



WestminsterResearch

<http://www.wmin.ac.uk/westminsterresearch>

Innovation management for the long-term.

Bill Hollins

Westminster Business School

This is an electronic version of a paper presented at Engineering Design in Integrated Product Development: EDIProD'2000, 12-14 Oct 2000, Department of Mechanical Engineering, Technical University of Zielona Gora, Poland.

The WestminsterResearch online digital archive at the University of Westminster aims to make the research output of the University available to a wider audience. Copyright and Moral Rights remain with the authors and/or copyright owners. Users are permitted to download and/or print one copy for non-commercial private study or research. Further distribution and any use of material from within this archive for profit-making enterprises or for commercial gain is strictly forbidden.

Whilst further distribution of specific materials from within this archive is forbidden, you may freely distribute the URL of the University of Westminster Eprints (<http://www.wmin.ac.uk/westminsterresearch>).

In case of abuse or copyright appearing without permission e-mail wattsn@wmin.ac.uk.

**ENGINEERING DESIGN IN INTEGRATED PRODUCT DEVELOPMENT
EDIProD 2000**

Department of Mechanical Engineering
Technical University of Zielona Gora. Poland
12 - 14 October 2000

INNOVATION MANAGEMENT FOR THE LONG-TERM

Eur Ing Dr BILL HOLLINS, BSc PhD DMS CEng, R Eng Des, FIED, M.Mgt
Brunel University
Runnymede Campus,
Englefield Green,
Egham Surrey. TW20 OJZ. U.K.

email hollinb@westminster.ac.uk
Tel. +44 (0)208 995 9095

ALAN TOPALIAN, BSc MBA
Alto Design Management
72 Longton Grove, London SE26 6QH. UK.

Summary

This paper describes some of the results of research funded by the UK Department of Trade and Industry into how companies plan their long-term products and services. Essentially, how they plan their product generation after the product generation after next. This is the first time that research has attempted to uncover how those in organisations plan their product innovations that far into the future. Through this research was determined what innovative organisations do, how they do it, who is involved and what they measure.

The findings were used to inform the British Standard BS 7000 Part 1, *Guide to Managing Innovation* published in November 1999.

Key words: Long-term Innovation, Strategic Design Management

Introduction

Back in the 1920s, Henry Ford said “*It is not the employer who pays the wages, he only handles the money; it is the product that pays the wages*”. So what products and services will pay the wages ten years or so into the future and generate profits and growth? It is those products and services that the company develops for the future. The failure rate of new and established companies is alarmingly high. Perhaps one of the reasons for this short life expectancy can be explained by the findings from research outlined in this paper, companies do not have procedures for planning products and services* over the longer-term future.

* *Note:* In this paper the term ‘product’ will also encompass services as well as business processes.

Strategy and Innovation

Although much has been written about business strategy, little of this focused on the actual products that organisations will need to provide to ensure survival in the longer-term future. Nor is there much discussion about how far ahead businesses need to plan into the future to ensure profitable survival. Though writers, such as Grant (1995) and Schwartz (1998), promote a longer term perspective than many when exploring the future and how to get there, they do not define the type of products that are needed in that future.

Why it is important to think long term

Yet it is important that organisations plan further into the future. As G Peters (1996) has written: “*We are invariably caught unaware of the trends affecting our business because we don’t spend enough time looking to the future. Our day-to-day lives are spent managing one crisis or another*”.

Innovation is fundamental to corporate survival over that longer time span. To quote Cooper (1993): “*The annals of business history are replete with examples of companies that simply disappeared because they failed to innovate, failed to keep their product portfolios current and competitive, and were surpassed by more innovative competitors*”.

Methodology for the research

Having developed sector guides for managing design for the short term, in 1995, the British Standards Institution identified a need for a standard to guide executives at the corporate level on how they could develop “*the product generation after the product generation after next*” (David Sproson, BSI Project Manager). For many organisations this time span would typically be ten years plus.

It was proposed that the new standard should target top executives and address issues surrounding future strategy in greater detail than existing design management standards. The plan was to guide users in how to assess their corporate capabilities, collect market intelligence and create the right organisation to benefit from this new knowledge. The standard was planned as a document for corporate use focusing on the design dimension of strategic thinking, the envisioning and planning of business futures and transforming these visions into reality.

In the original ‘Guide to Managing Product Design’ (BSI 1989) Design Management was described as ‘planning, communication, monitoring, and control’. Whilst it was accepted that these are all an important part of design management it was not design management itself. In later standards (BSI 1994, BSI 1996, & BSI 1997) design management is taken to mean the ‘organisation of the process of developing new products and services’. This has been found to work well in practice because with a knowledge of the process it is then possible to identify timescales, costs, concurrencies, and the roles and responsibilities of those who are to be involved (Hollins & Hollins 1999). In short, the design is being managed. For this reason it was similarly decided to attempt to also identify elements of a process for managing the long term.

The research was undertaken during 1998 and 1999 by Hollins & Topalian through a contract placed with Westminster Business School. This took the form of semi-structured interviews based around a questionnaire. The questionnaire had been compiled based on the research objectives as outlined in the research specification compiled by the Technical Committees for Design Management Systems of the British Standards Institution. One of the researchers had significant experience of writing questionnaires but these were also compiled with the use of accepted texts (Oppenheim 1993, Hollins & Hollins 1991, Hague 1993).

It was eventually agreed that the procedures of innovative organisations should be researched to determine what they do to plan and manage their products into the future beyond horizons set by most organisations. The contract for this research, funded by the Department of Trade and Industry, was placed with Westminster

Business School. A list of innovative companies was drawn up from winners of SMART Awards and the Queen's Award to Industry (Technology); the UK R&D Scoreboard; enterprise companies known to the parties involved and those that responded to an article in *Ambassador* (the journal of the Association of MBAs).

Over 80 companies were contacted. Several chose not to become involved as they considered their innovation management processes to be confidential. Others stated that they were not interested in such planning. Some were suspicious of the researchers' motives: as one stated "*If this is an exercise to pick our brains and use this for self-gratification without proper reference to the source knowledge base, I do not want to be involved*". Many more were found not to plan sufficiently far into the future and so were eliminated from the survey.

Findings from eliminated companies

Innovative thinking was short-term in nature in many organisations contacted. Most had no plans stretching far into the future; indeed many did not even seem interested in thinking that far ahead. If companies are not planning or even thinking about their products in the not-too-distant future, how can they expect a smooth passage into that future? **Finding 1: Only a minority of senior executives concern themselves with the long-term future of their products and organisations.** They need to be encouraged to plan for the future by adding this to their priority responsibilities.

It was also found that several apparently innovative organisations — some of which had won awards for their innovations — could be considered as '*one hit wonders*'. These companies had often 'stumbled' upon a good idea (rather than through planning). Although they had developed it into a successful product and marketed it well, they seemed unable to take a long-term view beyond their one innovation and had no plans or processes for future innovations. These companies were also eliminated from the research. **Finding 2: Executives in companies that are or have been successful at innovation are not necessarily successful at taking a long-term view regarding the management of their products and organisations.**

Another surprising finding was that some quite large and well known organisations that portray themselves as being advanced and forward-thinking are actually not so. This may be because 'innovation' has fashionable associations and companies wish to convey such images. **Finding 3: Several organisations perpetuate the myth that they are planning for the future when, in reality, they do not have the procedures in place to be able to do so.**

A final sample of 34 companies was investigated. The companies were geographically spread throughout Great Britain. Sizes ranged from three to over 58,000 employees. There was also a wide range in the annual turnover: £12,000 to £8.4 billion. The sample included organisations that were fairly new (two years) and long-established (over 100 years); private, public limited companies as well as employee-owned enterprises. Their interests spanned a broad spectrum of industries and markets — pharmaceuticals, travel and tourism, hard and soft drinks, communications, IT leisure activities and power generation.

The research took the form of semi-structured interviews based around an extensive questionnaire. These interviews lasted one to three hours. Those interviewed were senior executives who were responsible for planning long-term products. In order to benefit from their knowledge and experience, executives were encouraged to talk and often the discussion extended beyond the set questions into areas of long-term product management that had not previously been anticipated. This aspect of *Grounded Theory* (Glaser and Strauss, 1975) allowed the interviewers to explore new areas which resulted in interesting new findings. Virtually all who took part reported that it had been a worthwhile learning experience. All were prepared to take part in follow-up surveys.

The results from Innovative organisations

"We attempt to astound our customers more than our competitors do" (interviewee)

Surprisingly, we found that there was very little difference in the long term innovation management processes between small and large organisations involved in the research. What differences there were will be described.

Finding 4: Executives in forward-thinking companies have clear views of 'innovation' which could be encapsulated as radical 'newness' in their operations and outputs. Moreover, they were consistent in separating this activity from incremental change, product improvement and product 'facelifts'. All acknowledged that the risk, cost and time needed is greater when innovating.

Finding 5: The creation and sustenance of an innovation-nurturing culture was considered by the majority of respondents to be *the key responsibility of innovation leaders.* These cultures were generated from the top and had the support of most senior executives, especially the Chief Executive Officer. The search for new products generally starts at director level: it is here that a specific initial budget is allocated which is then communicated to other relevant people around the organisation. In some cases 'filters' from non-innovative management layers limited their effect. Therefore, care should be taken to ensure that systems put in place for long-term product planning neutralise the effects of such unnecessary 'filters' and so prevent the erosion of innovation-nurturing cultures.

Within these cultures there is an enlightened tolerance of failure. Experimentation in new activities and areas is encouraged and no blame is ascribed as certain mistakes are viewed positively as an inherent and valuable learning aspect of healthy long-term product planning. When punished for mistakes, individuals are likely to confine themselves to 'safe', low risk options: this will prove to be more harmful to the enterprise in the long run.

Finding 6: Forward-thinking companies encourage innovation in all their change activities and seek opportunities to innovate throughout the value chain. As such, innovation is not restricted to technology on products but extends to business processes, marketing and services. Innovations may also be 'captured' through acquisition: companies operating in small, profitable but slowly developing markets can still grow through the acquisition of innovative enterprises, typically in fields where synergistic gains will result. This acquisitive practice may become central to corporate strategy.

Planning horizons and other time factors

The span for planning specific long-term products was found to be typically 10 years. In two organisations products were planned twenty years into the future, while others planned just five years ahead. The range viewed depended on the type of markets and products addressed. [Note: organisations that did not plan over a suitably long time span had already been eliminated from the survey].

Finding 7: Senior executives in the more advanced companies typically spent 5% of their time considering and planning the long-term future. This figure varies widely from those who are involved full time in this activity to those who delegate it almost entirely to others. Often this was one of several aspects of the individual's role. In larger organisations, one or more person's roles were taken up entirely by looking at or developing products for the long term. These people were generally linked to the Product Development or Marketing departments.

Finding 8: Long-term product planning and innovation do not fit comfortably among the interests of top executives. Several respondents suggested that remuneration (and bonuses) tend to be based on short-term performance (sales, market share, profits) and the share price. This does not encourage them to give serious consideration to the long term. It was also suggested that directors in quoted companies rarely stay in post for periods of ten years or over, thus they do not have a real interest in plans that take ten or more years to bear fruit.

Budgets and costs associated with long-term product planning

Some of the respondents stated that the organisation could not afford to spend much time on long-term planning. One cited that this was because of pressures to provide sensible short-term returns for shareholders. By contrast, a family-owned organisation was able to fund long-term initiatives because all the shareholders were in the family. Several suggested that pressures to develop products in the short term often precluded their thinking sufficiently over the long term. Those who did spend the time stated that this time and money devoted to planning long-term products and services was significantly less than the time spent developing the next generation of products — an understandable and expected finding. **Finding 9: Typically the budget for long-term product planning was between an additional 5% and 20% of budgets allocated to new product development. Depending on the type of products, this typically amounted to 0.5% to 2% of annual turnover.**

This seems adequate because the costs of planning over the long term are relatively low compared with other aspects of new product development. It involves mainly people's time and does not generally involve significant capital expenditure. Costs rise significantly when the decision is taken to develop a specific product and the project becomes part of the normal new product development process. When these facts were discussed with interviewees, they accepted that the costs of *thinking* long term are not great and should not significantly

affect the level of dividends paid to shareholders.

Finding 10: The costs involved in planning for the long-term future are not great. Many respondents stated that the actual cost of long-term plans was not a problem, though they underlined that such investments must not jeopardise the viability of an enterprise. Indeed, the costs of *not* planning are even greater if the company sets out in the wrong direction and/or invests in inappropriate initiatives.

A Process for Managing Long-Term Innovation. Is effective planning possible ten years ahead?

Finding 11: There was broad acceptance among the enterprises surveyed that very little *cannot* be planned for 10 years ahead. There is also acceptance that it is worthwhile to attempt such planning so as to be better placed to deal with whatever future presents itself. Respondents had no sympathy with the view that it is not worth the effort to plan as the future will be very different from today and the chances of making the right predictions are minimal. There was acceptance that one should try to plan to ‘create the future’ if possible as this would provide competitive advantage and help prepare companies to deal better with whatever circumstances they may face. Plans should be sufficiently flexible to allow appropriate amendments as significant changes occur. A clear vision of overall aims will increase the chances of ‘staying on course’ with a relevant development programme.

Overall, several sceptical executives were brought round to accepting that rather more could be planned with beneficial effects. The trick was to sharpen their analyses of what will be significant in the future, then pile in the resources to work on those factors.

Future regulation and ‘discontinuous change’ that could destroy a company’s markets were cited most frequently as factors that *cannot* be planned ten years ahead. However, executives also stated that these rarely occurred suddenly without any warning: there ought to be sufficient signs and time to do something about them. “*Curiosity-driven research which yield unique sparks*” might also have a major impact on carefully laid plans.

In some markets, the fickleness of customers presented difficulties. Generally, factors relating to human and environmental values were viewed with caution. Nevertheless, there may be prizes for those that make special efforts to effect change legislation in their favour by lobbying governmental and standards agencies in relation to, say, environmental and health & safety issues. Changes in legislation (especially with regard to the environment) are a big opportunity that could be exploited for long-term product development. Being able to influence, or getting involved in, the formulation of European Standards were put forward as practices that could help with the development of future products.

Global changes — particularly in regions where nations economic and political systems might change present planners with particular challenges. Nevertheless, analyses of scenarios formulated to flesh out the implications of ‘switching’ systems should yield commonalities that represent ‘safe ground’.

Finding 12: There are few threats in planning the long term. Respondents mentioned few threats apart from the short-term economic climate and sudden changes in technology. However the general feeling was that changes in technology or legislation usually had lead times that allowed plenty of time to act as long as there were people formally assigned to looking for potential threats. The changing structure of particular industries was also mentioned, often through mergers that resulted in fewer, larger, more powerful competitors. One company had been confronted by a major competitor reducing prices suddenly by 10%: that could not have been foreseen.

Processes currently in use

“Competitors that have a rigid plan for their future tend to go out of business” (an interviewee)

Not all respondents agreed that a formal process was necessary to generate successful long-term products. One stated “*product life cycles are so short there is no time to plan. Our competitors who do plan spend so much time on it that they are going out like light bulbs*”. This view was the exception though it could be argued that companies should choose between detailed planning and agility to respond fast to change - perhaps they do not need to do both. If enterprises are sufficiently agile they may not wish to have constraining plans; if they lack agility it would be sensible for them to formulate plans with appropriate milestone to provide review break-points.

On the other hand, a company could build agility into their process so that they could change direction, or adapt, fast to changing situations. A suitable process could increase an organisation's agility allowing people to be 'fast on their feet' when technological breakthroughs occur. In any case, the process needs to be organic and flexible. Without any formal plan an organisation may be limited to being a follower of others innovations.

Finding 13: It is important that the process should be written down. Staff turnover was high in some companies, whilst in others the knowledge was held in the minds of only one or two people. The future of these companies may be very precarious if people leave, die, retire or simply forget. Retrieving archiving ideas was stated to be a problem.

Initially many respondents thought it would not be possible to write down a process for planning products so far into the future. Nevertheless most had sufficient knowledge to compile a long-term development plan. The research has shown that such a plan would need to include more than just a procedure. **Finding 14: The process also needs to include personnel and communication aspects, as well as a method for archiving ideas for future retrieval.**

Only one organisation in the sample had a complete *written* process for planning long-term products; this stretched out for a period of 20 years. This included a short overview which then led the user to greater details of each basic set of activities. Several organisations were working on aspects of a process for planning their long-term products. Several stated that they had implemented some parts of a process. Typically, one said that when the part of the process was working well they would implement a bit more. They planned that the complete process would be in place within five years. It appears to be a case of 'continuous improvement' of the process in these companies. Perhaps this piece-meal approach to developing a process is less disruptive.

A benefit of planning the future was stated to be the (sometimes rudimentary) direction provided. This may be similar to the *Foresight* programmes operated in Japan, where a view of the future is used as the model to distill targets to achieve. Brainstorming and scenario planning were undertaken by some of the enterprises. However, Delphi techniques, though known, were not used.

Several executives stated that it was possible to plan the broad description of a product long term and map out the major innovations that were likely to occur. They also thought that incremental changes and precise detail changes could not be planned a long way into the future. Detailed specifications and aesthetics cannot be planned more than twelve months ahead.

A system for planning over the long term.

Finding 15: Thinking of the longer-term future should be undertaken at the same time as thinking about present product developments. The polarisation and divorce between short-term and long-term perspectives needs to be addressed urgently. The survival of business enterprises demands that attitudes are transformed so these perspectives become two aspects of one continuum. However the long-term should provide the 'game plan': that is, the short-term is actually what firms do today so as to achieve their long-term goals 10 to 20 years hence.

The system for managing the long-term products is not one that can be described through a design process model. A series of inter-related 'layers' is a more appropriate model, each contributing to the organisation's management of the long term future.

Respondents also underlined the need to allocate sufficient time for long-term product planning to flourish: time-scales that are too tight tend to kill off such activities.

A long-term strategic plan or business plan - typically stretching from 10 years up to 20 years - is also critical to prescribe an overall time horizon, direction and route for the organisation and the targeting of new products. This was subsequently called '*the length of the innovation highway*' (BS 7000 part 1 1999). Quite often this is translated into three- or five-year rolling plans from which a long-term product plan is formulated.

Similarly, the long-term product plan must dovetail into specific shorter-term product developments (the type described in BS 7000 Parts 2, 3 and 4). Generating ideas for new products over the long term do not seem to be a problem. the real challenges are to be found in identification of the right ideas and adequate resources to develop them. (see also Cooper 1999)

The process for planning these long-term products generally includes a set of parameters within which new products should be positioned. Although respondents commonly said that no restrictions were placed on what could be developed over the long term, further questioning revealed that all organisations impose (usually sensible) restrictions. These are generally known but not written down, certainly not recorded as part of the process. Restrictions tended to relate to finance and time; they also covered the number of staff and range of skills that were required. Again, it was the smaller companies that had the most restrictions around areas to explore when looking for long-term product opportunities. These became known as *'the width of the innovation highway'* (BS 7000 part 1 1999).

Some of the better organisations further specified a direction in which they wished to go and this laid down the foundations for the type of products that would eventually be developed. Some organisations are compiling databases of possible products that might be developed, though the technologies required are not available yet. These propositions would be reconsidered at specific times in the future (for example, every three years) to see if the time was then right.

The more enlightened companies plan the complete life cycles of their products though only one is talking to customers about taking back products for recycling and disposal. In that company, proposals for new products had to include a section on phasing out existing models which, in turn, allows organised withdrawal programmes. There is a distinct move away from designing *products* to designing and managing *customer expectations* and *experiences* from first awareness through to final disposal and/or recycling.

Finding 16: There is almost no use of new languages to 'unlock' people from the present and transport them into the future. Few companies are using visual imagery to provide richer articulations of ideas — visualisation and the use of visual imagery featured in only a couple of companies though a few more aspired to it: as such, the 'visual dimension' of communication is grossly under-utilised. One company was introducing 'visualisation centres' in all its main premises to give colleagues and customers actual 'hands on' experience of new technologies and prototypes of new product concepts. They felt strongly that visualisation was the most vivid way to communicate ideas and excite their employees. However no training was planned to help those less confident with their 'visual' skills or to enhance the general level of such skills in the organisation.

Finding 17: Effective archiving and retrieval of information is one of the main challenges that need to be addressed. Respondents acknowledged that the acquisition and processing of information as one of the critical shortcomings at present. 'Capturing' knowledge and experience is crucial, and the central archiving and effective sharing of such 'corporate software' essential, if the productivity of intellectual property is to be raised. Concurrent processing of information has to be instituted; that requires fuller and faster access to information and those who can make sense and act on that information. Websites and intranets open up considerable opportunities to exploit knowledge more effectively.

Measurables for filtering ideas

Finding 18: Almost no innovation-specific evaluation is taking place at present. Without measurables, it is not possible to identify the effectiveness of organisations in their long-term product planning. The better companies have portfolios with judicious mixes of high risk/high return and low risk/low return projects to safeguard their future. One organisation had a marking system, graded from one to five on several parameters including possible returns, the likelihood of success, whether the required technology already existed, and whether the organisation had the required skills to achieve the set goals. Risk assessment was a common component in mechanisms for filtering ideas.

Ideas were evaluated, first, by looking at the potential benefits to customers compared to existing products on the market and, second, by assessing whether customers are likely to find those ideas attractive. A manufacturer of original equipment looked at the whole-life benefits offered to end users, however it then had difficulties in convincing customers of these advantages when being judged only on initial purchase price.

Ideas tend to be filtered at senior management level although this need not occur if an effective process is in existence. Respondents confirmed that there are generally more ideas than resources to develop them, so an early mechanism for filtering ideas is important. Filtering criteria include non-conformance with an organisation's strategic direction and failure to align with its core competencies, over-extended schedules and excessive development costs.

In innovative enterprises, evaluation of both successful and failed projects results in feedback that helps to adjust the design process and improve its future effectiveness.

Alliances and technology

Finding 19: Alliances are an essential part of implementing plans for the future. Alliances are a fact of life for most of the companies interviewed, and will feature more prominently in the years ahead. Some of these alliances had been in existence for up to 10 years. The principal motivation for establishing alliances is to survive and stay ahead of the competition. Another reason gaining prominence is that, increasingly, customers are seeking comprehensive solutions to larger requirements from their suppliers (for example, automotive sub-systems). Few companies can service such systems on their own, therefore, networks of suppliers are forming to offer such total support.

Alliances tended to involve elements of vertical integration and specialist assistance in product development and wider coverage of markets. Some alliances related to the selling side. Some alliances were with hardware or software suppliers; others with experts (often academics from universities especially where high technology is used). Such experts are also commissioned to research into specific areas often relating to the application of technologies and the characteristics of future markets.

Those that had a better developed route or process tended to consider that technology was not a serious problem when planning the long-term. In earlier stages attention focuses on the business plan and the likely product 'dreams' that could fit into the future envisaged in that plan. Once benefits of future product visions have been identified and assessed, attention progresses to the technology that will be needed to turn such 'dreams' into reality.

Sometimes potential new technologies needed to transform ideas into new products are investigated. Larger organisations often contacted high technology agencies to enquire if and when the necessary new technology would be developed. New alliances may arise from such contacts.

Some smaller companies collaborated with larger organisations to use and/or help develop technology that they themselves were too small to develop on their own. If a new technology was known to be under development in a larger organisation, then brainstorming sessions took place to explore how the development might be applied beneficially to their own long-term products. In smaller companies, this type of planning also stretched to looking at innovative and structural changes that were occurring in their markets following which the long-term organisational innovations were planned to benefit from these changes. Both of these courses of action seem to be valid depending on the size of the organisation.

Several organisations had alliances with companies (often in various parts of the world) to assist with the marketing of their products and services over a wider geographical area.

One company was part of a 'club' formed to 'watch what others were doing'. Members came together regularly to share their views and experiences. Apart from their industry/market monitoring activities, they invited appropriate speakers to expand their knowledge and network.

Conclusions

This research has shown how some companies are actively planning their long-term products. As a result, these companies are better placed to survive and thrive in the future. Perhaps executives who wish to improve the planning of long-term products and seek to safeguard their organisation's survival should heed these findings. As Gibson (1997) observed: *"Today a simple choice faces every individual, every corporation, every government and every society on earth. That choice is rethink the future or be forced to rethink the future"*.

Bruce (1998) stated that the right culture for change included *"a clear vision of what success will look like, commitment in the form of necessary resources and budget, a clear and communicated plan of activities and a mechanism for validating the value at the end"*. These have all been found to be true in the research reported in this paper.

High calibre results and information identified through the adopted methodology has given an insight into what might be considered 'good practice'. This information has contributed towards the formulation of an integrated process in the new British Standard, *BS 7000 part 1 Guide to Managing Innovation* (British Standards Institution 1999). This long-term perspective of product and services has also been considered further in a recent publication (Hollins & Hollins, 1999).

References

- Bruce A. 1998. Aiming for Change? Stay on Target. *Professional Manager* September
- BS 7000 Part 1. 1989. *Guide to Managing Product Design*. British Standards Institution: London
- BS 7000 Part 1. 1999. *Guide to Managing Innovation*. British Standards Institution: London
- BS 7000 Part 2. 1997. *Design Management Systems: Guide to Managing the Design of Manufactured Products*. British Standards Institution: London
- BS 7000 Part 3. 1994. *Guide to Managing Service Design*. British Standards Institution: London
- BS 7000 Part 4. 1996. *Design Management Systems: Guide to Managing Design in Construction*. British Standards Institution: London
- Cooper RG. 1993. *Winning at New Products - Accelerating the process from idea to launch*. (2nd edition) Addison-Wesley: USA
- Cooper RG. 1999. The invisible success factors in product innovation. *Journal of Innovation Management* **16**.
- Gibson R. (Ed). 1997. *Rethinking the Future*. Nicholas Brearley: London
- Glaser BG, Strauss AL. 1975. *The Discovery of Grounded Theory* (7th edition). Aldine Publishing Company
- Grant RM. 1995. *Contemporary Strategy Analysis*. Blackwell Business
- Hague P 1993 *Questionnaire Design*. London. Kogan Page.
- Hollins G, Hollins B 1991. *Total Design: Managing the design process in the service sector*. Pitman: London
- Hollins B, Hollins G. 1999. *Over the Horizon. Planning products today for success tomorrow*. Wiley: Chichester
- Oppenheim, A. M. 1993 *Questionnaire Design, Interviewing and Attitude Measurement*, Heinemann
- Peters G. 1996. *Beyond the Next Wave - Imagining the next generation of customers*. Pitman: London
- Schwartz P. 1998. *The Art of the Long View*. Wiley: Chichester

“You must have a clean desk to plan the future — otherwise you never get round to doing it properly”
(interviewee)