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## Targeting innovation and implications for capability development

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### Abstract

Innovation is often described in terms of changes in what a firm offers the world (product/service innovation) and the ways it creates and delivers those offerings (process innovation). Arguably this definition is insufficient since it does not take into account two other areas where innovation is possible—market position and business models. Market position relates to the situation where an established product/service produced by an established process is introduced to a new context; here the innovation management challenge is concerned with issues like adoption behaviour and technology transfer. Business model innovation relates to the situation in which a reframing of the current product/service, process and market context results in seeing new challenges and opportunities and letting go of others.

Each of these poses challenges for the ways in which innovation is organised and managed—what we term innovation management capability. The paper explores some of these challenges and also looks at the additional issues raised by discontinuous innovation, moving beyond the steady state conditions of ‘doing what we do but better’ to a new set of conditions in which ‘doing different things in different ways’ becomes the norm.

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### 1. Introduction

Since the Palaeolithic period (Curwin, 1954) some, but not all, human societies formed enterprises that created new or improved artefacts, devised ‘better’ processes, developed new ways of selling and devised alternative models of organising (Diamond, 1997). These enterprises were innovative—they found ways to exploit the latent potential of ideas. Innovation can be defined simply as “the successful exploitation of new ideas” (DTI, 1994). Others have defined innovation more elaborately, but in similar terms; for example (Baumol, 2002) writes that innovation is:

“the recognition of opportunities for profitable change and the pursuit of those opportunities all the way through to their adoption in practice”.

Embedded in these definitions is the notion that innovation can be managed. For example, Drucker (1994) argues that innovation is a core process for a firm; he suggests that: “in...a period of rapid change the best—perhaps the only—way a business can hope to prosper, if not survive, is to innovate. This is the only way to convert

change into opportunities. This, however, requires that innovation itself be organised as a systematic activity” (Preface 1).

It follows that enterprises that are better able to manage innovation than others and demonstrate a record of successfully exploiting new ideas can be said to possess, at least for a period of time, a superior ‘innovation capability’. Developing such capability is an important strategic issue since innovation plays a key role in survival and growth of enterprises. Baumol (op cit) argues that, “virtually all of the economic growth that has occurred since the 18th century is ultimately attributable to innovation”. This is also true at the level of the firm. Tidd et al. (1997) in their review of the field conclude that: “Management research suggests that innovative firms—those which are able to use innovation to differentiate their products and services from competition—are on average twice as profitable as other firms”.

The words ‘on average’ in Tidd et al’s assessment are important. The contribution of innovation to the profitability of a firm is not straightforward. Some innovation initiatives have proved to be dysfunctional, occasionally leading to catastrophic losses. Even an ‘excessive’ rate of innovation can be disadvantageous as Yoffie and Cusumano (1999) illustrated when considering the increasing resistance of

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corporate clients to rapid product developments by Netscape in the mid-1990s (Yoffie and Cusumano 1999). So innovation capability needs to include the ability to make such strategic assessments.

It is reasonable to assume that an innovative firm must generally possess 'innovation capability'—an underlying capacity to gain advantage by implementing more and better ideas than rivals. However, innovation capability may not be a unitary set of attributes—just as physical fitness can be sustained in different ways so different kinds of innovation may require distinctive approaches. Indeed, it may be that the capability needed to support some types of innovation conflicts with that needed to support other types. (For example, this situation is central to the argument surrounding the 'innovator's dilemma' in dealing with both sustaining and disruptive technologies. (Christenson, 1997).

## 2. Targeting innovation

An important aspect of innovation is its functionality—i.e. the uses made of innovation capability. We refer to this as 'targeting'. The well-known case of a Japanese company, Komatsu Ltd., helps us to understand the importance of targeting the exploitation of innovation capability. In the 1960s Komatsu made dumper trucks for the local market. The chairman, Ryoichi Kawai, decided that Komatsu would strive to topple Caterpillar from being the undisputed number one in the EME (Earth Moving Equipment) sector. This statement of strategic intent was called 'Maru-C'—which means, approximately, 'encircle Caterpillar'. The executives at Komatsu did not know how they would achieve their strategic intent, but it provided an overriding direction that guided initiatives in quality management, product design, marketing and so on. Komatsu grew stronger and, in the 1980s, Caterpillar was plunged into severe loss (more than \$1 billion over 11 quarters) caused mainly by competition from Komatsu. Ryoichi Kawai took the company through four distinct stages on its path from obscurity to beating Caterpillar in many core markets. The four stages were:

- improve quality
- reduce costs
- develop innovative products
- devise new methods of sales and financing

These waves of focused innovation were undertaken sequentially. The argument used by Komatsu's management was that undertaking too many initiatives at the same time would fragment effort and permit non-achievement. The Komatsu case demonstrates that it is possible to target innovation capability on firm-specific strategic goals and that these vary over time.

## 3. The four 'P's of innovation targeting

When Komatsu sought to improve quality, reduce costs, develop innovative products and devise new methods of sales and financing they did more than develop new or improved products. They had to improve processes, change their marketing and think about their company in a new way (as a global not Japanese firm). This is typical. Innovation capability is not confined to improving products: it can be targeted in four main ways. Fortuitously, these all begin with a 'P'.

- P<sub>1</sub> innovation to introduce or improve *products*;
- P<sub>2</sub> innovation to introduce or improve *processes*;
- P<sub>3</sub> innovation to define or re-define the *positioning* of the firm or products;
- P<sub>4</sub> innovation to define or re-define the dominant *paradigm* of the firm.

These 4Ps are not tight categories: they have fuzzy boundaries. Nor are they alternatives: firms can pursue all four at the same time. There are linkages between them; a firm using innovation capability for positioning, for example, will be highly likely to introduce or improve products. It is possible to define P<sub>3</sub> and P<sub>4</sub> as variations of re-framing—either concerned with what the offerings the organisation provides or what identity it pursues (Tidd et al., 1997). However, the 4Ps provide a structured approach to examining the opportunity space for innovation.

## 4. Innovation in product

New product and service development is an obvious target for innovation capability and can be considered on several dimensions. For example (Wheelwright and Clark, 1992) identify criteria that differentiate products including number, timing and rate of change of product platforms, whether they are variations or derivatives, the frequency of introduction/refresh rate, relationship with strategy and degree of modularity. They point out that product innovation is influenced by the state of industry maturity:

In relatively young industries, such as medical instruments, every development effort appears to be a platform effort (to broaden the firm's market coverage), with incremental changes targeted primarily at correcting deficiencies in the platform products.

The resource requirements for product development can vary over time—with the development of product platforms requiring more effort over a sustained period. A firm may be able to plan for several generations of products over a life cycle with derivatives in between. Here, innovation can be

seen as strategy-driven and deliberate rather than emergent or serendipitous (Randale and Rainnie, 1996).

Product innovation is also applicable to service firms<sup>1</sup> whose 'products' are, to some extent, created in real time. For example (Singh, 1991) notes that in Singapore Airlines, "the innovative spirit gave the travelling public the first slumberettes on Boeing 747 upper decks, jackpot machines to relieve boredom and round-the-world fares".

The issue of timing can be significant. (House and Price, 1991) cite a McKinsey report that suggests that, "on average, companies lose 33% of after-tax profit when they ship products six month's late, as compared with losses of 3.5% when they overspend by 50% on product development" (92). The management of the product development provides a complex decision-taking task for the firm. Uncertainty and risk can rarely be avoided and rules of game theory can seem more applicable than direct cause and effect relationships (McDonald, 1963).

The process of new product development can, in itself, be the target of innovation. Arguably the greatest resource in the future for product innovation will be in the use of the internet for accessing customers and, using mass-customisation and agile techniques, it may be possible for firms to devise a distinctive product for each customer (Goldman et al., 1995). Here, the product is presented as an 'envelope of possibilities' rather than a pre-determined entity. This notion presents intriguing challenges; it may become possible for a customer to participate actively in the development of a unique product.

At one level the notion of innovation in products offered is simple. All a firm has to do is to find ways of providing superior functionality and/or price and signal this to the market. It can be argued that any initiative in which the added value exceeds the added cost by an acceptable margin should be undertaken. Such a stance is simplistic—as the following case example of ABC Lighting demonstrates, product development requires making decisions with unknown consequences, making 'bets' and channelling limited resources.

## 5. Managing product innovation within ABC Lighting

ABC Lighting<sup>2</sup> in 1990 had more than 8000 products in their catalogue, some of which were slow-moving, lacked competitive advantage or were priced more highly than competitors' offers. An obvious remedy would be to go

through the catalogue and determine to innovate with some products and cut out others. Why was not this done? The view of top management was that a pruning of the product list could prove counter-productive as ABC Lighting's strategy was to offer a 'total solution for the building contractor' rather than a partial offer of superior products. Some managers argued that the firm had to offer certain categories of products at low levels of profitability in order to be able to fulfil all the requirements of large contracts that were generally offered to a sole supplier. In addition, each product put through the factory bore a share or burden of the factory's cost overhead. It could be that, if a marginally profitable but large volume product was cancelled, the added burden on other highly profitable lines, perhaps smaller in volume, might be sufficient to propel them into loss.

Managers realised that decisions about innovation in products offered could have multiple effects on market perceptions and was linked in somewhat obscure ways to profitability. Criteria used to make decisions could not be readily quantified. For example, no one could say how many contracts would be lost if ABC stopped supplying Emergency Lighting. Product development was given significant resource in ABC Lighting but was limited and some initiatives required more or different forms of effort than others. The added value of intensive product development could frequently only be assessed by surmise; competitors' intentions in the area were rarely clear<sup>3</sup> and, lastly as mentioned above, the link with the firm's overarching product policy was complex.

Historically, several of the fundamental technological innovations in lighting had been invented by ABC Lighting, including halogen lighting. ABC Lighting had developed the concept, proven it, taken out patents, devised complex production machines and assessed the potential market as 'huge'. From such a technological base the business question became 'should we develop a halogen light product range?' and, since the ingredients of competitive advantage appeared to be present, the answer was 'yes'.

ABC Lighting's range of halogen lighting products was launched and rapidly became world-leaders. The product found a ready market amongst commercial designers and profit margins were well above average. However, other major players, notably Philips, saw the rapid growth of the halogen lighting market and invested considerable research resources in devising alternative technologies. It was not long before ABC Lighting saw its margins dropping and competitors' products being made in volumes beyond the capacity of ABC Lighting's factories.

The initial reaction of an observer is to say 'well it's a story of a firm that couldn't capitalise on their advantage, but at least they had the benefits of excellent margins at

<sup>1</sup> The distinctive features of a service have been defined as Irons (1993). *Managing Service Companies: Strategies for Success*. Wokingham, England, Addison-Wesley: (1) They are transient-leave only memories or promises. (2) Cannot be separated from the person of the provider. (3) They cannot be stored. (4) Standardisation is only partly possible. (5) Constant supervision is almost impossible. (6) The consumer is a participant. (7) The consumer is a participant.

<sup>2</sup> Case material drawn from a presentation at INSEAD in March 1994. Certain details have been disguised.

<sup>3</sup> There were cases where competitors deliberately set out to confuse the company and try to cause it to abandon certain product development processes or 'waste' resources developing others.

the beginning'. This was true but developing the halogen lighting range absorbed a huge amount of resource from the managing director, the R&D lab, production engineers and marketing staff. It was the focus of a great deal of strategy formulation and problem-solving effort. In effect, the decision to develop the halogen product deprived other products of development resources.<sup>4</sup>

ABC Lighting provides a useful case to assist in the understanding of the interplay between management decision-making, industry logics and new product development. Here was a company with a long history, a full range of firm-specific capabilities, a uniquely talented R&D facility, global scope and a strong market presence being unable to survive as a light sources manufacturer. They were too small a player in an industry where economic logic favoured huge producers. This did not apply in the lighting fittings business, which was retained and operated successfully in markets ruled by a different strategic logic.

It can be seen from this example that managing innovation in product can be a complex task in which branding policies, market development trajectories, industry logics, resource availability, technological opportunism, intrapreneurship and other factors influence decisions. Accordingly, it would be incorrect to define product innovation 'merely' as an internal middle-level managed process—rather it is a major element of strategy. Targeting innovation capability on developing new and/or improved products can involve multiple actors engaged in complex and inter-linked processes with a single end in view—creating value at an acceptable cost for the customer.

## 6. Innovation in process

Processes are widely (Clarysse et al., 1998), accepted as a target for innovation initiatives. Processes are sequences of activities, often proceeding horizontally across the organisation, that are transformations.<sup>5</sup> There is considerable scope in improving the operation of existing processes, through taking out waste of various forms and optimising

<sup>4</sup> During the later stage of this case study ABC Lighting reported a loss on its light source business and sold it.

<sup>5</sup> The term 'transformations' is derived from systems theory. Each process in an organisation is conceptualised as a system with defined inputs, transformation processes and outputs. Systems models have been influential since socio-technical systems Trist (1978). On Socio-Technical Systems. Sociotechnical Systems: A Sourcebook. J.J. Sherwood. San Diego, University Associates: 43-57. began to be articulated in the 1950s and open systems planning was conceptualised in the 1960s McWhinney (1972). Open Systems and Traditional Hierarchies. International Conference on the Quality-of-Working-Life, Arden, Institute for Developmental Organization.. At the strategic level Porter (1985). Competitive Advantage: Creating and Sustaining Superior Performance. New York, The Free Press. used the underlying philosophy in his concept of the value chain. A more recent iteration of organisational analysis using the systems metaphor is re-engineering Hammer and Champy (1993). Reengineering the Corporation: A Manifesto for Business Revolution. London, Nicholas Brealey Publishing..

them for high performance. (Gallagher et al., 1997). For example, new technology can add precision, improved training can increase conformance or process mapping can identify time wasted in unnecessary activities (Stalk Jr. 1993). Much of the 'lean thinking' agenda is based on this principle.

There is also considerable scope for identifying new process routes which offer better performance along one or more dimensions. For example, the history of the chemical industry is based on a series of continuous improvements to established processes punctuated by occasional introduction of novel process which radically shifted the physical and chemical rules (such as moving from batch to continuous processing or changing the thermodynamics) and in doing so enhanced yields by an order of magnitude.

Processes interact, sometimes in complex ways (Heygate, 1996). In a simple organisation, for example a dentist's reception area,<sup>6</sup> there may be processes in place for registering patients, keeping records, stock management, making bookings, arranging rotas, logging staff time, arranging maintenance work, cleaning the waiting room, reminding patients of forthcoming visits and so on. At least some of these processes will be interdependent and core processes like maintaining hygiene will be particularly important. Innovation in processes in this relatively simple environment is unlikely to be coherently managed—different agents will play distinctive roles and ideas for improvement arise from a variety of sources. For example, there is a likelihood that reception staff will notice weaknesses in some processes or see opportunities and take initiatives to bring about improvements themselves without reference to senior personnel (Hummel-Kohler and Kristof, 1997). From time to time, problems or opportunities may occur that require a formal review and changes will be made on a planned basis. The dentists, who have the highest status in the system, will make suggestions or issue instructions—as may patients and suppliers. Moreover, trade journals will contain occasional articles on improving reception services that give inspiration. The dental practice may decide to submit itself to an overarching set of disciplines like ISO 9000.

It can be seen that ownership of innovation in processes in the dentist's reception area is likely to be diffuse, even though there may be a practice manager in a co-ordinating role (Sirkin and Jr, 1990). There are a variety of sources of critical observations and improvement ideas and several ways in which decisions are taken to initiate change. Such complexity in the ownership of process innovation is typical although major processes, like the layout of a new automated production line, will generally be managed using a systematic approach. This is more difficult to achieve where sub-processes evolve in a number of ad hoc ways (McHugh et al., 1995). Those directly involved may

<sup>6</sup> This example was suggested by comments by Roper (1996). Explaining Small Business Growth and Profitability, NIERC, Belfast.

be the best people to identify improvement possibilities and effect change (Bessant, 1992). There can be multiple actors dealing with multiple processes in multiple ways.

The diversity of agents playing roles in process innovation means that they tend to develop without an overall coherence. Accordingly, they can be inefficient, patchy and/or inherently contradictory. Approaches such as business process re-engineering (Hammer and Champy, 1993) seek to overcome such weaknesses, identify core processes and subject them to intensive development.

Process innovation can be facilitated by systematic analysis and by comparative benchmarking. Specific techniques include: process mapping, activity analysis, constraints analysis, kaizen, problem analysis, video recording, modelling, time compression, statistical analysis, pilot experimentation, process management, problem-solving fora and cost structure analysis. These techniques have the effect of raising consciousness about problems and opportunities, thereby increasing the probability that innovative initiatives can be undertaken (Burgess, 1994).

Not all process innovations are within firms. (Perry et al., 1999) describe a form of process innovation at the level of the value stream or supply chain. In the early 1990s the textile, clothing and footwear industries in Australia were in danger of being overwhelmed by more efficient foreign suppliers. The Australian government funded the 'Quick Response Program' to facilitate increases in speed-to-market. This took the form of a series of workshops that included participants from all components in a supply chain. The results showed improvements of between 74% and 100% on key indicators over four years. Interestingly, the development of mechanisms for open communication was considered just as significant by participants as the adoption of a standard for electronic data interchange.

Processes present a fertile and extensive set of targets for innovation. Multiple small improvements can accumulate into large gains. Major processes can be improved or re-engineered, perhaps incorporating new technologies. All processes, including those at the strategic apex of the firm and within the value stream, are potential candidates.

## 7. Innovation in position

A positional innovation does not significantly affect the composition or functionality of the product<sup>7</sup> but the meaning of the product in the eyes of the potential customer (Kim and Mauborgne, 1999a–c) and/or the market segments selected as targets.

Positional innovation is not mentioned by some commentators on innovation management who prefer to adopt

a narrower product-process definition. Nevertheless, the realisation that innovation can be positional is supported by some publications. For example (Guest et al., 1997) point out that, for some products, "success depends on finding innovative ways of bringing to the market products that appeal to potential buyers".

It can be argued that the capacity of firms to be innovative in product positioning has grown over the past 50 years for two main reasons. Firstly, there has been an improvement in the prowess of marketing and advertising agencies to construct meanings in potential customers enabled by their increasing skills, availability of market research data and the proliferation of means of persuasion (Tull and Hawkins, 1993). Secondly, low cost data processing means that customer profiling can be elaborated, practical and instant. Using this capacity presents specific management challenges. In a mass market billions of pieces of information could be collected about customers and potential customers but marketing decisions need to be based on a limited number of salient factors, hopefully interpreted with brilliance and insight. (Kim and Mauborgne, 1999a–c) suggest that managers need to "(i)magine a market universe that is made up of known and unknown market space" and they argue that there is a need to "(b)reak free from competitive convergence".

Most cases of positional innovation relate to firms, brands or products. However, institutions can go through the same process (Irons, 1993). For example, the Labour party successfully positioned itself as 'New Labour' before the 1997 general election in the UK. This required a host of changes in personalities, power-structures, policies and practices, apparently following a similar change model to that adopted by commercial firms.

Product positioning can be summarised as 'what the firm would like typical customers from targeted groups to feel and say about their product (and company)'. There are many examples of successful positioning and re-positioning (Gummesson, 1987). For example, the Daily Mail repositioned itself as the leading newspaper in the UK for women readers in the 1980s, the BBC repositioned itself as a global media corporation in the 1990s, Henley Management College repositioned itself as Britain's largest internet-based provider of MBA degrees between 1987 and 1993 and Manchester United FC positioned itself as a fashion brand in 1994–96.

The central feature of an innovative product positioning strategy is the management of identities, through advertising, marketing, media, packaging and the manipulation of various signals. These topics are extensively discussed in the literature of brand management (Doyle, 1997). Positional innovation can change the characteristics of a market or create a market that does not exist.

An example is the global brand of ice cream—Haagen-Daz (Joachimsthaler and Taugbol, 1995). This brand was

<sup>7</sup> Product attributes may be changed but these are minor compared with the revised marketing stance.

developed by Grand Metropolitan, whose marketing specialists<sup>8</sup> noted in the 1980s that ice-cream was associated with children or unsophisticated adults. They decided to create a hitherto unknown product—an ice-cream for sophisticated adults that fell into the category of an 'affordable luxury'. Many initiatives followed, including product formulation, packaging, advertising, selection of distribution channels and global product standardisation codes. Haagen-Daz has become a global brand of adult ice-cream and tapped a new market. The case suggests that product identity can be as significant as tangible product attributes. Some positional innovations are so radical in thinking that they could be considered to be innovations in paradigm (discussed below)—the development of Haagen-Daz ice cream would be an example, as neither the concept of an adult ice cream, nor the ambition of global branding for ice cream, had been previously developed it required multiple innovations of mind-set to launch and develop the product.

Product positioning includes the four elements of innovation (idea—adoption—application—benefit) and may excel at the first stage (Beatty, 1997). For example, some would use the word 'brilliant' for the notion of associating a leading brand of toilet paper with the gentleness of a puppy or connecting a brand of petrol (perhaps the ultimate commodity product) with the vitality of a tiger. The final element in the innovation process, harvesting benefits, is difficult to evaluate but this can be attempted (Tull and Hawkins, 1993).

Firms can seek build a distinctive market position by the management of identity. It is a frequent occurrence to hear a person choosing to buy a product as it comes from Sony, Gap or Harrods. In these cases the firm itself can be seen as a brand in itself. (Kim and Mauborgne, 1999a–c) discuss the case of Southwest Airlines and comment that by:

“focussing on the key discriminating factors of both flying and driving, and by eliminating everything else, Southwest has inserted itself creatively between airlines and surface transport, thereby creating a new and highly profitable market”.

It is significant that the word 'creatively' is used in the assessment of Southwest's strategic processes. Kim and Mauborgne assert that the company's possessed a superior ability to perceive a latent need and devise a business system to fulfil it. This is an example of positional innovation and Southwest's new business model was, arguably, an innovation in paradigm (see below)—demonstrating that the two can be interdependent. More generally, Kim and Mauborgne suggest that it “is in the space between substitute industries that tremendous opportunities exist for

creating new markets”. If this is correct, then positional innovation is particularly potent from a managerial perspective.

## 8. Innovation in paradigm

This final 'P' is more contentious. Not all scholars support the notion that 'paradigm' is a legitimate target for innovation capability. However, it is not unknown, for example (Rickards, 1999) observes: “Today the term 'paradigm' has found its way into the vocabulary of organizational management, in such terms as 'paradigm switch' and 'paradigm breakthrough'. The expressions are broadly taken to imply that a traditional belief system—the old paradigm—has been replaced by a new way of understanding, a new paradigm”.

The collective mind-set of the organisation, referred to by Yves Doz as the 'organisational orthodoxy',<sup>9</sup> has a sense making function. But it is not always functional as it can persist beyond the point of relevance. As (Grove, 1998) points out, there are times ('strategic inflection points') when managers may know that their current approach is failing but may not know what new paradigm to adopt. Here a 'pre-framing' activity can be required—that can be termed 'exploration', 'learning' or 'entering a void'.

Innovation in paradigm includes a requirement for learning, including self-reflection (Kolb, 1983) and/or discourse. In a metaphorical sense it is necessary for actors in an organisation to 'look into the mirror' and see themselves as having adopted just one of several options in the way that they have framed reality and opportunity. Here reflection is a key enabler and the level needs to be deep and, potentially, transmutational (Cooperrider and Srivastva, 1987).

Although there is a significant degree of fuzziness in definition, it is useful to categorise two types of innovation in paradigm. These are:

- Type A—innovation in inner-directed<sup>10</sup> paradigms
- Type B—innovation in outer-directed paradigms (business models)

### 8.1. Type A—inner-directed paradigms

Type A innovation capabilities targets organisational values and people management policies. (Abrahamson, 1991) calls these 'administrative technologies'. These can be important as, for example (Steele, 1975) asserted “(o)ne of the most important concepts to emerge from

<sup>9</sup> Personal communication to the first author.

<sup>10</sup> The concept of inner-directed and outer-directed is adapted from Riesman et al. (1953). *The Lonely Crowd: A Study of the Changing American Character*. New York, Doubleday.

<sup>8</sup> Additional information regarding this case was gathered from an ex-marketing manager of Haagen-Daz in confidence by the first author.

behavioural science consulting is, in my opinion, the notion of social invention. This is simply the realisation that social settings do not have to be taken only as they occur by chance”.

The significance of changes in inner-directed paradigm is underlined by (Binney and Williams, 1997) who suggest:

“Underlying the patterns of behaviour that define organisations are the mental models that people have, the assumptions and frameworks that enable them to make sense of the world... it is these mental models or paradigms that ultimately organisations have sought to change”.

There are cases in which such 'mental models' appear to have changed. In the late 1960s, General Foods (GF) had a low performing dog food plant in Chicago. In 1969 the company decided to relocate the factory on a green-field site in Topeka, Kansas and to use the new plant as a laboratory for innovative forms of work organisation including autonomous work groups, payment for skills, commitment to the quality of work life, operator-led problem solving, participative decision-making and non-authoritarian leadership styles (Ketchum and Trist, 1992). The initiative was led by the factory director, Ed Dulworth,<sup>11</sup> and supported by Professor Richard Walton as a facilitator (Walton, 1977).

This was one of the first experiments in 'innovative work organisations' to be the subject of systematic research and was managed according to a distinctive set of values, many of which were derived from a socio-technical systems framework (Trist, 1978). The socio-technical experiment at Topeka stimulated root-and-branch innovation in the social organisation of a factory. According to Dulworth, in consequence, a wealth of process innovations followed which resulted in superior performance and gave employees an enriched experience of work. The adoption of a new organisational paradigm is more than a process innovation (discussed above) as it requires a shift in values and associated power structures. In the case of the Topeka GF plant, many processes were revolutionised—as Dulworth said in an interview with this researcher, “we challenged all of the givens”. The case also highlights another important aspect of innovation. It can service other stakeholders than the management, shareholders and customers. Employees can also benefit (Ketchum and Trist, 1992).

The Topeka case, and similar experiments in organisational form, had innovation as a superordinate goal. This was pointed out by Ketchum and Trist (1992) who was organisation development manager for GF during the 1970s. Ketchum wrote twenty years later:

“equally important is the replacement of a climate of low risk taking with one of innovation. This implies high trust and openness in relations. All of these qualities are mandatory if we are to transform traditional technocrat bureaucracies into continuous adaptive learning systems”.

Ketchum and Trist described the origins of the 'new' paradigm in the 1970s, which they termed 'third-order diagnosis of problems of organisational performance'. Importantly, industrial plants that adopted this new paradigm were up to 40% more productive than their counterparts (21) at the time when a financial evaluation was conducted. Ketchum and Trist describe these as “organizational innovations”.

The underlying principle in Ketchum's observation is that bureaucracy is unfriendly to innovation. Somewhat contentiously he, and others, for example (Nutt and Backoff, 1997), argue that innovation capability cannot be achieved by the installation of systematic management of new product and process development. Rather, the fundamental social architecture of organisation needs to be rebuilt to be 'innovation friendly' (Hurst, 1995). Equally disadvantageous, in their view, was the alienating and de-humanising effect of working in a bureaucratic form of organisation where individuality was perceived as a threat (see Beynon, 1973 for a vivid description of this form of social setting).

Thus far an inner-directed paradigm shift has been discussed as if it were a single event. There is evidence that a flow of paradigm changes, a form of episodic revolution in paradigms, is needed—at least in some industries. This is suggested by comments on Microsoft from one of its senior managers:

“what distinguishes Microsoft is that we're not afraid of making paradigm shifts, largely because our senior management is very technical. We understand the technology, which at the end of the day is really what drives the industry.” (Cusumano and Selby, 1996)

Cusumano implies that paradigms can be managed, and that it can be important to do so. It is reasonable to assume that explicit paradigm management would be especially important in industries where the structure of thinking is advancing in generational ways.

## 8.2. Type B—innovation in outer-directed paradigms (business models)

Type B innovations of paradigm relate to business models—these are the system of coherent, comprehensive, explicit and/or implicit constructs used by managers to understand their firm and shape its development (Senge, 1992).

This form of innovation in paradigm is outer-directed in the sense that it seeks to provide an organisational formula

<sup>11</sup> Two tape recorded interviews between Ed Dulworth and the first author (made in 1973 and 1975) were consulted in preparation for this section of the article.

for thriving in, generally, a competitive environment. Hence, the test of the efficacy of a business model is whether it provides the necessary conceptual architecture for a firm to gain and sustain competitive advantage. As such, it is more extensive than the market-facing positional innovation discussed above. An early comprehensive approach to strategic positioning was described in (Tregoe and Zimmerman, 1982). They argued that firms need a Driving Force (a dominant paradigm) and that they can only have one at a time. Tregoe and Zimmerman described 8<sup>12</sup> different possible driving forces, each of which required a distinctive pattern of assets, capabilities and strategies. The relationship between the Driving Force concept and innovation capability was discussed by (Tregoe et al., 1989):

“There is a wide range of opportunities for future business development facing just about every organization: deeper penetration of existing markets with existing or improved products; expanding to new markets with current or improved products; developing or acquiring new products for current markets; developing new products for new markets. No organization can pursue all future business development options simultaneously. If it does, scarce resources become dissipated, as do the creativity and energy of those involved. Focus is lost, and with it the discipline to achieve the vision”.

(Slywotzky et al., 1999) extended this approach and argue that there are unifying principles around which a firm’s activities need to be aligned. It is possible, Slywotzky et al argue, to identify 30 or so patterns, several of which may be unfolding at the same time. They argue that what is frequently needed is innovation at the level of business design—the structure of thinking shared by the power elite of the firm that determines policy and practice. Describing firms that had found their way out of a profitless position (for example, Swatch) Slywotzky and his co-authors write:

“In each of these cases, business design innovation brought the business back to sustained profitability. In each of these cases, at least one player created a paradigm shift, a change in the rules of the game, in order to create new kinds of value that had not previously existed in the industry”.

There can be multiple innovations to be undertaken in pursuit of a new business design, each of which is aligned to the new meta-patterns selected. This raises the interesting

<sup>12</sup> Unfortunately for academic researchers the Driving Force concept is company-confidential as it is used as the foundation for an extensive strategic consulting business. The company were forthcoming with published material but would not allow access to their extensive case library.

issue of how alignment is to be managed of a rapid flow of innovation initiatives in product, process (market) position and (organisational) paradigm.

The choice of business model shapes innovations in product, process and position. The Slywotzky framework provides an intermediate level of analysis between the generic dynamic resource of innovation capability and the specific needs of a particular organisation. Rather than saying, “all organisations are the same” or “all organisations are different” the approach asserts that, “you need to understand what your dominant strategic thrust is and the attributes that firms in your classification need. How effective are you in each of these?”

A change in business model can have revolutionary implications. Keith Todd, then Chief Executive of the IT company ICL (now part of Fujitsu) commented on the extent of change in the company in the following way: “ICL started as a manufacturing company. Now it has no factories—we put together service products. For companies like ours, these are fundamental discontinuities. They’re on the scale of the Berlin Wall coming down” (Jackson, 1998).

Sub-systems within organisations can also be the targets for paradigm innovation. Indeed, they are a natural location. For example, a training function may move from promoting a business school-based approach to executive education to running an in-house action learning programme (Ulrich, 1997) or a finance function may move from cost analysis to activity based costing (Srinidhi, 1998). Such paradigm shifts can be the spur for multiple innovative initiatives (Ulrich, 1995).

Perhaps the most dramatic forms of reconfiguration business model follows acquisitions, mergers, joint ventures and alliances. These may be undertaken specifically to provide an appropriate resource base for innovation, as seems, for example, to have been the rationale for the merger between AOL and Time Warner, described (Hill and Waters, 2000) as “revolutionising the way that news, entertainment and the internet are delivered to the home”. In this case the Internet distribution capability of AOL was merged with the content provider, Time Warner, following a ‘convergence strategy’. That this can be a risky endeavour is shown by the decline in share values after the merger.

## 9. Moving beyond the steady state

Up till now we have been considering the 4Ps framework in the context of mapping innovation under what might be termed ‘steady state’ conditions, in which firms are concerned to ‘do what they do, but better’. As we have seen there is considerable scope within this envelope, especially in exploring all of the four target areas. But it is also clear that organisations need to develop the capacity to explore ‘outside the box’ and identify radical ‘do different’ options for innovation, again using all of the four dimensions. The danger is that if they

do not contemplate such moves—even if they appear to conflict with current portfolio of activities—they risk being usurped by competitors, often new entrants to their marketplace. Such discontinuities can arise through technological changes moving the frontier of possibilities but discontinuity can also emerge on the demand side with the emergence of totally new markets or where the rules of the game are significantly changed within existing markets Table 1 lists some examples of discontinuity and the ‘do different’ challenge.

The need to consider discontinuities means that the framework of 4 Ps needs to be expanded, as shown in Table 2, to take account of the whole innovation agenda.

The problem in terms of developing innovation capability is that the set of behavioural routines and accompanying structures and processes to deal with innovation of the ‘do better’ variety may not be sufficient to deal with the challenges of ‘do different’. As Utterback and other commentators point out, under conditions of discontinuity within industries incumbent firms tend to do badly and are sometimes displaced by new entrepreneurial players (Utterback, 1994). At the limit there may be conflict between the routines for ‘do better’ and ‘do different’ innovation. For example, as Christensen points out, the ‘good practice’ model for ‘do better’ innovation creates a self-reinforcing and virtuous

circle in which close working with customers gives insight into their innovation needs which can be translated into better products and services to serve those markets well (Christenson, 1997). But whilst this is extremely effective for dealing with an existing market, it is a powerful filter cutting out signals about new or emerging markets with different characteristics. Consequently even ‘good’ firms which had been successful in innovation with previous combinations of technology and market find themselves surprised and their markets disrupted by new entrants with a different proposition—and sometimes they make the discovery at too late a stage to respond effectively.

The implications of this are that organisations need to ensure that their ‘innovation agenda’ covers the entire spread of the 4Ps illustrated in Table 2—and that they develop capabilities to deal with each of these areas (Fig. 1).

## 10. Using the 4Ps approach for strategic development

From studying the four Ps it is clear that it is possible to target innovation capability in different ways. One firm might invest significant sums of money, and a great deal of creativity, into developing a new range of products, perhaps based on the latest technology. Another company may keep

Table 1  
Examples of discontinuities and their triggers

Example	Trigger
Transition from valve-based to solid state electronics	Technological change, particularly the development of the transistor and subsequently integrated circuits. Many of the major player in the glass valve industry did not make a successful transition to the new era of solid state, whilst other new players—for example, Texas Instruments, emerged at this time
Deregulation of utilities markets	Old monopoly positions in fields like telecommunications and energy were dismantled and new players/combinations of enterprises emerged. In particular, energy and bandwidth become increasingly viewed as commodities. Innovations include skills in trading and distribution—a factor behind the considerable success of Enron in the late 1990s as it emerged from a small gas pipeline business to becoming a major energy trade (Hamel, 2000). Although Enron failed to capitalise on their innovative business model (financial concerns became apparent in 2001 and the company became insolvent) their re-conceptualisation of business opportunities remains an example of significant innovation in paradigm. The Enron case demonstrates the risks inherent in radical change where bold moves are called for. Without a track record is difficult for prudent decisions to be made—unquantifiable chances may be needed to be taken
Dismantling of political systems	The post-Cold War experience in Eastern Europe or the transition from apartheid in South Africa led to conditions in which new rules of the competitive game applied (Barnes et al., 2001). Incumbent firms in those regions were ill-equipped to jump trajectories and many failed as a consequence
Emergence of new market constituencies	Christenson’s work on disk drives suggests that new markets that later become mainstream and set trajectories/define the innovation envelope begin at the fringes and are often not detected by established players (Christenson, 1997). Under these conditions ‘good practice’ recipes like staying close to existing customers, whilst effective for ‘do better’ types of innovation may not be sufficient to help with the transition to new markets and product platforms
Diminishing innovation space within mature industries	Firms in mature industries may seek to escape the constraints of diminishing space for product and process innovation and the increasing competition of industry structures by either exit or by radical reorientation of their business (Baden-Fuller and Stopford, 1995). For example, Preussag’s move from primary production (lead and other ore smelting) into a broad based conglomerate and from there into a focused tourism business

Table 2  
The innovation agenda

	'Do better' innovation	'Do different' innovation
Product/service innovation-change in what is offered	This is incremental product development. For example, the Bic ballpoint was originally developed in 1957 but remains a strong product with daily sales of 16 million units. Although superficially the same shape closer inspection reveals a host of incremental changes that have taken place in materials, inks, ball technology, safety features, etc	Radical shift to new product concept for the firm, perhaps for the industry as well. An emerging example of this could be the replacement of the incandescent light bulb originally developed in the late 19th century by Edison and Swan (amongst others). This may be replaced by the solid state white light emitting diode technology patented by Nichia Chemical. This technology is 85% more energy efficient, has 16 times the life of a conventional bulb, is brighter, more flexible in application and is likely to be subject to the scale economies associated with electronic component production
Process innovation-change in the ways in which it is created and delivered	These are incremental improvements in key performance parameters-for example, cost reduction, quality enhancement, time reduction, etc. A good examples of incremental process innovation can be found in the 'lean production' field where intra and inter firm efforts to drive out waste have led to sometimes spectacular performance improvements-but achieved within the same envelope established by the original processes (Womack and Jones, 1997)	These are radical shifts to new process routes for the firm and, perhaps, for the industry as well. For example, the Bessemer process for steel-making replacing conventional charcoal smelting, the Pilkington float glass process replacing grinding and polishing, the Solvay continuous process for alkali production replacing the batch mode Leblanc process, etc
Position innovation-change in the context in which it is applied	This includes the launching of a product or deployment of a process in familiar context and redefining the perception of a product for customers. For example, in mobile telephones a shift has taken place from a business tool to a leisure and recreation aid, with considerable associated incremental product and process development (ring tones, cartoon displays, text messaging) emerging as a result of such positional innovation	This requires creating completely new markets rather than extending and deepening existing segments or incremental brand identity changes. (Moore, 1999) For example, satellite navigation was originally developed for military use but is now used by sailors, motorists, surveyors and even postmen. Christensen's study of the rapid evolution of the hard disk drive industry highlights the ways in which unimagined markets can quickly become the key segment.(Christenson, 1997)
Paradigm innovation-change in the underlying mental models surrounding it	These are evolutionary changes in the way that business activities are undertaken that provide the opportunity for incremental innovation in paradigm or business model. An example might be rethinking the Rolls-Royce motor car business as that of supplying luxury experience, competing with expensive watches, holidays, clothes, etc.-rather than as a transportation mechanism	These are new business or industry models-for example, 'mass production' vs. 'craft production'. (Freeman and Perez, 1989). An example of a recent transformational innovation in paradigm was the development of internet solutions to many business areas like banking, insurance, travel, etc. (Evans and Wurster, 2000)

its products more or less the same but invest a great deal in trying to change the way that potential customers perceive the firm, as oil companies appear to do. The question arises, 'can the 4Ps help a firm to take better strategic decisions?'

The answer is, we believe, 'yes'. The 4Ps approach helps companies in three principal ways: focussing effort, managing interdependencies and enlarging choice. An example illustrates this point.

Nine innovation activities were listed on the diamond chart, including:

- building totally customised products for customer's individual orders (paradigm);
- using sensors in the next generation of lawn mowers to avoid roots and stones (product)
- re-positioning the company's products as female-friendly as more women are keen gardeners (position)
- installing 3D design software in the RandD department (process)

The selection of just nine major innovation initiatives gave focus to R&P's innovation management; the firm

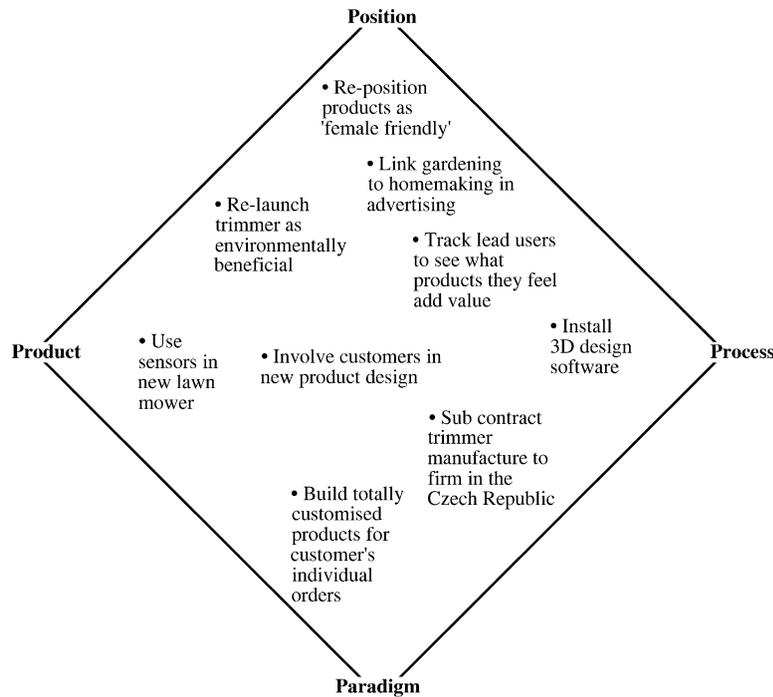


Fig. 1. shows how the approach was applied in a company (R&P Ltd) making garden machinery. The diamond diagram provides an indication of where and how they could construct a broad-ranging 'innovation agenda'.

considered that “it is important not to try to do too much at once”. Some initiatives, such as re-launching their trimmer as environmentally friendly, require both product and positional innovation. Such interdependencies are clarified by discussion on the placing of an initiative on the diamond diagram. Also, the fact that the senior management group had the 4Ps on one sheet of paper had the effect of enlarging choice—they saw the completing the diagram as a tool for helping them think in a systematic way about using the innovation capability of the firm.

**11. Further testing of the model**

The researchers undertook a preliminary study in order to assess whether the 4Ps model provided a useful heuristic device capable of being used by managers. The data set was collected from five different companies in the Pharmaceutical

Industry (companies 1–5 in Table 3 below). Each of the companies had been asked to prepare an innovation plan. We analysed the five planning documents and allocated each planned innovation initiative to one of the 4Ps—either 'do better' or 'do different'.

The data indicate that initiatives to innovate in new products were the most frequent (25 cases) but that multiple initiatives were planned in each of the other 3P areas as well. The less well-recognised innovation in paradigm was as frequent as innovation in process, with innovation in market position only slightly behind (12 as against 15 mentions).

Out of the 65 planned innovation initiatives in the five companies, 39 were (for that company) 'Do Different', rather than 'Do Better'. It should be noted that the initiatives that 'made it' to the innovation plan were those that require a significant commitment—it is probable that there are many more that will be undertaken at lower levels of

Table 3  
Distribution of innovation plans across the 4Ps

Company	P1-DB	P1-DD	P2-DB	P2-DD	P3-DB	P3-DD	P4-DB	PB-DD
Co 1	4	3	1		1	2	1	2
Co 2	1	2	3	2	2	2	3	4
Co 3		3	1	3				
Co 4	2	1	1		2	1		4
Co 5	2	6	2	2		1		1
Totals	9	15	8	7	5	6	4	11

(DB = 'do better' innovation', DD = 'do different')

the organisation without the requirement for formal planning. The fact that 60% of the total initiatives were novel (from the company's perspective) suggests that 'Do Different' innovations need a strategic commitment, whereas those 'within the box' do not require the same level of top management involvement. Hence, it may be companies have found a simple mechanism for managing 'Do Different' innovation—i.e. ensure that 'Do Different' is owned by top managers.

## 12. Conclusions

Innovation is widely seen as a critical imperative for survival and growth of firms. But responding to this challenge needs to be balanced against the resource constraints of the organization in terms of money, skills, time and knowledge base. In this article we have developed a framework for setting a firm's innovation agenda holistically which makes a contribution to thinking about the strategic portfolio of innovation projects undertaken. It also focuses attention on areas which may not be recognized as having innovation potential and on emerging areas in which it may be desirable to explore potential new projects.

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