

## Chapter 6

# R&D AND STRATEGIC DECISION MAKING

### 6.1 INTRODUCTION

Strategic decisions concerning R&D in the corporations are examined in this chapter. A strategic decision is often associated with a 'big' decision in some sense. Bigness may then refer to the size of a concentrated decision-making effort as well as to the size of a change resulting from the decision. Braybrooke and Lindblom (1963) discuss the concept of size of change in connection with decision making. They come close to suggesting that the 'distinction between a "small" and "large" change is the difference between structural changes and changes within a given structure' (Braybrooke and Lindblom, 1963, p. 63), but they emphasize the continuum between incremental and non-incremental change. The concept of importance is sometimes used for distinguishing strategic decisions. Mintzberg, Raisinghani and Theoret (1976, p. 246) define a decision as 'a specific commitment to action (usually a commitment of resources) and . . . strategic simply means important, in terms of the actions taken, the resources committed or the precedents set'. Ansoff (1968), on the other hand, discards the notion of importance in defining a strategic decision and uses 'the term strategic to mean pertaining to the relation between the firm and its environment . . . . Depending on its position, the firm may find operating decisions to be more important than strategic ones'. (Ansoff, 1968, p. 18).

Ansoff also defines by specification three principal decision categories in the firm: strategic, administrative and operating decisions. This subdivision is common and may be thought of as a general subdivision on a continuum of importance. The term tactical is then often used for the intermediate category.

Here a strategic decision means a decision at the highest level of importance for the whole. This is presumably in accordance with common ideas, although it may be difficult to sort out strategic decisions on a continuum of importance. However, a concentrated and substantial decision-making effort will also render to a decision the quality of being strategic, regardless of the size of the resulting change. Finally, importance may here pertain to different wholes and, in particular, to a corporation, on one hand, and to its R&D operations, on the other. Thus, a decision may be strategic on the corporate level but not on the R&D level and vice versa.

One has to be cautious about the misconception that large effects ought to have large causes. In particular, large effects do not necessarily derive from strategic decisions. Conversely, a strategic decision in the form of a great concentrated decision-making effort does not necessarily have to cause large effects. Naturally, the opportunity to observe strategic decisions varies. There is a tendency among interviewees to make attributions to discrete events and decisions, but when a low

frequency of strategic decisions is observed, this tendency strengthens the validity of the observation.

Literature on decision making in relation to R&D is rich, especially concerning what possibly could be called operational and tactical R&D decisions, such as project selection, project control, and R&D budgeting (see Clarke, 1974; Winkofsky, Mason and Souder, 1980, for surveys). A common feature is that uncertainty resolution is focused on, while the political dimension of R&D decision making is not. Studies that specifically focus on the processes behind strategic decisions, seem to be missing despite their possible importance by definition.

## 6.2 EMPIRICAL FINDINGS

### 6.2.1 Strategic decision making in corporate histories

There are several developments in corporate histories, which appear as possibly resulting from strategic decision making. Examples include:

- the movement into light chemicals in the 1970s by KemaNobel;
- the establishment of local production and R&D at Philips-Sweden;
- the transition from component to systems orientation at Alfa-Laval;
- the establishment of a central R&D laboratory at SKF;
- the opening of a new generation of mines at Boliden;
- the integration forward in the 1960s at Iggesund;
- the acquisition of an external invention by Astra in the 1940s;
- the diversification into hydraulics by Volvo.

In examining these and other parts of corporate histories, the question arises in what sense and to what extent decisions involved in these developments were strategic. Case 6.1 gives a more detailed account.

#### *Case 6.1 Alfa-Laval*

After World War II Alfa-Laval experienced rapid growth within an extended range of applications. The scale of production of many of the customers also grew. R&D were split up into machines and plant design. A small revolution occurred in the technical design of one component, but otherwise the 1950s were characterized by continued growth in the technical parameters of the products, for example, in motor power. Alfa-Laval developed equipment for mainly dairy and starch factories and the food industry. The handling of combinations of machines became increasingly important, and knowledge of the customer processes in which the machines operated accumulated.

For Alfa-Laval the 1960s meant a transition from a component orientation to a systems orientation. This transition happened successively, determined by the ways in which markets and internal knowledge of customer processes developed. Studies were made of changes in customer needs in the marine and chemical industries, dairies, farming, etc. all around the world. R&D grew, disinvestments

were made of products and companies which did not 'fit in', and at the same time companies were acquired to supplement technological knowledge.

In the second half of the 1960s new technologies became relevant. One reason was an increased systems orientation, which brought Alfa-Laval into contact with a wider range of technologies. Another reason was external technological change in general and still another was problems with products and processes. Thus, mathematics was modernized and computers came into use, automatic process control became increasingly important, and within food processing the use of microwaves was actualized. In the late 1960s top management also initiated an analysis of all products with respect to possible technological substitutions. Attention was paid to the risk involved in basing corporate operations on old principles and technologies, for example, separation by centrifugal forces. R&D were initiated within filters and membrane technology, resulting in new processes.

In the 1970s R&D have grown after some years of stagnation. The base of competence has been enlarged into areas such as biology, protein chemistry, agriculture and electronics. The more complicated customer technologies become, the more R&D in diverse fields are needed. Also, the nature of R&D has changed from trial and error to more scientifically oriented R&D. A special unit for automation technology has been created. Also a corporate R&D laboratory has been built up, where R&D not naturally belonging to a single product division or being of a long-range nature can be performed.

[End of Case 6.1]

In summary, Case 6.1 illustrates:

- the incremental and branching nature of learning about technologies and markets;
- the influence of developments regarding size and complexity in customer technologies and regarding developments of science and technology in general;
- the few strategic decisions, if any, involved.

Naturally, it is hard to assess the nature and frequency of strategic decisions based on accounts like this one. Rather than singling out and classifying decisions on a general basis, some decisions common to the corporations studied will be described below with respect to their possible strategic nature.

The acquisition of a company often appears as a strategic decision. The pre- and post-history of such a decision may, however, vary significantly. The acquisition may be made as a result of sudden offer or of a search for companies to acquire or a perceived threat that a competitor will make the acquisition. Often minor acquisitions are made as a means to obtain experience. The risk involved may be rather low as in the case when KemaNobel, in moving into light chemicals, acquired a company in consumer products. This company could always have been sold if the experiment did not turn out well. Similarly, Volvo acquired—and shortly afterwards also sold—some stock in the ventilation business as part of a diversification strategy. Almost all corporations have made acquisitions of this experimental kind with varying degrees of success. Often the



direct economic risk involved has not been extraordinarily high. On the other hand, an acquisition may later on divert management attention, involving another kind of risk, which, however, is indirectly related to the decision to acquire. Major acquisitions certainly may be strategic in the sense that if they did not come off, the corporation would significantly have to change its strategy, as when SKF acquired a tool company. However, R&D aspects seldom play a major role in this kind of acquisition.

The decisions to acquire inventions and licences resemble decisions to acquire companies. The decision-making process may be short, as in the case when Alfa-Laval in 1889 and Astra in 1943 were suddenly offered an external invention, and a deal was made within one day. Both inventions turned out to be of great importance for corporate development. The economic risk involved was minor to the corporations, since the deal was mainly made on a royalty basis. To turn down an offer of a patent, licence, or company may also involve a short decision-making process. The risk involved in a decision not to acquire is difficult to assess in retrospect but sometimes appears to have been underestimated. It should, moreover, be noted that the length of a decision-making process and the degree of risk taking are influenced by the way opportunities arise and become recognized as well as by the preparedness of the decision makers and their attitudes towards risk.

In raw-material based and capital-intensive corporations, investment decisions clearly could be considered as strategic. The relative proportions of sums involved are of quite a different magnitude than in other industries. The long-range nature of investment decisions, the few possibilities to make incremental investments and undifferentiated products with fluctuating prices are features that make the nature of decision making quite different from that in many other industries, in which risk taking may be more connected to product technologies than to process technologies and supply. The decision by Iggesund to integrate forward into the manufacturing of cardboard clearly was a strategic decision that involved high risks (see Chapter 2). However, investment decisions of this kind may be strategic and may also have strategic consequences for internal R&D, but they are not strategic decisions with respect to R&D. In fact, both size and content of R&D operations tend to lag behind this kind of strategic decisions (see Chapter 3).

Igesund also made a decision to transplant a fast-growing Canadian pine as a response to scarcity of forests. This decision was perceived by top management as a strategic decision involving high risks, while biologists with greater familiarity with the problem considered the decision making as a sequence of 'ordinary' decisions (see Chapter 9). The familiarity with a decision situation is associated with the degree of its recurrency to the decision makers, which in turn affects their perception of degree of risks involved. Thus, it is conceivable that there is a tendency to characterize decisions in connection with diversification as strategic. To the extent that non-divisible resource commitments are made, this seems to be the case, but such decisions may often then be preceded by many other decisions, which sometimes will put the strategic decision makers in a situation of *fait accompli*. If strategic decisions to scale up resource commitments are made on the

premise of a clear acceptance of recognized high risks, it is possible that a discontinuation of a diversification project would be facilitated, although many individuals still might have their interests and emotions tied to it. There are many examples of the difficulties involved in stopping diversification projects as well as projects in general. In fact, two such projects, one at KemaNobel in the late 1950s and one at Volvo Flygmotor in the late 1960s, were referred to as requiring a new managing director to be stopped. In the latter case there were two lines of products for achieving diversification, turbo-compressors and hydraulic machines. After the turbo-compressor project was stopped, only the work on hydraulic machines remained as a recognized promise of diversification without having to develop something new. The decision in 1970 to scale up the expansion into hydraulic machines involved risks of a new product technology and entrance into new markets, and the decision may be considered as strategic. On the other hand, there was no viable alternative if diversification was attempted in order to distribute the overall risks. In the light of the urgent need for Volvo Flygmotor to diversify outside the military product area, it is difficult to see how the Board of Volvo Flygmotor could have stopped this project, which already had passed a stage of market introduction of a proven technology.

The decisions involved in establishing and locating new R&D units are as a rule preceded by years of discussions and preparations. These decisions are seldom, if ever, responses to sudden pressures or opportunities arising externally. Also, the resource commitments are often divisible. The location may indeed be crucial. The location of subsidiaries close to medical universities by Astra and the foreign location of the central R&D laboratory in SKF, geographically separated from production and marketing operations, appear as strategic decisions in retrospect. However, R&D resources may be shrunk or transferred and locations may be changed in many cases. Moreover, it is not just the choice of a certain location *per se* that is important, but also subsequent decisions to recruit R&D personnel and develop external relations. Thus, a successful outcome of locating an R&D unit may hardly be traced to a single strategic location decision. On the other hand, there are examples of decisions to locate production operations, which have later given rise to difficulties in recruiting personnel to R&D units, as preferably these should be integrated with production. Thus a partial failure may sometimes be traced to a single strategic location decision.

The acceptance of a large order may result in considerable learning as well as a foothold on the market. A company, acquired by Philips-Sweden, in fact, 'contained' a large order, which provided a means for Philips-Sweden to enter a new market. There are risks in accepting a large order, which requires extensions of corporate technologies and also often requires rapid decisions. These risks may be hedged against by relying on managerial skills in subcontracting or by making agreements of a joint-venture type.

A major reorganization is sometimes regarded as a strategic decision. However, it is also the subsequent commitments to a chosen organizational form that are of significance. Decisions to implement a new organizational form may, at least in principle, be thought of as reversible decisions. However, internal relations may be damaged for some time, and key personnel may leave the organiza-



tion for good. Also, the process of internalizing and externalizing some operations may be irreversible. The decisions by the product-invention-based corporations to substitute sales agents with sales subsidiaries were hardly reversible and also signified strategic marketing decisions. Similarly, the organizational separation and formation of a new unit may be difficult to reverse. (An example would be a merger between SKF and Volvo, Volvo once being a subsidiary of SKF.)

Manning decisions are often considered to be strategic. Certainly, there are several examples in corporate histories where the change of the corporate managing director has had a profound effect on corporate development. Similarly, the recruitment of a top-ranked researcher or technologist may be highly significant for the technological development of the corporation. In fact, Astra considers such a recruitment as a strategic decision or rather as a strategic decision area. There is a policy in Astra to invest in highly qualified R&D personnel, but this policy has hardly evolved as a result of a strategic decision. In connection with manning decisions, one may also argue that they may be reversed and thus are not necessarily strategic. To a certain extent this is true, and there are possibilities to fire, replace or demote a person. However, certain positions *per se* are equipped with power, and certain individuals are powerful in themselves, and with their instinct and need for power they will change the power relations in the organization. It may then be a difficult task for other decision makers in the organization to reverse the decision to combine a certain position with a certain individual. The possibilities of making manning decisions in a step-wise or incremental manner may be used in recruiting and sometimes also in promotion, but are seldom used for the position as corporate managing director.

The dependence on certain key individuals in R&D and innovation is witnessed in almost all corporations, although the strategic nature of recruitment decisions may vary. Also, decision-making behaviour differs regarding personal orientation or content orientation in managing R&D and innovation (see Chapter 7). For example, in R&D-intensive corporations (such as Philips-Sweden and Astra) cases may be found where certain individuals are supported on the merit of their being competent and expansive rather than certain areas of competence being supported *per se*. This increases the strategic nature of such manning decisions.

Decisions to enter a new area of competence or to specialize or to define a business idea are also sometimes considered as strategic in retrospect. However, they are often conceptual decisions, loosely connected to significant resource commitments. Rather, this is a case of R&D policies evolving without strategic decisions (see Chapter 5).

In general R&D budgeting decisions are seldom considered to be strategic decisions. A principle of budgeting, if applied, is mostly arrived at by learning and bargaining. Naturally, exceptions may be found, such as the commitment to a large R&D project or a sharp cut in R&D budgets. The discontinuation of, as well as a disinvestment in, a large project not only often signifies a strategic decision regarding the termination of certain operations but also creates financial room for new strategic decisions. In fact, there are several cases of R&D operations that have been initiated or strengthened as a result of a marked increase in available resources.

As to R&D policies or strategies concerning technological leadership or forms for exploitation of technological knowledge, these also develop in an evolutionary manner. They may be influenced by other strategic decisions, but they hardly derive from strategic decisions made with respect to these policies or strategies. Technological leadership, however, is sometimes achieved in an intermittent fashion by a corporation in certain product areas and markets, and significant R&D efforts may result from a perceived threat or a perceived need to gain a lead. Sometimes, the intermittent behaviour derives from a suddenly raised awareness, but often it is also a conscious strategy. This relates to the formation of product generations, which in certain industries is a common feature. Examples include passenger cars, jet engines, certain pharmaceuticals, computers, certain instruments, and certain separators. The extent to which generations are formed may vary and may be subjected to decision making. Certainly, the development of a new product generation may be considered a strategic decision in some technologies and markets, as well as a decision to skip one generation in a succession of generation shifts. In Philips-Sweden one has experienced several substitutions in product technologies, and in certain areas strategic decisions in this respect have been made, sometimes with 3-4 years in between, during which time ideas arise and market requirements develop.

On the whole then, several types or areas of decisions may be distinguished, and for some of these types or areas strategic decisions are more likely than for others. Strategic decisions made with respect to R&D are, however, in general difficult to find. Rather, R&D decisions are conditioned upon other strategic decisions or appear as strategic only in combination with subsequent decisions.

### 6.2.2 R&D decision making

If historically there has been a low frequency in general of strategic decisions made with respect to R&D, one may ask how the R&D decision making processes are structured. An illustration is given in Case 6.2.

#### Case 6.2 SKF

Throughout SKF there is a superimposed organization for R&D management, comprising permanent and temporary bodies for general, technical and R&D management levels of operation. The principal R&D management bodies at corporate level are:

- (a) *Product Board*. Principal tasks are strategic decisions and policy making with respect to R&D and corporate development, especially diversification. It supervises a small innovation company at corporate level.
- (b) *Technical Executives Board*. Principal tasks are formation of R&D policies and evaluation and control of product R&D projects. It recommends the establishment of development centres and supervises the central R&D laboratory.
- (c) *Machinery Board*. Principal tasks are policy making and evaluation and control of process R&D projects.

The essential composition of these bodies is shown in Table 6.1. These R&D management bodies are permanent. Attached to Machinery Board and



Table 6.1 Essential composition of principal R&amp;D management bodies in SKF

	Product Board	Technical Executives Board	Machinery Board
Concern management			
Corporate managing director	c		o
Divisional managers	x		
Director group engineering and research	x	c	x
Director group manufacturing engineering	x	x	c
Operating management			
Manufacturing managers in major subsidiaries			x
R&D managers in major subsidiaries		x	
Management of the innovation company	o		
Management of the central R&D laboratory		x	

*Notation:*

- c = Chairman  
 x = Regular member  
 o = Attend non-regularly

Technical Executives Board are, moreover, committees for different areas and temporary multinational working groups. In total, 230 persons were engaged around the world in this R&D management structure in 1976.

The system for R&D project control differs between, on one hand, product R&D as managed by the Product Board and Technical Executives Board, and, on the other, process R&D as managed by the Machinery Board. Process R&D is controlled in a less formal and elaborate way partly because of the in-house nature of the 'market' for process R&D. Corresponding co-ordination is taken care of through overlapping management bodies and project information routines.

All non-process R&D projects will be classified along the following principal dimensions:

- the range of interest among subsidiaries;
- project purpose (e.g., diversification);
- product line;
- technological character;
- responsibility for project management and sponsor.

This main classification of projects determines the different courses of management action in relation to the project. Criteria for evaluation of projects are rather conventional and, for example, concern credibility of technical and commercial success, cost, timing, size and share of potential world market, market growth characteristics, and strategic need. These criteria apply with different

accuracy, depending on project type and stage. Together with qualitative judgements on both portfolio and project level, ratings along these criteria form the basis for project priorities.

[End of Case 6.2]

SKF represents a case with formal and elaborate routines for project establishment and control and structured R&D decision making to a higher extent than in most of the other corporations, although there are several similarities to the other corporations with respect to structure and processes of R&D decision making. The Product Board has strategic decision making as a principal task, but it is doubtful to what extent such a decision-making body will be able to make strategic R&D decisions. Such a decision-making body may be difficult to gather for strategic decisions. Often decisions are made on lower levels, and higher levels may be left with more or less counter-signing roles. This tends to be the case particularly when technology moves fast, as in Philips. Moreover, many strategic R&D decisions, such as manning of key posts or investing in R&D facilities, may be made 'outside the system'. However, it is, in fact, too early to assess the impact of the R&D decision-making system in SKF on the nature and frequency of strategic decisions. It should also be added that a prime purpose of such a system may be to achieve consensus and co-ordination in R&D (see Chapter 4). The making of strategic decisions may not be desirable in itself but rather the collective quality of R&D decisions has to be considered. This is also indicated by the few possible future strategic R&D decisions conceived of in the corporations by the interviewees. The validity of this observation is, however, questionable.

## 6.3 DISCUSSION

### 6.3.1 Empirical summary

In general, a low frequency of strategic decisions was indicated, especially strategic decisions made with respect to R&D. R&D decisions were often conditioned upon other strategic decisions, such as large resource commitments. Examples of strategic decisions or decision areas for R&D are manning on key posts, investment and location of R&D facilities, acceptance of a large order, introduction of a new technology in products and processes, and discontinuation of a project. An over-riding impression is, however, the difficulties associated with sorting out strategic decisions from other types of decisions and events. The decision-making pattern, moreover, varies according to industry, technology, and corporation.

### 6.3.2 Strategizing and R&D decision making

Large decision-making efforts are neither a necessary nor a sufficient condition for large decision-making effects. If a decision is assessed to be strategic on the basis of some threshold values to be exceeded by efforts and effects associated



with the decision, the frequency of strategic decisions is naturally dependent upon the choice of these threshold values. Any quantitative assessment will not be penetrated here, but rather the nature of R&D decisions related to the nature of strategic decisions.

First, the size of the effect of a decision could be assessed with respect to duration, number of other decisions affected, and degree to which the conditions of these other decisions are affected. Naturally, effects of decisions become interconnected, and it may be highly difficult to assess the size of the effect of some specific decision. Nevertheless, the inflexibility resulting from a decision is important for assessing its strategic character. Here irreversible resource commitments are typically giving a strategic character to a decision. R&D decisions in capital-intensive industries are largely conditioned upon materialized investment decisions, similar to the way R&D decisions in a laboratory are largely conditioned upon expensive instrumentation. The commitments may be both of an economic and psychological nature.

Manning decisions and decisions to reorganize may to some extent be thought of as revocable, although some relations may deteriorate to an irreparable degree. However, they often have long lasting effects, even if the effects may not always be profound. For example corporate managing directors, (CMDs), technical directors, and R&D managers may be in office for decades. For the corporations in this sample, the CMDs in 1977 were appointed CMD in 1966 on average. CMDs in large corporations in Sweden, as studied by Bolin and Dahlberg (1975), had occupied their posts for seven-and-a-half years on average. These and similar lengths of time for other significant actors may be compared with times from idea stage to innovation and product life times. In this sample of corporations no statistical connection was indicated between turnover of significant actors or frequency of organizational changes and, for example, R&D intensity, although clearly there were cases in which technological changes were associated with such changes in organization and manning. The point is, however, that decisions in connection with these kinds of changes are not necessarily strategic *per se* but only in combination with the way subsequent decision making is conditioned upon these decisions.

Second, the empirical difficulties associated with assessing whether a decision is strategic or not indicate the limited possibilities there are for classifying decisions into strategic, tactical and operative ones. To slice the importance of decisions in this way necessarily involves some arbitrariness. Moreover, it is doubtful if a specification of three general types of decisions captures the interdependence in decision making. Is it a tactical or a strategic decision to re-centralize strategic decision making when decentralization has been perceived by top management as having gone too far in connection with divisionalization? Decisions may naturally be sequentially dependent over time as well as connected to each other in the organization. Inter-organizational decision making is also increasing in importance, due to the cost and complexity of technological innovation (Gerstenfeld, 1977). Thus, the commonly encountered subdivision of decisions by three into strategic, tactical and operative ones may become increasingly inapplicable due to increased interdependence in decision making.

A third question, then, is why decisions concerning R&D are made with a low

frequency of concentrated decision-making efforts in the corporations. Keeping in mind the arbitrary element in assessing frequency and the many kinds of R&D decisions, some general features of R&D decision making may be brought forward as explanations. Decisions concerning R&D and innovation are characterized by a high degree of uncertainty, a low degree of repetitiveness and a long time perspective. Also, there are seldom distinct alternatives and expected values of outcomes may be fuzzy over the set of alternatives. The outcomes may, however, differ widely—and a large risk may be involved. In general, there are time pressures involved but not often in the form of clearly recognized deadlines after which the value of decisions drop radically. The distribution of relevant information for making R&D decisions is generally skew among managers and personnel. Moreover, the process by which relevant information is generated and a decision situation is triggered typically involves randomness. Finally, there may be disparities in the values and behaviours of the people involved in R&D and innovation, which is to be distinguished from uncertainty in value assessments and uncertainty in the assessments of behaviour. Several of these general features, which apply to varying extents to different decision situations, appear to smooth out decision-making efforts in decision making concerning R&D and innovation. For example, a lack of deadlines in combination with diffuse alternatives—as in the choice of direction for building up new competence—will not promote a concentration of decision-making efforts. This tendency may be further accentuated by skewly distributed information and a disparity in values.

Often there are parallel projects or lines along which, say, a diversification objective or an R&D objective is attempted. When total resource requirements increase relative to total resource availability, the number of lines may be cut according to some criterion of expected profitability or utility as in capital budgeting in general. The decision to terminate a line could be thought of as a tactical decision, while decisions about the structure of the whole portfolio and the criteria on which to judge projects could be thought of as strategic. However, as empirical observations show, there will be individuals in the organization who successively tie their interests and emotions to current projects. If the number of parallel projects is cut down to a final one, the continuation of this last alternative may be reinforced. Also, people involved in an R&D project will underestimate costs and time involved, even with some regularity with respect to type of situation.

An analytical reason to continue work on an old R&D project, which has caused cost overruns already, is that in the selection of projects in the portfolio, the continuation of an old project may be considered analytically as a new project. If, as is mostly the case, the benefits of the project accrue in its later stages more than proportional to costs of completion, the expected profitability of costs of completion will rise. It is then easy to see how regular underestimation in early stages of an R&D project, combined with arguments in later stages based on expected profitability of costs of completion, will reinforce the tendency of R&D work to continue along the lines once established.

This suggests that the real opportunities for strategic R&D decisions concerning R&D projects are in the early stages of initiation and establishment and in the late stages of termination. The acts of omission to initiate new R&D projects may



be of significance collectively but can hardly be considered as a series of strategic decisions. The same holds for the acts of omission to terminate a current R&D project.

An emphasis on the strategic nature of embryonic decisions in R&D, (i.e., decisions in the early stages of initiation and establishment), may be found in Steele (1975) and Gluck and Foster (1975). The attention paid by top management to R&D may also be scarce, especially in the early stages of an R&D decision-making process in which resource commitments have not yet become conspicuous. These circumstances lead to a simplistic conclusion that top management should be engaged in the making of embryonic R&D decisions as described by Gluck and Foster (1975). This conclusion is not shared by Steele (1975), who considers it doubtful whether top management interventionism as a matter of routine would contribute to the quality of R&D decision making (see Section 7.3). On the other hand, a series of interconnected commitments made by embryonic decisions may create a type of unwanted *fait accompli* or inertia in the organization as described above. However, one has to distinguish between the desirability of making a strategic decision and the desirability of involving different individuals in the strategic decision. To design a decision-making process by interspersing large decision-making efforts in the series of decisions may be called strategizing the process; to involve an expanding collection of decision makers in the decision-making process may be referred to as politicizing the process. Simplified, it then appears that certain R&D decision-making processes in a large organization benefit from being strategized early while being politicized late. At least, it may be concluded that early politicizing without strategizing may be hazardous in light of the skew distribution of innovative and entrepreneurial talents in a large organization. Naturally, strategizing and politicizing are matters of degree. Uncertainty resolution and consensus seeking in R&D may benefit from sequential and political decision making to different extents. An extreme case would be a 'one-shot' strategic decision made by a single person. The influence exercised by significant actors, such as entrepreneurs and inventors, may occur, but group decision making is a common feature in R&D and innovation in large organizations, at least in the later stages of innovation. The emphasis in SKF (Case 6.2) on careful preparation and early consensus seeking in the R&D process followed by a determined action is not uncommon and in fact resembles the Japanese way of decision making, the Ringi system (Yoshino, 1976, p. 165), at least in its superficial aspects. (Socialization in a corporate culture as practised in Japan is a 'soft' way of achieving co-ordination and motivation but may present difficulties when implemented in a multinational organization.)

#### 6.4 CONCLUSIONS

By definition a strategic decision has been determined by the size of a concentrated decision-making effort as well as by the size of the effect of a decision. A low frequency of strategic decisions made with respect to R&D was indicated. However, due to increased interdependence in decision making, there was a

limited applicability of the subdivision of decisions by three, into strategic, tactical and operative decisions based on notions of importance.

Often R&D decisions were conditioned upon other strategic decisions or appear to be strategic in connection with subsequent decisions and omissions to make decisions. The low frequency of strategic R&D decisions may derive from general features of R&D decision making, such as diffuse alternatives and lack of deadlines.

To design a decision-making process by interspersing large decision making efforts in the series of decisions is called strategizing. To strategize R&D decision making in embryonic stages is found to be important as well as in the later stages of the termination of a project. In a large organization consensus seeking also has to supplement uncertainty resolution at some stage, but it is doubtful that politicizing the decision making about R&D and innovation at an early stage is effective, at least as far as radical innovation is concerned. In particular the effectiveness of the Japanese way of decision making could be questioned in this context.