8

# Improving the product development process

Best practice in product development is a dynamic target. Not only are new practices being developed and refined but the differences in organisations demand the tailored application of these practices. There are eight basic principles and four basic stages in product development which are true for all companies, all projects and at all times. But the company philosophy, knowledge, skills and assets change; and these changes cause changes in the types of product innovations and the activities in product development. Successful companies recognise that product development is an important strategic issue that demands constant attention. There is a need to evaluate the product development performance and the product development success rate (product development efficiency and effectiveness), and then combine this evaluation with the company's strategic direction to determine and organise improvements in both the effectiveness and efficiency in the future. This is not simple because creativity and criticism are two opposing thought processes. Creativity, vital to product innovation, goes into the unknown and makes mistakes; the product development evaluation looks for mistakes and criticises them. Emphasis on mistakes leads to conservative product development; emphasis on creativity leads to wild product development; the successful companies intertwine the creativity and the evaluation in the project.

Product development is unique to the company and is related to the company's history, philosophy and knowledge, but the company's position relative to the best practice in the related industry and market is an indicator of the company's past and present product development effectiveness and efficiency. From this evaluation can be built up strategic plans for improving product development. As shown in Fig. 8.1, product development effectiveness and efficiency are improved together to give the strategic product success



Fig. 8.1 Evaluating and improving product development.

indicated by the company top management. Product development effectiveness and efficiency are inextricably linked.

# 8.1 Key messages

There is no single recipe for successful product development. During the previous chapters, a number of basic principles were identified which are common to all successful product development as shown in Table 8.1.

# 8.1.1 Link to overall business strategy

'Doing the right things' must always be central to any product development effort. The product development strategy must be in harmony with the overall business strategy. It should both receive and provide direction to the business strategy. The balance of reactivity to proactivity will depend on the nature of the organisation and its overall goals.

Table 8.1 Basic principles of product development

Link to overall business strategy Balanced product development portfolio Clearly defined product development strategy

Appropriate systems and processes for project management Appropriate human and physical resources Committed and supportive organisational climate

Understanding the consumer, customer, market and society

#### 8.1.2 Balanced product development portfolio

The business goals and strategy should define the key criteria to be used in preparing the product development portfolio. These include:

- degree of novelty or newness;
- level of technology;
- target market;
- level of risk;
- desired return on investment;
- time frame.

Preparing a balanced portfolio of new product development, consistent with business aims, is a critical part of product development management.

#### 8.1.3 Clearly defined product development strategy

The product development strategy should provide:

- total clarity about the relationship between the portfolio of product development projects and the overall business strategy;
- clear definition of the portfolio of new product development projects relative to business selection criteria;
- indication of the costs and timeframes involved to achieve the desired outcomes of the portfolio;
- indication of the resources required to achieve the desired outcomes what resources are required internally and what should be out-sourced.

The product development strategy is linked to, and indeed is the basis for, the tactical strategy that organises the product development programme and the individual product development projects. In a number of companies there is often a communication blockage between the product development strategy and the tactical strategy that determines the work of the designers, engineers, marketers, production and other personnel involved in the project. This can reduce both the effectiveness and efficiency.

#### 8.1.4 Appropriate systems and processes for project management

Having decided on what things to do (the portfolio), it is important to have the appropriate systems and processes to support individual projects – 'doing things right'. There are four clearly identified basic stages in the PD Process – product strategy development, product design and process development, product commercialisation, product launch and evaluation. But there are differences in the activities, decisions and outcomes in the different projects, although there are significant ones that occur in many projects.

Although the PD Process is important to the successful completion of projects on time, in budget and in line with the initial target, it would be wrong to force all projects into a standard process. The PD Process is unique to the company, level of innovation, and the level of technological knowledge. The company can design different PD Processes for product improvements and major innovations, for consumer products and industrial products, and also make some changes between product development projects (de Brentani, 2001). The chance and costs of product failure can also cause the company to make changes in activities; for example, the low cost of project failure may lead to significant short cuts in market analysis and business analysis. The choice of activities also depends on the company's level of risk. If the company is not afraid to live with product failures, it may omit many activities; if the company does not want to risk product failure, it will include activities that increase its knowledge of the technology and the market. In creating both new products and new services, a platform-based approach can be used, which relates directly to the design of systems and PD Processes (Meyer and DeTore, 2001).

# 8.1.5 Appropriate human and physical resources

All the best systems and processes can be worthless without the right resources. People, above everything else, make product development successful. *Knowledge* of technology, market, consumer, product development activities and decision making, and the *skills* to use this knowledge in practice are the basis of successful product development. Capable and committed people, who are able to work in teams, across functional boundaries, will make systems and processes work for them. Systems and processes will rarely change people. There is a need to recognise the tacit knowledge of individuals and teams, as well as the knowledge bases both within and outside the company. Most important is the ability of the individual and the team to create new knowledge during the project.

#### 8.1.6 Committed and supportive organisational climate

Perhaps the most important aspect of all in determining successful product development is the organisational climate. Historically, this has received relatively little attention in the product development literature and yet it has the potential to have the greatest impact on product development outcomes. Climate includes:

- clarity of direction;
- management commitment;
- team commitment;
- flexibility;
- standards;
- rewards.

The decision making by top management at the beginning and throughout the project must be timely and based on knowledge; from this the project management and the team need to see clear directions which are not changed without further knowledge and discussion.

# 8.1.7 Understanding the consumer, customer, market and society

If the needs, wants, attitudes and behaviour in the target market and in the society in general are not identified and understood, and then interwoven into product development practice, then product failure can occur either in the short or long term. The food industry has a history of introducing innovations over the years that cause suspicion by the general public and the consumers, so that food regulations are used to control the product. The immediate customer, whether industrial user or retailer, needs to be integrated into the PD Process from the initial stages of developing the product concept to the final evaluation after launch. In developing new consumer products and indeed in all food product development, the final consumer who buys and eats the food is an integral part of product development.

#### Think break

The authors have summarised what they identify as the basic principles of product development from the preceding seven chapters.

- 1. Do you agree with their list? Have you identified any other basic principles? Would you drop some of their basic principles?
- 2. Compare with other principles in the literature, e.g. Cooper and Kleinschmidt's (1995) factors found to drive new product success
- For your own company, list the basic principles for product development at the present time.
- 4. How have these principles changed in the past and how do you predict they will change in the future?
- 5. List the basic principles for product development for your company for the next decade.

# 8.2 Evaluating product development

Conducting a post-development review of a specific product development project and a regular review of the product development programme, is a very good way of learning what is excellent, all right and bad in the company's product development. For the product development project, the initial product strategy needs to be compared with the final total product in the market; the final product characteristics with the consumer needs and wants; the efficiency of the product development project with the overall implementation of the launch. For the product development programme, some important measures are:

- ratio of major innovations to incremental products;
- key differentiating factors in products and services;
- number of new products in a time period;

- programme complexity the size of the programme and the interrelationships between projects;
- commercial constraints on the programme;
- company pressures on the programme.

In recent years there has been an increasing interest in developing methods for evaluating product development. For example, the assessment tool and methodology (ATM) of Barclay *et al.* (2001) measures the complexities and newness of a product and relates them to the PD integrating activities and process. Clark and Wheelwright (1993) developed a method for auditing the individual project. Cooper and Kleinschmidt (1995) developed a tool aimed at identifying the firm's critical success factors in product development. It had two sets of measures for the product development programme: programme profitability and programme impact on the company. They separated companies using these measures into:

- *high-impact technical winners* with highest product success rate and % sales from new products, but not so high profitability
- *dogs* with poorest performance on all measures
- *solid performers* with highest profitability and second highest product success rate, lower % sales from new products than high-impact technical winners
- *low-impact performers* with mediocre product success rates and low impact of new products on company sales.

There have been the general industry comparisons described in Chapter 1, for example Griffin (1997), which have useful measures and results to compare with your company's results.

This comparison of the company's product development effectiveness and efficiency with those of other companies or of the industry in general is known as 'benchmarking'. Benchmarking the company's current practices against the latest findings in the literature and through comparison with other companies is an essential part of overall product development management. The application of best practices to our specific situations and the on-going measurement of performance ensure a basis for continuous improvement.

# 8.2.1 What is benchmarking?

Benchmarking is a process of continuous evaluation to achieve a competitive advantage. It measures a company's products, services and practices against those of its best competitors or other acknowledged leaders in their fields. It can be a specific area such as the benchmarking of the new product concept against the competing products (Rudolph, 2000), the company's technology against the most technically advanced company, the company's innovation strategy against technology predictions. But mostly there are multiple measures in benchmarking. Benchmarking can be at different stages of the product development project, for

the overall product development project and the product development

programme. There can be short-term and long-term benchmarking; for the short term, Hultink and Robben (1995) identified product-level measures such as speed-to-market, launched on time, development cost; in the long term, customer acceptance (met revenue goals, market share goals and unit sales goals, percentage of sales by new products) and financial performance (attaining goals for profitability, margins, return on investment). Four factors were equally important for short-term and long-term success: customer satisfaction, customer acceptance, meeting quality guidelines and product performance level. Finally benchmarking must be related to possible improvements; there is no point in extensive benchmarking in areas where the company or personnel cannot make improvements because of lack of people, knowledge and assets. Benchmarking and continuous improvement need to be linked. Zairi's (1998) comment is worth remembering when benchmarking

the impact of its application is more for changing attitudes and behaviours and raising commitment through better education, awareness and inspiration from model companies. Benchmarking is perhaps the best means for servicing the human asset by continuously supplying new ideas to sustain superior performance levels.

Over recent years benchmarking has become a fashionable tool for many organisations. Like many such tools, one has to question the rigour and objectivity with which many benchmarking exercises are carried out and, in turn, the value that is captured from these exercises. Benchmarking is not a tool (the many methods suggested for benchmarking are tools), but it is a method of increasing knowledge and skills of all people involved in product development from the top management to the junior team member, so that product development is more effective and efficient.

#### 8.2.2 Basic steps for benchmarking product development

There are some basic steps in benchmarking, shown in Fig. 8.2, which need to be followed to maximise the return on any investment in benchmarking (Zairi, 1998; Czarnecki, 1999; Barclay *et al.*, 2001).

#### Clearly define the benchmarking objectives

Before beginning a benchmarking study, the organisation should be clear on what the subject is to be; what are the desired outcomes; who will use the results; and how will the results be used to benefit the organisation in the future. It is all too easy to embark on wide-ranging data collection, which, in the end, provides very little useful information for the organisation and its specific requirements.

#### Determine the sources of benchmarking data

The benchmarking can be internal and using internal data sources, but usually the comparison is with companies within the specific industry or in industry in general. Sources include the following:

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Fig. 8.2 Basic steps in benchmarking.

- Published materials. Case studies, industry surveys and research into R&D management methodology and practices provide an excellent source of primary data. These materials can also be used to prepare a list of potential benchmarking partners.
- Databases. For example those prepared by the Industrial Research Institute (IRI) in the USA, provide an excellent source of information on level of spending on R&D, number of R&D employees, number of patents granted, etc. Regular summaries of these data are presented in the *Journal of Research Technology Management*.

*Identify companies and individuals that can act as benchmarking partners* This partnership can range from an infrequent exchange of general information about company operations and practices to regular meetings where details relating to company practices are shared with a common aim of improving the overall practices of both partners. It is important not to be limited to similar companies in the selection of partners. Look to the best practices, wherever they occur. The object is to learn from the leaders, those with world-class operations and techniques.

### Form a benchmarking team

Although an individual can conduct a benchmarking study, a team effort will usually get a better return. Involving a cross-section of people with different skills and organisational responsibilities will provide benefits not only in the capture of the information but it will also enable greater acceptance and more rapid assimilation of best practices into the organisation.

#### Determine, design and execute the data collection process

There are various ways of collecting benchmarking information, including telephone interviews, postal surveys, face-to-face meetings and desk-top research. Clearly, the type of information required, the level of detail and the available budget will determine the methodology. The best approach is probably to start with the relatively simple desk research to provide the background material and further clarify the critical information required from surveying or from face-to-face meetings.

#### Analyse and implement the findings

Very often there will be a number of valuable findings from the study. It is important to prioritise these and to focus on the implementation of a manageable few. Commitment and support from senior management is an important starting point. It is also essential that besides showing that these are 'best practice initiatives' there must also be clear evidence to all who are involved in the implementation that there is real benefit to their business.

It is important in setting up a benchmarking or assessment system that it should be (Barclay *et al.*, 2001):

- relevant to the users' needs;
- fairly comprehensive;
- capable of a variety of approaches;
- both educational and action-oriented;
- capable of being used in total or selectively;
- able to 'force' the development and implementation of action plans.

In other words, set up a system that does not overwhelm with information, but gives the knowledge needed to lead to product development improvement. In Box 8.1 is shown the development of benchmarking in the New Zealand Dairy Board, which shows some methods that can be used in benchmarking the total

# Box 8.1 The New Zealand Dairy Board (NZDB) experience

- 1993 An audit of the NZDB by the Boston Consulting Group (BCG) required for statutory reasons and covering all parts of the business. The major recommendations for R&D focused on the improvement of the product development process in achieving greater speed to market and greater success rates.
- 1994 Development of a phase-gate process for product development and implementation across all parts of the organisation.
- 1995 Consolidation of PD Processes with increased emphasis on 'doing things right'.
- 1996 Recognition that future gains in R&D effectiveness would most likely come from 'doing the right things' in addition to 'doing things right'.
- 1997 A small cross-functional benchmarking team was formed initiating a three-pronged approach:
  - Decision practices. An internal survey of the performance and areas for improvement against key decision practices required for 'best practice'. The decision practice framework was defined by the Strategic Decision Group (SDG) in California (see Matheson & Matheson, 1998). Analysis of the survey data by SDG pointed to a number of specific areas for improving the decision practices that lead to 'doing the right things'.
  - **ProBE survey**. Developed by Robert Cooper and Scott Edgett at the Product Development Institute Inc. (Ontario, Canada). An internal survey designed to evaluate product development performance against 11 critical success factors was used to identify areas of strength and weakness relative to industry average results and those of the top 20% of firms in the Product Development Institute database.
  - Secondary data. A range of published materials including annual reports, management journals, the Industrial Research Institute (IRI) R&D database were used to provide background information on industry and individual company performance.
  - A set of prioritised initiatives, centred around 'doing the right things' was recommended. These focused on linking R&D to business strategy including technology planning and portfolio management.
  - Implementation of these initiatives was begun.
- 1998 A second BCG audit of the NZDB confirmed most of the recommendations of the internal benchmarking team and endorsed their implementation.

# Box 8.1 (continued)

1999 A further benchmarking study was started with Arthur D. Little, focusing on the use of metrics to track R&D performance. The scope of the project was widened to include all parts of the innovation process and not only R&D. A suite of metrics was developed based on lagging, real-time, leading and learning indicators. These metrics were implemented in the business units of the NZDB.

product development in a company. This benchmarking development shows in sequence the aims of firstly product development efficiency (doing things right) and then product development effectiveness (doing the right things); and also the use of different evaluation methods and different consultants. The important part in benchmarking is to choose the correct measures or metrics.

# Think break

The NZ Dairy Board is a large company and is able to employ a range of consultants. If you were a small or medium-sized company.

- Discuss the ways you could measure product development effectiveness and efficiency.
- 2. How would you select and use suitable methods of benchmarking product development for your company?
- 3. How could you identify the essential product development activities, outcomes and decisions for the successful business performance of new products?
- 4. How could you design suitable product development processes for your company?

# 8.3 Innovation metrics

Increasingly we are being required to justify the expenditure on innovation. How effective is it? Does it meet the organisation's objectives? What is the return on the investment? There is very little doubt that justification of expenditure on innovation is necessary, just like any other element of organisational expenditure. But all too often the measures that are used only provide information about past performance. They contribute very little to our understanding of why that level of performance was achieved; to our improvement of innovation practices; or to our prediction of the future value of our current innovation efforts.

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Fig. 8.3 Product development project and programme metrics.

Firstly, what do we mean by measures and metrics? Measurement applies to anything that has a quantifiable characteristic; a metric is a quantifiable characteristic, which one can measure against (Dimancescu and Dwenger, 1996). Metrics such as 'new sales ratio' (contribution derived from new products/services), 'R&D intensity' (spend on R&D as a percentage of sales) and 'number of patents granted' provide some insight into an organisation's innovation performance, but it is historical. Greater benefit can be achieved from having a range of metrics that provides both forward and backward looking information. *Static metrics* are data gathered only after the event has occurred; *dynamic metrics* are real-time data feedback usually related to a goal.

Barclay *et al.* (2001) suggested process metrics for internal efficiency; business metrics and customer metrics for external effectiveness as shown in Fig. 8.3. Arthur D. Little (personal communication) proposed a metric suite based around the timing of the information and on specific areas of focus. They suggested that metrics be designed with a framework of time and the holistic dimension.

# 8.3.1 Timing of information

Metrics can be measured at different times in the product development project and programme. They can be on information from past projects, or from the present project or they can be predicted for the future product development performance, as shown in Table 8.2.

**Table 8.2** The time of using metrics in product development

Lagging metrics provide information on past performance. Real time metrics provide information on the current performance. Leading metrics provide information on the likely future performance. Learning metrics provide information on the rate at which an organisation is improving its performance.

Learning metrics or motivational metrics translate business objectives into meaningful and motivating measures that teams can work against. A specific performance gap may have been identified, and then the goal is to gradually reduce it over time. For example, in initial production runs with a new product, rejections usually lie between 10 and 20%, then the aim is to gradually reduce this until it lies near the level of standard production which is 1%; or it could be the time to market for a new product which may be 24 months and the aim is to reduce this gradually to 15 months. A reasonable time frame for these reductions needs to be set (Dimancescu and Dwenger, 1996). Metrics are meant for continuous improvement of product development performance; historic data may set a basis but it is the continuing measurement during the development of the project and the programme that give the more useful metrics.

#### 8.3.2 The holistic dimension

Metrics can be applied to all areas of the product development programme and the project:

- Strategy. Is innovation aligned with business objectives, strategy and vision?
- **Process.** Do the innovation processes support successful execution and outcomes?
- **Resources**. Are the desired level of resources being applied to innovation?
- **Culture and organisation**. To what extent does the culture, climate and organisational structure support innovation?

Examples of metrics within the Arthur D. Little framework for analysing the product development programme are shown in Table 8.3.

	-			
	Lagging	Real time	Leading	Learning
Strategy	Contribution from new products/services	% of growth targets met through innovation	Value of portfolio	Increase in revenues from new products
Process	Number of patents per year	% milestones on time	Forecasted project completion time	Reduction in breakeven time
Resources	R&D spending as % of sales	% outsourcing	Forecast resource allocation	Changing demand for specific capabilities
Company culture	Client survey feedback	Number of ideas logged	Innovation climate surveys	Change in critical climate dimensions

 Table 8.3
 Examples of innovation metrics in the product development programme

# Think break

Study Fig. 8.3 and Table 8.3.

- For benchmarking product development programmes, what differences in the final analysis would you expect from using the metrics in Fig. 8.3 and the lagging metrics in Table 8.3?
- In what product development situations would it be more useful to use lagging, real time, leading and learning metrics for product development programme benchmarking?
- 3. A number of metrics have been suggested for product development projects. What do you think would be the more useful metrics for your company – for improved products, for major changesand for radical innovations?

#### 8.3.3 Metric selection criteria

The set of innovation metrics should be selected according to the specific needs of the organisation. In selecting measures, they must be economical to collect, understandable to the people who are going to use the results, learning focused, externally focused, actionable, broad in scope and accomplish the stated objectives (Czarnecki, 1999). Innovation metrics should be regularly reviewed and changed as the direction and priorities of the organisation change. Some basic criteria for metric selection are:

- use a matrix approach, selecting a few metrics from throughout (as shown in Table 8.3);
- support the weakest link in the current innovation systems;
- emphasise real time or leading measures where possible;
- select metrics for which results point directly to actions;
- focus on simple and obvious measures that clearly support business imperatives;
- select those that are easily measured consistently over an extended period.

Some pitfalls for choosing metrics are predominance of short-term, financial, efficiency, economy and functional measures. It is important to select metrics not only because data are easy to find and they are within the capability of the benchmarking team and the understanding of top management. Metrics must also be relevant to the improvements to be made.

#### 8.3.4 Integrating innovation metrics into the business

The application of innovation metrics will be successful only if they are 'bought into and truly owned' by the business or business unit. All members of the business management team must see the benefits from the metrics, both to themselves and to their business unit. There are four steps in this integration:

identifying the growth gap, defining the innovation programme to meet the growth gap, defining an appropriate set of metrics for each project, measuring and tracking performance over time.

#### Step 1: Identify the growth gap

The first, and most important, step in the application of innovation metrics is at the strategic level where the required contribution from innovation is defined against future business targets:

- What is the total business growth aspiration?
- How much of this growth will come from organic growth?
- How much can be expected from mergers and acquisitions?
- What is the value of the innovations currently in the pipeline?
- What is the growth gap that must be filled by new innovation?

This is illustrated in Fig. 8.4.

#### Step 2: Define the innovation programme to meet the growth gap

Determine the value and timing of the current innovation portfolio to ensure that it provides the required contribution to meet the growth gap. The total innovation portfolio value is made up of the sum of contributions from all innovation projects.

- What innovation projects are planned?
- What is the time of delivery of these projects?
- What is their predicted revenue and earnings before interest and tax (EBIT)?
- What is the total predicted value of the current innovation portfolio?
- Does this value meet the growth gap aspirations? If not, what further innovations are required?



Fig. 8.4 Identifying the growth gap.

If satisfied with the current innovation portfolio value, use this value and the schedule of realisation of the value as a leading metric.

#### Step 3: Define an appropriate set of metrics for each project

A set of leading and real time metrics should be defined and used to measure the progress of individual projects.

- Define the individual contribution of each project to the total. This becomes a key target for a leading metric for the project.
- Define a set of real time metrics and targets for each project. These might include milestones on time, expenditure against budget, etc.

#### Step 4: Measure and track performance over time

Lagging metrics should be used to measure past performance. This should be compared with the predicted performance as indicated in the leading metric targets. If the overall innovation portfolio is on target then the innovation contribution to the growth gap will be achieved.

- Use lagging metrics such as current return from products developed over the last five years to measure past performance.
- Compare this performance to the targeted performance required to meet the growth gap.
- Study the underlying reasons for differences between what is achieved and the target. Learn from past mistakes and successes and apply this learning to improvement in the overall innovation practices.

Over recent years a great deal of time and effort has been focused on the improvement of new product development (NPD) management. Not only are we seeing an abundance of research literature on the subject but we are also seeing significant emphasis on the management of research and development activities as a senior management function in many companies.

# Think break

Consider your company:

- 1. Step 1. Identify the growth gap.
- 2. Step 2. Define the innovation programme to meet the growth gap.
- 3. Step 3. Define an appropriate set of metrics for a project for an incremental product, and for an innovation.
- 4. Step 4. How would you measure and track performance over time?

# 8.4 Striving for continuous improvement

It is no longer enough to have a creative group of product developers. Success comes from having a fully integrated NPD function, supported by first rate practices and processes, and focused on the business goals of the company. This is illustrated in Fig. 8.5. For the total company product development function, the business strategy is connected to the product development programme which is interrelated to the individual product development projects. Benchmarking can signify changes to the business strategy and this is then transferred to the product development programme and to the individual product development projects. Or the benchmarking study may have been on individual projects and the results are recognised in the business strategy, or in the product development programme which is transferred to the product development projects. Continuous improvement based on benchmarking is an interactive process. It is directly connected with the basic parts of the PD Process with the specific standards for decisions, outcomes, activities and techniques being set by different levels of management, but interconnected. There must be focus on the effects on the market and also on teamworking and general company cooperation in product development.

# 8.4.1 Steps in continuous improvement

The information and knowledge gathered during the benchmarking exercise have to be converted into efforts that will result in improved product



Fig. 8.5 A fully integrated NPD function.

development performance. Four important steps are (Codling, 1996):

- 1. Communicate benchmark findings.
- 2. Adjust goals and develop corrective improvement plan.
- 3. Implement the corrective improvement plan.
- 4. Review progress and calibrate.

**Communication** is important if cooperation and indeed commitment to the proposed changes by individuals, teams and management are to be built. The relation of the benchmark results to the proposed future changes in the product strategy, the product development programme and the individual projects need to create a vision for the future of product development in the company. There needs to be the opportunity for self-assessment and discussions by all involved in product development to build up the improvement plan. The plan is not an edict from top management on the verdict of outside consultants, it is the working together of management and key individuals in product development to create the change in product development. The time frame for the changes and how people will be involved in the changes need to be communicated.

**Goals** for the product development strategy, programme and individual projects are usually changed or at least adjusted by benchmarking. In particular, the new decisions and outcomes at the various stages in the product development project and for the overall project need to be identified by both top management and the project managers. These outcomes are going to be the goals for the activities in the product development project, and will affect the choice of activities and techniques. The activities and techniques are also going to be changed by the product development efficiency benchmark results, and by the resources made available by top management for the changes. There are two ways of improving performance (Barclay *et al.*, 2001):

- **Refinement change**: product development is treated as a business process and is continuously reviewed and refined.
- **Radical change**: a major shift in PD activities and process usually prompted by poor results or a shift in strategy and/or market.

If the refinement change is followed continuously and wisely, the radical change which is costly in resources, people and time, can be avoided.

**Implementation** is not easy. The action plans need to include descriptions of the proposed action, time scale for introduction, resources required and available, knock-on effects in other areas of product development and in the functional departments, measures of performance of the change, expected outcomes (Coughlan and Brady, 1995). But most important, is to identify the key people and to have them cooperate in developing the action plan and putting it into practice. The management has to recognise the complete plan, identify the staffing and how the changes are to be guided.

**Reviewing** the progress is important. This means reviews undertaken at recognised intervals not just at the end. Is the plan stalled because of resistance

by team members, lack of resources, lack of knowledge or lack of cooperation between the product development team and the functional departments? Are the changes being introduced too fast so that people do not understand what is to be achieved and how to achieve? The benchmarks set to measure the progress need to be achievable with the time and resources available. There will be fundamental differences between projects, and they cannot be set common benchmarks such as reducing the time by six months – easy to achieve in an incremental product development project, often impossible in a major innovation. There needs to be opportunity to make changes to the action plan, if the short-term benchmarks are not being achieved and there is no hope of attaining the long-term benchmarks. Product development is new and creative, so it is not always possible to predict accurately in the action plan.

# 8.4.2 Product development project

The product development process and its decisions, outcomes, activities and techniques are going to be improved from the results of the benchmark study. The milestones in the project need to be set, and then followed in the project to see if they have been accomplished partially or completely. The targets for the later stages and the whole project may need to be reviewed as the project proceeds through the various stages, because of the new knowledge and achievements in the early stages. The benchmark metrics are accepted into the project and used during the project, and adjusted if necessary. For example, in past projects, the product quality may have been identified as low because of poor packaging and storage properties; this means more creative and controlled package design together with more extensive storage tests, and metrics of packaging quality such as improving reject level on the production line or in distribution, and lengthened storage life of the new product. In putting the benchmark improvements into practice, the most important factor is to have the cooperation and commitment of the multifunctional team. This means their ownership of the project goals, cooperation across the team and good team leadership (McDonough, 2000), as well as the resources and knowledge to make the changes, and top management support. Self-assessment of team members is the most important basis for product development improvement; there can be comparison between projects in the company, and also with other companies as shown in Box 8.2. In the large company, it can be between different projects, and in small companies working in 'clusters', it can be between the member companies of the cluster group. It is important to have self-assessment in company projects before cooperating with other companies. A difficulty is in identifying suitable companies for the comparison, gaining access to these companies' information at a useful level of detail, and deriving useful guidance for the company's product development from this comparison (Coughlan and Brady, 1995).

# Box 8.2 Self-assessment and benchmarking product development in five Irish firms

The main objectives of the study were:

- establish benchmarks of current practice in the management of the product development process in five manufacturing firms drawn from differing industries in Ireland;
- increase awareness of areas of choice in the management of product development among manufacturing firms in Ireland with a view to improving their management of the product development process.

Each company selected two recent product development projects for assessment. Each project illustrated development in different situations or different approaches to development. The projects represented different degrees of product change and manufacturing process change. Six of the ten projects fell into the category of incremental or derivative projects, four of the projects were platform or next-generation projects.

The self-assessment and benchmarking approach consisted of three generic phases: data gathering and initial self-assessment; communication of insights both within and between the firms; development and discussion of action plans. All three phases required the active participation of up to ten staff members in each firm, drawn from the product development projects under review.

Arising out of the research each firm identified a range of performance limiting practices in its development process, which had caused schedule delay or cycle time extension through:

- insufficient up-front technology planning and development,
- reacting to short-term resource shortages,
- accepting productivity limiting practices,
- inadequate product and product line planning,
- allowing requirements to float,
- reliance on major versus incremental changes.

The issues were concentrated in the areas of market focus, teamworking, transfer of manufacturing, leadership, resourcing and performance evaluation.

Source: After Coughlan and Brady, 1995.

# 8.4.3 Product development programme

In improving the whole product development programme, a new innovation/new product strategy needs to be formulated and a plan to achieve it developed. This is a much more fundamental change to the company's product development. It is

important not to set the achievement levels so high that the company and the individuals cannot achieve them in a reasonable time with the present or agreed expanded assets. Goals need to be reasonably flexible, to allow for adjustment as the new programme proceeds and for any environmental or internal company changes. Programmes are often organised for 3–5 years, but future predictions up to 10 years should be made. There is a need for constant monitoring of the programme benchmarks, and making changes when necessary. The product development programme is a dynamic organisation and must allow controlled (but not wild) changes. The corrective improvement plan needs to monitor/ check/review the impact of the product development programme changes on the outcomes and the critical product development success factors.

Learning from the projects is important and their benchmark data need to be incorporated into the product development programme so that continuous improvement of the efficiency and effectiveness of the programme can occur. The natural tendency in a company is to go forward into the next project without reviewing the product development programme to see what can be improved. The knowledge must be absorbed into the company through the product development programme. Organisational and individual learning are the outcome of benchmarking projects and the knowledge learnt must not be lost. Learning from product development projects is one of the most difficult things that a company can do.

There are two objectives in programme improvement: to be better at designing new products and processes, and continually to build and improve the company's procedures, processes, leadership skills, techniques and methods in order to do things faster, more efficiently and with higher quality (Clark and Wheelwright, 1993). Building the development capability is also another important objective.

#### 8.4.4 Product development and business strategies

The company's top management needs to have an increased awareness of the areas of choice in product development management and the performance limiting practices in the company. It has to know not only how to modify the business and product strategies in response to changes in market and competitive actions; but even more important to act proactively through its own diagnosis of the need for change in technology or/and consumers. Management also knows from its own examination of the company as to how the company is performing in product development, who are the key individuals on which the product development is based, but it needs to also identify the knowledge and lack of knowledge in the company, and the financial and other resources needed. When top management has to introduce consultants and make drastic changes, then it knows that its management of product development has been poor. By continuous improvement integrated throughout the company, management can prevent this happening.

A company, and indeed an industry, can choose its own improving standard of development through the four levels of PD practice (Coughlan and Brady, 1995):

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Lowest level: Product development is not managed and encouraged.

Basic procedures, management and motivation are in place.

Product development is managed and encouraged as a key objective for the firm.

Highest level: 'World-class' development performance is the norm.

# Think break

You have now read eight chapters on product development.

- 1. What are the most important factors that you have identified to improve product development effectivenessin your company?
- 2. What are the factors that you have identified to improve product development efficiency in your company?
- 3. If your company does not conduct benchmarking of individual development projects, do you know why it does not? How might your company overcome hindrances and stumbling blocks to make project benchmarking a standard tool?
- 4. How does your company create and store technical knowledge from previous projects, to make it available for present and future projects?
- 5. How does your company create and store customer/consumer knowledge from previous projects to make it available for present and future projects?
- 6. How does your company improve product development? Can the method of doing this be changed to bring product development to a higher level?
- 7. What is the overall standard of product development in your company?
- 8. How can the standard be raised?

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