With the increased complexity of electronics, TI has recognized that technical intuition alone is seldom sufficient. Trying to extrapolate customer needs in the isolation of the laboratory was found to be too risky. 'For a while, we had a bunch of engineers who used to figure out what the customer wanted and throw it over the wall to the sales guys, who would figure out how to sell it...but not now', says Bob McKune with TI's Wireless Marketing team. Over the past ten years, TI has developed a variety of approaches to support the process of anticipating customers' needs and predicting technology trajectories. These are based around a new function and its interface to people in the business units, both in marketing and technology management.

#### STRATEGIC MARKETING

One of TI's most effective means for stimulating innovative ideas has been the Strategic Marketing function, which is staffed by technical, business and market experts. They collect and develop ideas for new markets and evaluate potential projects very much in the way venture capitalists work. The group was founded in 1998 and has been responsible for developing some major new businesses, such as the OMAP™ family of applications processors for mobile telephones. Ideas are honed by comparing data from the market, technology and financial scenarios. Every idea has to undergo top-management scrutiny and, if approved, seed funding is available, resources are quickly identified and high-level priorities are set. To keep the development of new business focused, a simple 'top-three priorities' rule is often applied. And to speed progress even further, the strategic marketing people most closely associated with the development of an idea transfer to the 'start-up' business unit. 'Being in one of the strategic marketing teams is about as close as you can get to external start-up mentality...inside of a big company', is how one of the original members of the OMAP team described it.





One of the ways Strategic Marketing and the business units go further than many of TI's competitors is in studying end-users and not just direct customers. It is recognized that end-users determine what will be needed in the future and although these end-users understand little if any of the technology going into a mobile phone, for example, identifying trends in requirements is vital. Therefore, Strategic Marketing closely follows markets and conducts significant consumer research. Doug Rasor, VP of Strategic Marketing, says that understanding end-user trends helped TI recognize very early how 'the combination of convenience and increased functionality would transform gadgets from "luxury" or "techie" items to "must-haves" for today's busy consumer'. Similarly, tracking the consumer gave an early prediction of the need for every mobile phone to support high-quality photographic capability. Such insights into the world of the consumer have had a major impact on how TI products are designed, often pushing R&D to deliver what could be called 'over the horizon performance'.

#### MARKETING AND LEAD CUSTOMERS

Just as Strategic Marketing focuses on new markets, marketing in the business units is tasked with developing ideas for radical new products. McKune says, 'TI has shifted to become not only technology-oriented but also customer- and end-user oriented'. In the process, new approaches have been adopted to help customers articulate the future and a strong focus on end-users comes from close cooperation with Strategic Marketing. Lead-user technique has also been used extensively and the view of McKune is that choosing the right people for lead-user groups is the critical part of the process. 'Literally, you have to look years ahead and a lot of our customers can only look out about 12 months. Others can only look out six months to the next introduction'. Therefore, 'industry thoroughbreds', as McKune calls them, are carefully chosen and experts are also brought in from related sectors. This stimulates broader discussions around technology and emerging customer issues, which in turn identifies real opportunities. Leading these discussions is a role shared by McKune and the Chief Technologist.

#### Chief Technologist

The Chief Technologist for the OMAP platform, Michael Yonker, works in an office directly opposite to McKune's. Their respective doors are always open and they constantly trade jokes, accusing each other of either an inability to properly interpret the market, the technology, or both. Behind the jest, however, both Yonker and McKune are very serious about their goal of matching future technology to hidden needs. Yonker describes his role as 'the technical guy, who also understands the business side and who has a prominent role with our customers. In a sense I have to bridge the gap, acting as an evangelist to both R&D [convincing them about the importance of interpreting and leading the market] and marketing [convincing them of the potential of new technology]'.

'A lot of technology managers are pure R, or pure D but I put a premium on internal and external communication', says Yonker. Product technology roadmaps are used extensively as an internal planning and communication tool. By using roadmaps to show the links between the market and technology, Yonker aims to avoid 'technology



being developed that is not effectively applied. That's what we call "herd products" – nobody wants to buy them and we don't want to develop them'. This in turn has led to the 'customer is always right' rule being broken regularly. Usually customers have a tendency to demand ever more functionality. However, McKune and Yonker have found that appropriate communication can identify product simplification opportunities. Removing product features can be a tough negotiation with customers but when all five key criteria – cost; size, weight and volume; power consumption; performance; and time-to-market – are discussed in unison, as opposed to features alone, TI have found that interesting alternatives emerge more easily than might be expected. 'Through introducing this broader view and discussing all five criteria with customers, the whole technical thing has taken on a different light', says Yonker.

#### INNOVATION: DEFINE NOT REFINE

In common with their competitors, each year TI is introducing new chips that are half the size, one-quarter of the price of previous ones, and have half the power requirement (and therefore require fewer battery changes). In terms of performance, however, the work of Strategic Marketing, lead-user discussions and end-user studies are providing TI with ideas for exceeding expectations. For example, the OMAP™ team is now working on a 'superchip', which will offer manufacturers the capability of designing all of the features they want to include in a mobile telephone from voice-only to multimedia. This is one product but the result of what Yonker and McKune see as the clear innovation philosophy of their business unit; 'our goal is to define new customer needs, not just refine existing ones'.