

Chapter 17

Marketing Strategy Models*

Yoram (Jerry) Wind

The Wharton School, University of Pennsylvania, Philadelphia, PA 19104, USA

Gary L. Lilien

Pennsylvania State University, University Park, PA 16802, USA

1. Introduction

Many of the models and approaches outlined in other chapters of this book address single marketing issues (promotional spending, pricing, salesforce deployment, etc.) within the context of any organization where other factors are assumed constant. For the most part, such approaches are 'bottom-up', and closely akin to the operational philosophy of traditional OR/MS.

Consider, in contrast, a large organization with several business divisions and several product lines within each division. Marketing plays a number of roles throughout that organization.

At the organizational level, marketing can provide both perspectives and information to help management decide on what the mission of the corporation should be, what the opportunities of the organization might be, what strategies for growth it might have, and how it might develop and manage its portfolio of businesses. The resulting corporate policies provide guidelines for development of strategy at each business division. And, at the lowest level, the managers of each product and/or market within each division develop their own marketing strategies within the context of the policies and constraints developed at divisional levels.

We use the term *strategic management process* to describe the steps taken at the corporate and divisional level to develop market-driven strategies for organizational survival and growth, while we use the term *strategic marketing process* to refer to the parallel steps taken at the product and/or market level to develop viable marketing plans and programs. Thus, the strategic marketing process takes place within the larger strategic management process of the organization.

Thus, in contrast with many of the approaches outlined in earlier chapters, marketing strategy models must reflect the overall corporate mission of the

*The authors would like to thank Josh Eliashberg for his extraordinary efforts in making this paper happen and Adam Fein for his assistance.

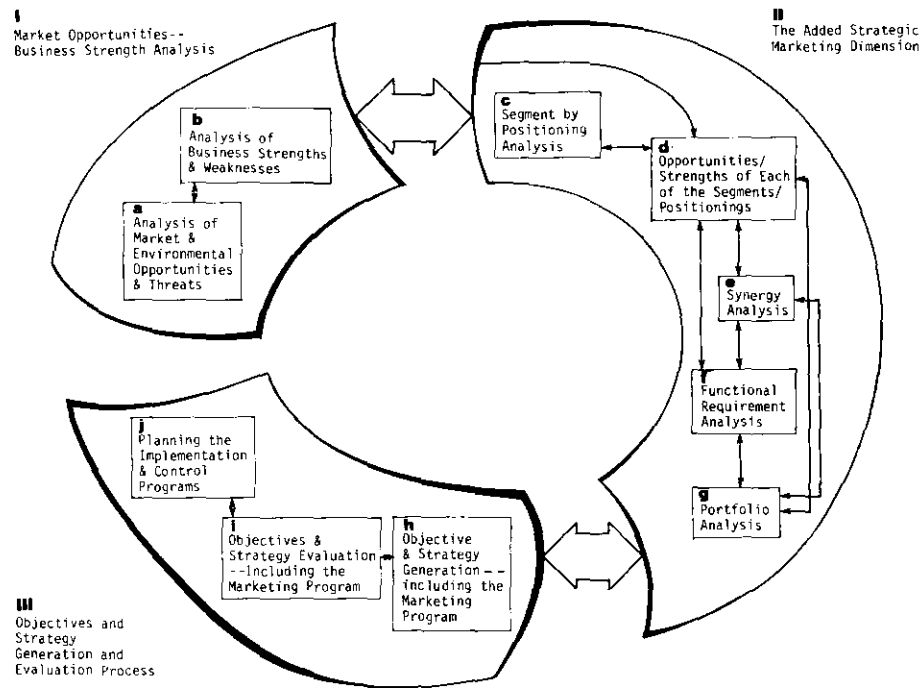


Fig. 17.1. A marketing-oriented approach to strategy formulation and evaluation (source: Wind & Robertson [1983, p. 16]).

organization. While the domain of marketing strategy models is murky, there are clearly a number of strategic marketing problems that have yet to be adequately addressed with existing models. One purpose of this chapter is to highlight those gaps and to propose and illustrate some solutions.

We take a broad view of the definition of strategy models in this chapter, including management-science models and less traditional process models which apply to the generation, evaluation and selection of strategic options at (1) the product/market level; (2) the strategic-business-unit level (which can include a number of product/market units); and (3) the corporate level (which can include a number of strategic business units).

The models and processes that are often employed in the development of marketing strategy and marketing-driven business (and corporate) strategy can be divided into three sets of models. These are highlighted in Figure 17.1 and include:

- (1) A traditional assessment of market opportunities and business strengths, including:
 - (a) analysis of opportunities and threats;
 - (b) analysis of business strengths and weaknesses.
- (2) Marketing-strategy analysis including:
 - (c) segmentation and positioning analysis which provide the foundation for the selection of target segments and product-positioning;

- (d) opportunity analysis linking the segments/positioning to market opportunities and business strengths/weaknesses;
 - (e) synergy analysis focusing on the positive and negative synergies in advertising, distribution, manufacturing, and so on, among products, segments and marketing-mix components;
 - (f) functional requirements analysis which include the specification of the key success factors in each segment/positioning and the company's competencies and abilities to satisfy those requirements;
 - (g) portfolio analysis, the analytical core of the process providing an integrated view of the product, market segments and businesses.
- (3) Generation and evaluation of objectives and strategies, including:
- (h) generation of objectives and strategies;
 - (i) evaluation of objectives and strategies;
 - (j) implementation, monitoring and control of the program.

The range of analytical approaches and models that underlie these ten phases highlight the broad scope of marketing strategy models. Lilien, Kotler & Moorthy [1992] use Figure 17.1 as a framework to discuss seven types of models that are designed to overcome the seven key limitations of current marketing strategy efforts. The seven model categories they discuss and the limitations they attempt to overcome are highlighted in Table 17.1. The types of models that Lilien, Kotler & Moorthy discuss include BRANDAID, ADVISOR, the PIMS ROI PAR Model, the Analytic Hierarchy Process, portfolio models, and others. Indeed, an informal survey we conducted of a number of leading marketing scholars aimed at identifying key marketing strategy models elicited these models and other models such as ASSESSOR [Silk & Urban, 1978; IRI, 1985], BASES [Burke Marketing Services, 1984], NEWPROD [Cooper, 1988], and POSSE [Green, Carroll & Goldberg, 1981].

Most of these models have been around for at least a decade. They include both models that focus on a specific element of the marketing mix and models that

Table 17.1

Seven limitations of typical marketing strategy and the type of marketing strategy models that can be used to address these limitations (source: Adapted from Lilien, Kotler & Moorthy [1992, pp. 508–509].)

Limitation of typical marketing strategy [Wind & Robertson, 1983]	The modeling solution
1. Improper analytic focus	Market definition and market structure
2. Functional isolation	Integration, especially models of cost dynamics (scale and experience effects)
3. Ignoring synergy	Marketing-mix/product-line methods
4. Short-run analysis	Dynamic models, especially product life-cycle analysis models
5. Ignoring competition	Competitive-analysis models
6. Ignoring interactions	Proper market-definition models
7. Lack of integrated view	Integrated models including shared-experience models such as PIMS, product-portfolio models and normative resource-allocation models

address business-strategy issues. The most serious problem with these and similar marketing strategy models is that most of them are *not* commonly used by management. Our work indicates that the reason for the lack of use includes the following:

- The models are *not* addressing the key strategic issues facing management.
- The models tend to focus on brand strategy and are not aimed at the higher-level business and corporate strategies of the firm.
- The most challenging parts of strategy are problem definition and generation of strategic options. Yet, most of the models are of little help in this area.
- Many of the models and especially those based on market data, may provide some useful input to the decision, but do not facilitate the process of making the strategic choice.
- Most of the models are *not* ‘user-friendly’.
- Most of the models do not address the current key concerns of top management such as the introduction of quality, ‘reengineering’ key processes, becoming customer-driven, time-based competition, capitalizing on the enormous advances in information technology, globalization of customer and resource markets, and the shift from hierarchical to less hierarchical cross-functional team-empowered organizations.

These concerns have led to a growing gap between the supply of marketing-science-based strategy models and the demand for and use of these models.

The gap is especially striking given the advances in marketing science, as evident in the papers in *Marketing Science*, *Management Science* and similar publications. (See Chapter 1 for some empirical evidence.) In addition, the increasing receptivity and concern by management with the need to become more customer-oriented makes this gap even more difficult to accept.

The theme in this chapter is that there are many important OR/MS developments in marketing strategy models that are already available. Those developments, despite their low level of utilization, have the potential, once ‘reengineered’, to enhance the creativity, rigor and value of the marketing strategy process.

The chapter is organized as follows:

Following this section, we provide a taxonomy of strategy models and review what is currently available in Section 2. That section focuses mainly on what we refer to as ‘traditional’ OR/MS models. We include several examples of those traditional approaches in Section 3. In Section 4, we develop some non-traditional models, aimed at addressing some of the barriers to use, while Section 5 demonstrates the value of some of these non-traditional approaches. Section 6 provides a vision for strategy models in the 21st century and Section 7 draws conclusions.

2. Strategy models: Progress to date

Table 17.2 presents a taxonomy of marketing strategy models structured around six key attributes:

Table 17.2
A taxonomy of strategy models and assessment of current offerings

	No effort	Some effort		Significant effort	
		Limited utilization	Broad utilization	Limited utilization	Broad utilization
<i>1. Focus</i>					
1.1. Specific marketing-mix components					
1. Segmentation				*	
2. Positioning				*	
3. New products				*	
4. Product line				*	
5. Pricing				*	
6. Promotion				*	
7. Distribution				*	
8. Advertising				*	
9. Salesforce				*	
10. Public relations and public affairs	*				
1.2. Integrated marketing program					
	*				
1.3. Business strategy					
1. Overall business strategy	*				
2. Joint decision with other management functions	*				
a. Marketing-operations	*				
b. Marketing-R & D-operations-human resources	*				
c. Marketing-human resource	*				
d. Marketing-finances	*				
1.4. Corporate strategy					
	*				
1. Portfolio models					
2. Resource allocation models			*		
3. Simulations	*				
4. Screening models	*				
5. Process models	*				
<i>2. Geographic and industry scope</i>					
2.1. Geographic					
1. Global	*				
2. Regional	*				
3. Country	*				
4. Region within country	*				
2.2. Industry					
1. Consumer					
a. frequently purchased products					*
b. durables				*	
2. Industrial products and services	*				

Table 17.2. (cont'd)

	No effort	Some effort		Significant effort	
		Limited utilization	Broad utilization	Limited utilization	Broad utilization
<i>3. Objectives of models</i>					
A. Problem definition	*				
B. Generation of strategy options		*			
C. Evaluation of strategy options				*	
D. Optimal allocation of resources		*			
E. Selection of strategy		*			
F. Help implement the strategy					
<i>4. Inputs</i>					
4.1. 'Hard data'	*				
1. External					
a. Customers					
b. Competitors				*	
c. Other stakeholders					
d. Market performance type data (PIMS, etc)	*		*		*
2. Internal					
a. Accounting, sales, profit					
4.2. Incorporate outcome of formal market analysis					
1. Conjoint analysis		*			
2. Brand-choice models		*			
3. Multidimensional scaling		*			
4. Diffusion models		*			
5. Econometric modeling		*			
6. Forecasting:		*			
a. Analogies		*			
b. Concept testing		*			
c. Pre-test-market models		*			
d. Test-market models		*			
e. Early sales models		*			
4.3. Integrate 'hard' data with management subjective judgments					
<i>5. Type of model</i>					
5.1. (1) Stand-alone vs. (2) part of a larger system				(1)	
5.2. (1) Descriptive vs. (2) predictive vs. (3) prescriptive				(1)	
5.3. (1) Static vs. (2) dynamic		(1)			
5.4. (1) Deterministic vs. (2) stochastic		(1)			
5.5. (1) Stand-alone models vs. (2) part of DSS		(1)			
5.6. Facilitate sensitivity analysis		*			
5.7. Process model		*			

Table 17.2. (cont'd)

	No effort	Some effort		Significant effort	
		Limited utilization	Broad utilization	Limited utilization	Broad utilization
<i>6. The output–'benefits'</i>					
6.1. 'Quality' of the selected strategy					
1. Short-term	*				
2. Long-term	*				
6.2. Speeding up decision-making	*				
6.3. Higher likelihood of successful implementation	*				
6.4. Enhance the unit/Create value		*			

- the focus of the model,
- the geographic and industry scope of the model,
- the objective of the model,
- the input to the model,
- the type of model,
- the output of the model.

The table also includes our subjective assessment of the current strategy models on two dimensions – the number of models in each category (none, little, or many) and the degree of utilization of these models (limited or broad).

The key models in each of the categories are identified below and discussed in the context of some general observations about the table.

2.1. The focus of marketing strategy models

2.1.1. Specific marketing-mix components

Market segmentation. The selection of target market segments is (together with the positioning decision) the foundation for most marketing programs. Yet there are few models for the selection of market segments. The segmentation decision is one of the major meeting grounds between marketing research and modeling, since models used for the selection of target segments require considerable information on the size of segments, their key characteristics, expected competitive activities, and expected market response of given segments to the offering of the firm and its competitors. Among the segmentation models used are normative models which try to offer prescriptive guidelines [Moorthy, 1984]. Also, models such as POSSE [Green, Carroll & Goldberg, 1981] and the Analytic Hierarchy Process (AHP) have been used effectively. POSSE is a decision support system for making product design decisions. The approach uses conjoint analysis to identify the relation between the attributes possessed by a product and the desirability of that product, for each of a set of potential customers. In a second step, the level

of market demand for any potential product is estimated by aggregating the individual preference models across customers. An optimization routine then reveals the most desirable product (or products) in terms of some specific management objective (e.g. maximizing incremental market-share). This objective may take into account the presence of specific other products in the market and/or any cannibalization effect of the new product on specific existing products. The market segment most attracted to this optimal new product is identified [Green, Carroll & Goldberg, 1981]. For further discussion, see Green & Krieger [1989]. An AHP analysis is especially appropriate when one considers the portfolio of segments that product management, the SBU, or the firm wishes to reach. An example of the use of AHP to select a portfolio of segments is included in Section 5.

Positioning. Given the importance of positioning as the foundation of marketing strategy [Wind, 1990], it is not surprising that much attention has been given to the development of positioning models. Multidimensional scaling, clustering and conjoint analysis have been used primarily for positioning analysis [e.g. Wind, 1982]. Operational models for positioning strategy include multidimensional scaling and optimization models such as POSSE, which help to select a product's best position and then find the best market segment; or, alternatively, selects a target segment and then find the product's optimal position. Analytical models prescribing target positioning under various scenarios have also been developed [Eliashberg & Manrai, 1992]. AHP analysis has also been used to find the best positioning to reach selected target segments. A good review article on this topic is Green & Krieger [1989].

New product and product-line decisions. Marketing-science models have been applied to the entire range of product decisions from the generation of new product ideas to the evaluation of ideas, concepts and products, to new-product launch, to the management of the product life-cycle, and finally to product deletion [Urban & Hauser, 1980; Wind, 1982]. These models have encompassed all of the major modeling and research developments in marketing. They have been subject to some of the more creative modeling efforts which include simulated test markets and innovative models for new-product design optimization, product-line decisions and new-product forecasting models. For review articles of many of the models see Shocker & Hall [1986], Wilson & Smith [1989], Green & Krieger [1985] and Mahajan & Wind [1986].

Pricing. Most applied pricing models are aimed at assessing the price-sensitivity of the market. They include experimentation, econometric modeling, conjoint analysis, and a variety of consumer surveys focusing on customer attitudes toward price, price perceptions and expectations. Most conjoint-analysis models include price as a factor, leading to the determination of price-elasticity. More specialized models, such as the Mahajan, Green & Goldberg [1982]. Elasticon models, offer insights into the cross-elasticity of demand and the expected impact of price changes on brand shares. There is also increasing interest in bidding models, game-theoretic

models for competitive pricing [Eliashberg & Jeuland, 1986], quantity discounts [Monahan, 1984], and identifying the best pricing strategy—not just the price itself but a number of associated ‘services’ such as terms of payment, premiums and life-cycle costing (Chapter 11).

Promotion. The proliferation of scanner data has resulted in a flood of models to measure the effects of sales promotional programs. The PROMOTER model by Abraham & Lodish [1987], for instance, uses artificial-intelligence technology. It offers on-line computer access to evaluate sales promotion programs using measures such as incremental sales and profit, consumer pull-through, and comparisons with other company sales promotions and those of competitors.

Distribution. Channels of distribution have also received attention by marketing scientists, focusing mainly on identifying the best distribution outlets [Rangan, 1987]. The tremendous growth of *direct-marketing* activities has led to significant modeling and research activities. This modeling is often limited to experimentation and is aimed at establishing the most effective direct-marketing program.

Advertising. Advertising models encompass copy-testing, media selection, advertising pulsing, campaign scheduling, and advertising budgeting [Burke, Rangaswamy, Wind & Eliashberg, 1990; Horsky & Simon, 1983]. Advertising is included in most market response models where it is used to assess the relative contribution of advertising to product sales, market share, or diffusion patterns [Eastlack & Rao, 1986]. Much of the recent development is associated with new research methods and the design of test markets where split-cable technology links with consumer-panels data collection and experimentally assesses the effect of different advertising strategies.

Salesforce. Significant modeling has been done in the salesforce area, focusing on allocations of salespeople to territories, territory realignment, frequency of sales calls, and scheduling of sales calls [Zoltners & Sinha, 1983]. Salesforce expenditures are often included as part of market response models. Analytical models have also examined the related issue of salesforce compensation [Basu, Lal, Srinivasan & Staelin, 1985].

Public relations and public affairs. Public relations focuses on communication with the desired target segments and other external stakeholders. Although this function is typically outside the responsibilities of marketing, public-relations and public-affairs programs should be consistent with the overall marketing strategy of the firm. Modeling activities from the advertising and communication areas could be applied here.

2.1.2. *The integrated marketing program*

An important modeling area which has had limited usage in practice is the modeling of the entire marketing program. Such models tend to focus on the interaction among the various marketing-mix variables. BRANDAID [Little 1975]

is one of the few models that focuses on the entire marketing-mix program. This model, discussed in greater detail in Section 3.1, is a decision support system with modular components that are developed individually and then put together to form a customized marketing-mix program. Despite its early promise, BRANDAID is not commonly used by management.

Promising developments in the marketing-mix area include studies and models of synergy among the various marketing-program elements and approaches that allow for the development of an *integrated* program. These developments include the simultaneous selection of a target market segment, desired product-positioning, and the identification of a creative strategic thrust that links these with the rest of the marketing program. The AHP [Saaty, 1980; Wind & Saaty, 1980; Dyer & Forman, 1991] has been useful for this purpose.

2.1.3. Business strategy models

Overall business strategy models. Models that focus on business strategy can greatly benefit from a marketing-science perspective. Most notable in this regard are the PIMS-based models – PAR ROI and LOOK ALIKE ANALYSIS – and the portfolio models. They are discussed in more detail in the next section.

Portfolio by products, market segment and distribution outlets. One of the key decisions facing any business manager is the determination of the desired portfolio of products by market segment by distribution-outlet-type. This decision involves (1) an analysis of the current product, market and distribution portfolio and (2) the selection of the desired portfolio of products, market segments and distribution outlets. The analysis of the current product, market and distribution portfolio follows two major approaches: (1) factor listing and (2) determination of target portfolio.

Factor listing considers the factors used in making decisions on the width and depth of the portfolio. Product-portfolio models offer a more structured set of dimensions on which the current portfolio models can be analyzed. These dimensions include market share (as a measure of the business's strength) and market growth (as a measure of the business's attraction), as well as profitability, expected return, and risk. Most models focus on two dimensions – company (product) capabilities and market-attractiveness. Yet, the specific dimensions vary from one portfolio model to another. They include models with a normative set of dimensions (such as share and growth or risk and return) and the more flexible customized portfolio models which identify dimensions that management considers relevant.

Following an assessment of the existing (and any potential new) products of the firm on the chosen dimensions, the major managerial task is to decide on the desired target portfolio. The target portfolio should not be limited only to products. Ideally, it would also include target market segments and distribution outlets. Such a portfolio reflects management's objectives, desired direction of growth, and the interactions (synergy) among products, market segments and distribution outlets [Wind, 1982].

Joint decisions with other management functions. A relatively new area of investigation involves the development of joint-optimization-type models. Most notable among these efforts are some initial development of joint marketing-and-operations optimization models, focusing on new-product design [Cohen, Eliashberg & Ho, 1992] and pricing decisions [Eliashberg & Steinberg, 1987].

As the acceptance of marketing orientation increases, one would expect the other business functions to include marketing considerations in their functional plans, and, to the extent possible, utilize appropriate marketing-science research and models. Yet little progress in the direction has been seen to date.

2.1.4. Corporate strategy models

Corporate strategy models include portfolio models, resource-allocation models, simulations, some (venture) screening models and strategy process models.

Portfolio models. These include the standardized portfolio models introduced by consulting firms such as the BCG growth-share matrix and the GE/McKinsey market-attractiveness-business-strength matrix. Given the limitations of these models (as discussed in Wind, Mahajan & Swire [1983]), a number of customized portfolio models have been developed and employed. These include both modification of the customized portfolio models as well as specially designed conjoint-analysis-based and Analytic Hierarchy Process (AHP)-based portfolio models. Key characteristics of the customized models are their focus on management's criteria for evaluating strategic options and the focus on the allocation of resources among the portfolio elements while offering diagnostic guidance to corporate strategy involving the portfolio elements. (We develop some portfolio models in Section 3.)

Resource-allocation models. Given the importance of prioritization of objectives, strategies and businesses, management uses a variety of resource-allocation models. These range from the use of simple heuristics (such as matching a successful competitor), through models that help quantify management subjective judgments such as the AHP, to optimization-type models. The more powerful of these models tend to be based on market-response elasticities. The problem, however, is that the closer the model is associated with market response data, the less comprehensive it is in terms of the other key strategy determinants (such as likely competitor activities, technology, etc.). There are a number of elegant resource-allocation models such as STRATPORT [Larréché & Srinivasan, 1981, 1982]. Yet, their usage is quite limited. (We discuss STRATPORT in Section 3.2.)

Simulations. Business simulations are quite common. One of the first major business simulations was designed by Amstutz in the early 1960s [Amstutz, 1967]. Yet it has not been employed widely due to its complexity and unrealistic data requirements. Forrester [1961] represents another attempt to employ dynamic simulation models to aid strategic decision-making. Today, most simulations are designed and used for education purposes as business games. A significant number of firms do use business simulations as part of their business and/or corporate strategy. In recent years, some simulations have been developed as games adding an entertain-

ment component to the business strategy and educational goals [Reality Technologies, 1990].

Screening models. The increased reliance on external sources of business expansion (i.e. licensing, forming strategic alliances, merging or acquiring products, businesses or even entire firms) has led to the development of screening models. Among the more popular of these models are discriminant analysis on the key discriminating characteristics of 'successful' vs. 'unsuccessful' entities.

Most of these models have been developed by firms that were able to put together a database on successful vs. unsuccessful products or businesses. At the product and SBU level, there have also been significant efforts to develop cross-industry databases. The most popular ones are the NEWPROD model for product screening [Cooper, 1988], and the PIMS database for business screening and evaluation [Buzzell & Gale, 1987].

A comparison of the NEWPROD cross-industry model with a customized industry-specific model developed by a pharmaceutical firm suggests that an industry-specific approach leads to better predictions. Yet, given the speed and cost at which one can get an answer from one of the cross-industry databases, both types of screening models have their role.

Process models. These are the most popular of the models used in the corporate strategy area. Most strategy books [Lorange, 1980; Day, 1986; Aaker, 1992], propose a process-flow model for strategy development. These are often used as blueprints for the design of strategy generation and evaluation processes.

2.2. Geographic and industry scope

2.2.1. Geography

Most of the marketing-science-based strategy models are domestic in nature. A number of the models have focused on segments and several have been applied to regions. The regional focus has received increased attention as a number of manufacturers of frequently purchased consumer goods, such as Campbell Soup, have restructured their operations along regional lines.

The few global models have focused on country selection [Wind, Douglas & LeMaire, 1972], global portfolio of countries and global portfolio of countries by segment by mode of entry [Wind & Douglas, 1981].

Despite the growing interest in regional blocks (i.e. European Community, NAFTA, etc.), none of the marketing-science models have focused on the development or evaluation of regional strategies.

2.2.2. Industry

Most of the brand-specific models have been developed for frequently purchased products, while a few (such as diffusion models—Chapter 6) focus primarily on consumer durables. With the exception of conjoint-analysis-based strategy models, which have been applied primarily to industrial and quasi-industrial products such

as pharmaceuticals, little attention has been given to industrial goods and services. Services, including growth areas such as entertainment and leisure activities, have received less attention and, to date, have benefited very little from marketing-science-based strategy models.

2.3. Objectives of models

Current marketing strategy models focus on evaluation of strategic options and on optimal allocation of resources. Little attention has been given to models that help management define and formulate the problem, that help generate creative options, that help select a strategy, or that help implement the strategy. The latter category has been almost completely ignored in the marketing-strategy literature.

This lopsided focus on strategy evaluation overlooks the potential that marketing-science methods have in helping management in the process of:

- *Problem definition*: Scenario planning [e.g. Shoemaker, 1991], stakeholder analysis, SWOT analysis (strength-weakness, opportunities and threats), marketing audit, benchmarking, positioning analysis, and similar analyses can all help in defining the problems facing the firm.
- *Generation of strategic options*: The various approaches marketing scientists have been using for the generation of new-product ideas can all be used for the generation of strategic options. For a discussion of these approaches, and their application to the generation of strategic options, see Wind [1982, 1990]. The most powerful of these approaches are morphological analysis and stakeholder analysis.
- *Selection of a strategy*: The Analytic Hierarchy Process has been effective in helping management structure a problem hierarchically, evaluate the various options on a set of criteria, and make a choice following appropriate sensitivity analysis. For a review of AHP-based applications to marketing-strategy problems, see Wind & Saaty [1980], Dunn & Wind [1987] and Saaty [1990].
- *Help in implementing the selected strategy*: One of the major advantages of an AHP-like approach is that the participants in the process tend to 'buy in' and support the group decision, an important benefit considering the typical difficulty in implementation.

2.4. Inputs

2.4.1. 'Hard data'

One of the unique contributions of marketing science to business strategy is the nature of the inputs it provides to strategy models. Given the 'boundary' role of marketing, and its traditional focus on understanding consumer behavior, it is not surprising that marketing-science-based strategy models emphasize information about the consumers. More recently, the scope of marketing has been expanded to include all stakeholders. Figure 17.2 presents the '6C' model which emphasizes the need for expanding the scope of the inputs to the marketing strategy models,

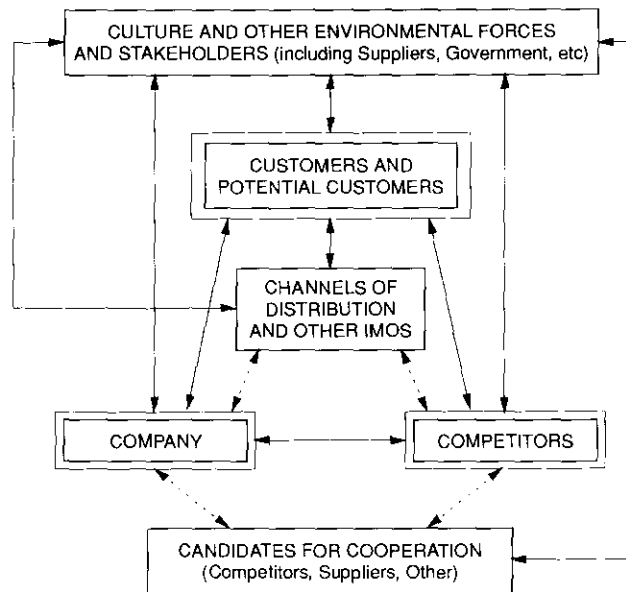


Fig. 17.2 The 6C model: an expanded view of the focus of marketing strategy models.

as well as the models themselves from the traditional 2C or 3C models – the ‘company–customer’ or the ‘company–customer–competition’ – to all the relevant stakeholders.

Many marketing-science models use data on consumer behavior generated from surveys, experiments, or secondary data services. These include scanner data and associated single-source data for frequently purchased consumer products, various forms of prescription data for the pharmaceutical industry, etc. Whereas most of the secondary data services include information on competitors as well, such data is typically at the product level and not the SBU or corporate level.

When surveys are used, they often collect data about perception preferences and reported behavior. Few syndicated data services are available to monitor the behavior of other stakeholders.

At the SBU level, important data services are the PIMS and Federal Trade Commission databases, as well as the databases of Dunn and Bradstreet and other information providers. Company-internal data are often important inputs to strategy models. These data often have significant problems concerning accuracy of profit figures, appropriateness of analytic unit (i.e. segments, distribution outlets), etc. Internal data should generally be supplemented with external data on relative competitive performance such as market-share, positioning and customer-satisfaction data.

2.4.2. Incorporate outcome of formal market analysis

A major advantage of marketing-science-based strategy models is that they can incorporate the outputs of formal market analyses including:

- the results of conjoint-analysis studies (see Chapter 10),
- brand-choice models (see Chapter 2),
- multidimensional scaling (see Chapter 5),
- diffusion models (see Chapter 8),
- econometric modeling (see Chapter 9).

2.4.3. Management subjective judgment

An important component of all strategy models is management subjective judgment. Strategy models vary with respect to the degree of formalism and qualification of management subjective judgment. AHP-based models, for instance, are based on management subjective judgment and incorporate 'hard' market data through management's assessment of the results of available studies. Most other strategy models do not explicitly incorporate management subjective judgment and thus leave management the task of deciding what to do.

2.5. Type of model

Marketing strategy models include a variety of models that can be classified on seven dimensions:

2.5.1. Stand-alone vs. part of a larger system

Most current models are developed on a stand-alone basis. Since most decisions require more than the output of a specific model, this may be one of the reasons for the relatively poor utilization of marketing strategy models. Consider, for example, the need to decide on a pricing strategy for a new product. Models for estimating the consumer price-elasticity, for example, are useful input to the decision, but must consider issues such as the likely trade reaction, likely competitive and government reaction, and the implication of the initial pricing on the firm's ability to change prices in the future.

2.5.2. Descriptive vs. predictive vs. normative

Models are often classified based on their primary objective. Most consumer-based marketing models have tended to be *descriptive* in nature. The interest in *predictive* models is evident from the many forecasting models in use. And MS/OR has always encouraged the development of *normative* models. The best strategy models should encompass all three objectives.

2.5.3. Static vs. dynamic models

Most models tend to be static in nature. Given the dynamic nature of business, there is a great interest in dynamic models, which consider factors such as competitors' reactions to the firm's strategy; entry of new competitors; changes in government regulations and technology; and changes in consumer demographics, needs and behavior. These and other dynamic factors are often dealt with via simulations, sensitivity analysis, and occasionally by complex analytical models.

2.5.4. *Deterministic vs. stochastic models*

Major developments in stochastic brand-choice models include the incorporation of marketing-mix variables and the use of these models as a basis for laws of market behavior. The Hendry system [Kalwani & Morrison, 1977], for example, partitions and defines a market in terms of current market-shares and a switching constant. Based on this, it calculates a par share for a new-brand entry and suggests implications for the new brand and its competitors.

Despite stochastic model developments and the obvious stochastic nature of marketing phenomena, most marketing models, especially those used at the SBU and corporate levels, are deterministic in nature. Even most new-product diffusion models have been mostly deterministic.

2.5.5. *Stand-alone models vs. part of decision support systems*

Many of the early marketing models had a single focus. A number of these models were linked to marketing decision support systems (MDSS) – a coordinated collection of data, models, analytical tools and computing power that help managers make better decisions. MDSSs generally replaced marketing information systems, which often failed because of lack of user-orientation. User-orientation and friendly marketing decision support systems are emerging, but are still quite limited in their diffusion. MDSSs utilize computer technology (including personal computers); artificial-intelligence approaches; management judgments; inputs on market, competitive and environmental conditions; and models of the market plan. Encouraging developments in this area include expert systems and their incorporation as part of a decision support system (Chapter 16).

2.5.6. *Sensitivity analysis*

Given the uncertainty surrounding most marketing strategy decisions, it is often beneficial to conduct sensitivity analysis to assess the sensitivity of the results to different assumptions. Simulation-based models and the AHP are especially conducive to sensitivity analysis.

2.5.7. *Process models*

Models of processes such as new-product development or a new-product launch, are common. They differ from traditional strategy models in their focus on the set of activities that should be considered to yield a set of actions. The most advanced strategy process models are those involving the various steps in the development of new products [Crawford, 1991]. More recently, with the increased attention to cross-functional processes, there has been an invigorated search for the design of processes for speeding up decisions and activities, incorporating customer/market input in the firm's decision, enhancing quality, etc. [Kleindorfer & Wind, 1992].

2.6. *The output-benefits of the models*

Aside from the obvious output of any model – has it answered the question that it has designed to answer? – little attention has been given to the four critical

benefits of:

- (1) The quality of the selected strategy. Did the model offer a solution that enhanced the short- and long-term quality of the selected strategy?
- (2) The acceleration of decision-making and the resulting actions. The increased focus on time-based competition has not found its way to most of the strategy models, except for a few process models that are designed to speed up key processes.
- (3) The enhancement of the likelihood of successful implementation. With the exception of the AHP, little attention has been given to this benefit in designing strategy models.
- (4) The improvement of the unit's ability to create value. Given that a major objective of any business is value creation, it is important to assure that any major activity such as the design and implementation of strategy models will enhance the user's ability to create value.

3. Traditional strategy model examples

In this section, we discuss four types of strategy models: BRANDAID, STRATPORT, financial-portfolio models, and the PIMS shared-experience approach, in terms of their structure and applications.

3.1. BRANDAID

BRANDAID [Little, 1975] is a flexible marketing-mix model not linked to a specific database. The model is different from the other published efforts in that (1) its structure is generally inclusive (at the expense of leaving many parts of the model calibration to the manager), and (2) it is modular and flexible, providing specific, customized submodels that can be used or not used as desired.

Figure 17.3 shows the marketing system to be modeled. The elements are a manufacturer, competitive manufacturers, retailers, consumers and the general environment. The model is clearly addressed at consumer packaged goods.

Model structure. The model structure is based on the concepts of product-class and brand sales rates:

$$m_i(t) = \frac{s_i(t)}{S(t)}, \quad \text{market share of } i \text{ at } t, \quad (1)$$

where

$$\begin{aligned} s_i(t) &= \text{sales of brand } i \text{ at } t, \\ S(t) &= \text{product-class sales at } t. \end{aligned}$$

In addition, the model develops an annual profit rate, $z_i(t)$:

$$z_i(t) = g_i(t)s_i(t) - \text{marketing-cost rate} \quad (2)$$

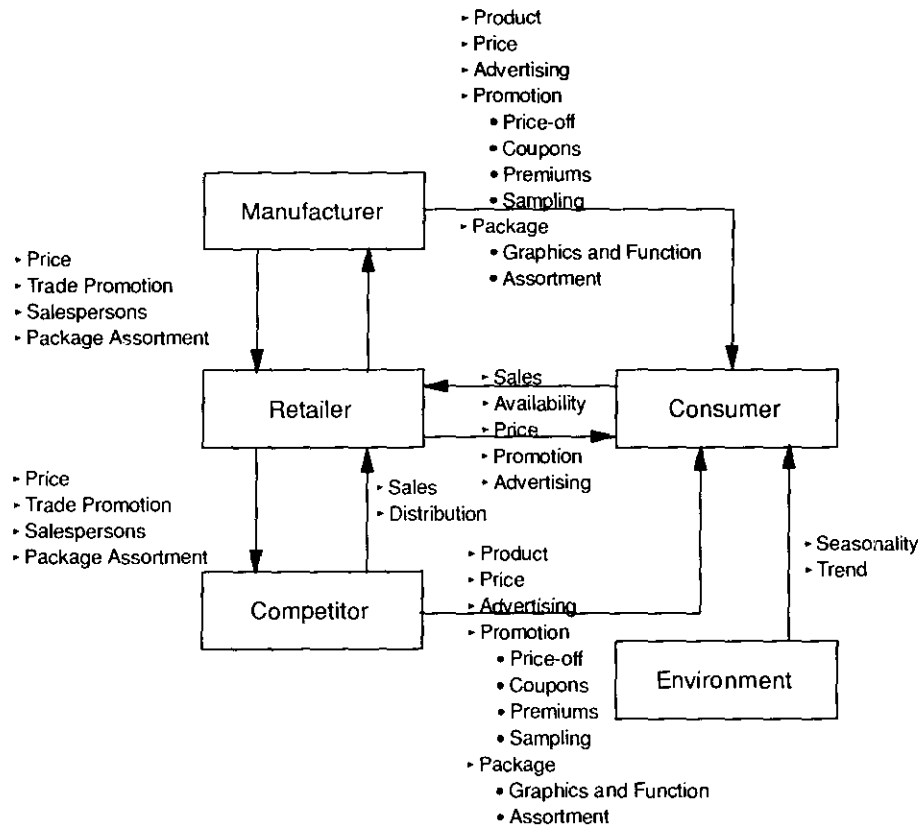


Fig. 17.3. The BRANDAID view of the marketing system to be modeled (source: Little [1975]).

where $g_i(t)$ is the contribution of brand i (in dollars per sales unit).

For a given brand (dropping the subscript i), the brand sales rate $s(t)$ is expressed as a reference value modified by the effect of marketing activities and other sales influence. The structure of the model is:

$$s(t) = S_0 \prod_{i=1}^I e_i(t) \tag{3}$$

where

- S_0 = reference-brand sales rate, dollars per customer per year,
- $e_i(t)$ = effect index in brand sales of the sales influence, $i = 1, \dots, I$
(I = number of sales indices).

The specific submodels are described next, in turn. In each case, we drop the subscript i in $e_i(t)$ for t the particular promotional activity because it will be clear from the context.

Advertising submodel. The advertising submodel starts with the brand's sales at a reference value and assumes that there exist some advertising rate that will maintain sales at that level. This rate is called the maintenance or reference advertising rate. When advertising is above reference, sales are assumed to increase; below reference, they decrease.

The dynamics of the process are captured in the following equation:

$$e(t) = \alpha[e(t-1)] + (1 - \alpha)r(a(t)) \quad (4)$$

where

$e(t)$ = advertising-effect index at time t ,
 $r(a)$ = long-run sales response to advertising (index),
 α = carryover effect of advertising per period,
 $a(t)$ = advertising rate at time t in dollars.

Operationally, the advertising rate is the rate of messages delivered to individuals by exposure in media paid for in dollars. Thus,

$$a(t) = \frac{h(t)k(t)X(t)}{h_0k_0X_0} \quad (5)$$

where

$X(t)$ = advertising spending rate,
 $h(t)$ = media efficiency at t ,
 $k(t)$ = copy-effectiveness of t ,
 X_0, h_0, k_0 = reference values of the above quantities.

The model can also incorporate a memory effect:

$$\hat{a}(t) = \beta\hat{a}(t-1) + (1 - \beta)a(t) \quad (6)$$

where

$\hat{a}(t)$ = effective advertising at t ,
 β = memory constant for advertising (fraction per period).

Price submodel. The price-index submodel has the form:

$$e(t) = r[a(t)]\Psi[X(t)] \quad (7)$$

where

$e(t)$ = effect of brand price on share at t ,
 $a(t) = x(t)/x_0$ = relative price,
 $X(t)$ = manufacturer's brand price,
 $r(a)$ = response function,
 $\Psi(x)$ = price-ending effect.

Salesforce submodel. The salesforce submodel is also structured in the form of a response function. Salesperson effort is defined as

$$a(t) = \frac{h(t)k(t)X(t)}{h_0k_0X_0} \quad (8)$$

where

$X(t)$ = salesperson-effort rate, dollars per customer per year,
 $h(t)$ = coverage efficiency, calls per dollar,
 $k(t)$ = effectiveness in store, effectiveness per call,
 $a(t)$ = index of normalized salesperson effort rate.

To account for memory and carryover effects, the following equation is employed:

$$\hat{a}(t) = \beta\hat{a}(t-1) + (1-\beta)a(t) \quad (9)$$

where

$\hat{a}(t)$ = effective effort at t ,
 β = carryover constant for memory effect (fraction per period).

Finally, the salesperson-effect index includes a carryover (loyalty) constant α , as well as a response function:

$$e(t) = \alpha e(t-1) + (1-\alpha)r(\hat{a}(t)). \quad (10)$$

Other influences. Other influences, such as seasonality, trends, package changes, and the like, can be handled by direct indices. For example, trend can be treated as a growth rate. In this case a trend would be modeled as

$$e(t) = e_0 \prod_{i=1}^t [1 + r(i)] \quad (11)$$

where $r(i)$ is growth rate in period i .

Competition. In BRANDAID, competition is handled in the same way as direct sales effects; each effect (competitive advertising, competitive pricing, etc.) goes into the model either as an index or as an additional submodel, depending on the level of detail available.

Application. The implementation of BRANDAID can be viewed as the development of a decision support system for aiding brand-management decisions. Little recommends a team approach to implementation; the ideal team involves an internal sponsor, a marketing manager, a models person on location, and a top-management umbrella.

Calibration of the model involves two types of data: state data (reference values

of sales, share, product-class sales, etc.) and response information. The former are easy to obtain; the latter require a creative blending of judgment, historical analysis, tracking (running the model on past data and getting managers to review the results and, if necessary, refine parameters), field experimentation, and adaptive control (the formal processes of using marketing activities to refine parameter estimates through an ongoing measurement process).

Little describes a case, called GROOVY, for a well-established brand of packaged goods sold through grocery stores. The model tracked sales well over a five-year period and has proven useful for advertising, pricing and promotional planning. For example, by tracking months 72 to 78, analysis made it clear that year-to-date sales were good. However, since most of the year's advertising was spent, most of the promotional activity was over, and price had been increased, the prospects for the rest of year were bleak. The brand manager used this analysis to support a request for additional promotional funds, a proposal accepted by management. This action 'almost certainly would not have been taken without the tracking and forecasting of the model'.

In spite of this illustration the rich BRANDAID structure is apparently too complex for most managers to use and its operational impact has been slight.

3.2. STRATPORT

As theory and understanding about the factors underlying effective strategies are emerging, normative product-portfolio models that incorporate those ideas are also emerging. The STRATPORT model of Larréché & Srinivasan [1981, 1982] is an example of an integrative, normative approach.

STRATPORT focuses on the allocation of marketing resources across business units; it is not concerned with the allocation of resources within business units. The business units are assumed to be independent of one another – they share no experience-curve synergies or marketing synergies. The model is structured around two time-frames: the planning period and the post-planning period, common to all business units. Changes in market shares are assumed to be accomplished during the planning period, while the post-planning period captures the long-term profit impacts of the strategy implemented during the planning period, and the market shares are treated as if they had remained constant during this time. Marketing expenditures and changes in working capital follow the evolution of sales. In the model, the following notation is used. Time is at the end of period t . Flow variables (cost, revenue, production) have a start time and end time. Thus, ${}_{t_1}C_{t_2}$ is the cost from t_1 to t_2 and C_t is the cost from 0 to t . Also, T is the length of the planning period, and $S - T$ is the length of the post-planning period.

The driving force behind the model is the set of business-unit market shares $\{m_{Ti}\}$, $i = 1, \dots, N$. The problem is then to find m_{T1}, \dots, m_{TN} to

$$\text{maximize } \pi = \sum_{i=1}^N \pi_i(m_{Ti}) \quad (12)$$

$$\text{subject to } Z_{1i} \leq m_{Ti} \leq Z_{2i} \quad i = 1, \dots, N, \quad (13)$$

$$F = \sum_{i=1}^N F_i(m_{Ti}) \leq \Delta \quad (14)$$

where

$$\begin{aligned} \pi &= \text{long-term profit,} \\ Z_{1i}, Z_{2i} &= \text{limits imposed by management,} \\ F &= \text{cash flow need during planning period,} \\ \Delta &= \text{net cash-flow limit.} \end{aligned}$$

Equation (12) represents total profit during the planning horizons (in constant dollars), Equation (13) represents the upper and lower limits on market share, and Equation (14) represents the cash-flow constraint. In effect, Equation (14) is not fixed since the value of Δ can be affected by borrowing. The constrained optimization problem (12)–(14) can be solved using the generalized Lagrange multiplier method [Everett, 1968].

We now consider the components of the model for a single business unit, dropping the i subscript (business-unit notation). The effect of marketing investment during the planning period is modeled by the market response function:

$$m_T = 1 + (U - L) \left(\frac{E^\alpha}{B + E^\alpha} \right) \quad (15)$$

where

$$\begin{aligned} L, U &= \text{lower and upper limits on } m_t \quad (0 \leq L \leq U \leq 1), \\ \alpha, B &= \text{parameters to be estimated,} \\ E &= \text{marketing expenditures.} \end{aligned}$$

The evolution of market share from m_0 at 0 to m_T at T is modeled as

$$m_t = m_0 + (m_T - m_0)f(t) \quad (16)$$

where

$$f(t) = \left(\frac{t}{T} \right)^\beta, \quad \beta > 0. \quad (17)$$

Thus, values of β greater than 1 lead to a slow approach to m_T , while values of β near 0 lead to a rapid approach to ultimate shares.

The model assumes that industry demands are exogenous, given by $\{M_t\}$. Then the total production for the firm is given by

$$P_T = \sum_{t=1}^T \left(\frac{m_{t-1} + m_t}{2} \right) M_t \quad (18)$$

where the market share during a period is approximated by its average values.

Combining Equations (16), (17) and (18) yields:

$$P_t = k_1 + k_2 m_T \quad (19)$$

where k_1 and k_2 are constants that can be evaluated numerically following some algebra [Larréché & Srinivasan, 1982].

Total costs are driven by the experience curve and are modeled as:

$$C_T = \frac{C}{1-\lambda} [({}_t P_T)^{1-\lambda} - ({}_t P_0)^{1-\lambda}] \quad (20)$$

where

C_T = total cost of units sold,
 λ = learning or experience constant,
 ${}_t P_T$ = cumulative production from time of product introduction to end of planning horizon.

A similar expression is derived for costs during the post-planning period.

Industry unit price is assumed to fall with industry cumulative experience as:

$$p_I = pI^{-\eta} \quad (21)$$

where

p_I = average industry unit price,
 I = industry cumulative value (in units),
 p = constant,
 η = industry learning constant, which potentially changes over time ($\eta > 0$).

Now following the reasoning in Equation (20), we get

$${}_t Q_{t2} = \frac{P}{1-\eta} [({}_t I_{t2})^{1-\eta} - ({}_t I_{t1})^{1-\eta}] \quad (22)$$

where ${}_t Q_{t2}$ is industry revenue from start time for industry (t_1) to present (t_2). The price set by the firm may be higher or lower than the industry price, so the firm's revenue during time period t is modeled as:

$${}_{t-1} R_t = \omega_{t-1} Q_t \left(\frac{m_t + m_{t-1}}{2} \right) \quad (23)$$

where ω is ratio of firm's price to industry average price. Revenue during the post-planning period is modeled similarly.

A market share of m_t at T requires production capacity of

$$X = m_T M_T. \quad (24)$$

If the current plant capacity is X_0 and $X_0 < X$, capacity-expansion expenditures will be incurred during the planning period; if $X < X_0$, then liquidation of excess capacity can generate a cash inflow. The capacity expenditures corresponding to X are modeled as

$$Y = \left(\frac{bX^\gamma}{a + X^\delta} \right) - q \quad (25)$$

where

$$\begin{aligned} Y &= \text{capacity-expansion expenditures,} \\ q &= \text{cash value of divesting entire current capacity,} \\ a, b, \gamma, \delta &= \text{positive constants, with } 0 < \gamma - \delta < 1. \end{aligned}$$

Expenditures above what is spent (through C_t and ${}_tC_s$ in the form of depreciation) during the planning period are expressed as a fraction (θ_1) of Y : $Z = \theta_1 Y$.

We also need to adjust C_t by an amount A , which represents the depreciation over the period 0 to T of assets acquired prior to $t = 0$.

In general, a change in market share calls for a change in working capital, modeled as a function of revenue in period t :

$$g_t = \alpha({}_{t-1}R_t)^\beta \quad (\alpha, \beta > 0) \quad (26)$$

The change in working capital corresponding to the change in market share is given by $g_t - g_0$. To avoid double-counting the working capital expenses included in C_t , we only take a fraction θ_2 of $g_t - g_0$:

$$G = \theta_2(g_T - g_0) \quad (27)$$

where G is the additional required working capital.

Let V denote the proportion of the firm's revenue spent to maintain market share at m_T ; V is modeled as

$$V = d - e(m_T - L) \quad (28)$$

where d and e are constants to be determined. The cost of maintaining share from t to $t + 1$ ($t \geq T$) is

$${}_tH_{t+1} = V_t R_{t+1} \quad (29)$$

and from Equations (28) and (29), we get

$${}_tH_{t+1} = d_t R_{t+1} - e_t R_{t+1} (m_T - L). \quad (30)$$

The value of profit from the business unit can now be calculated as

$$\pi = (R_T + {}_T R_S) - (C_T + {}_T C_S) - (E + {}_T H_S) \quad (31)$$

where expressions for terms on the right-hand side of Equation (31) are developed above. Similarly, the cash flow need for the business unit during the planning period is

$$F = E + C_T - R_T + Z + G - A \quad (32)$$

where, again, the expressions are given above, and discounted dollars are used in all expressions. To account for taxes, we must multiply Equation (31) by $(1 - \text{tax rate})$, as we must also do for E , C_T and R_T in Equation (32).

Risk can be handled by discounting business units at different discount rates, reflecting their different risk profiles.

Application. Given a specific portfolio strategy, the model described above can evaluate its profit implications and cash-flow needs. In addition, STRATPORT has an optimization module to determine the best allocation of resources among business units with the maximum net present value over the time horizon, subject to market-share and cash-flow constraints. The cash-flow constraint can be evaluated over ranges of borrowing activity, if desired. One can utilize STRATPORT to update, via its optimization routine, $\{M_T\}$ which can be obtained initially by standard forecasting techniques. For more details of the solution algorithm and an illustrative run of the model, see Larréché & Srinivasan [1981, 1982].

However, as with BRANDAID, the model's richness and comprehensiveness has severely limited its use.

3.3. Financial/product portfolio models

STRATPORT incorporates risk in an implicit manner. Financial-portfolio-based models deal with risk explicitly. The financial approach to the portfolio-selection problem assumes that the profits from portfolio items (such as product lines, stocks, bonds, etc.) are random variables, and estimates concerning their distribution (subjective or objective) are known. Furthermore, the rates of profit for different items may be correlated and hence the need to examine the portfolio items collectively. The expected rate of return on a portfolio is simply the weighted average of the expected rates of return of the items contained in that portfolio, i.e.

$$\bar{R}_p = \sum_{i=1}^m w_i R_i, \quad \sum_{i=1}^m w_i = 1, \quad (33)$$

where w_i is the portion of funds invested in item i , R_i is the expected value of return for item i , m is the total number of items in the portfolio, and \bar{R}_p is the expected rate of return for the portfolio. If variance is used as the measure of risk associated with a portfolio, it may be obtained by

$$V_p = \sum_{i=1}^m \sum_{j=1}^m w_i w_j \sigma_{ij} \quad (34)$$

where V_p is the portfolio variance, w_i and w_j are the portions of funds invested in items i and j , respectively, and σ_{ij} is the covariance between returns of items i and j .

The systematic steps that characterize the portfolio selection decision may be stated:

(1) *Determine all possible items to be considered in the portfolio and generate all feasible portfolios.* The major objective of this step is to specify a finite number (m) of items and generate a set of feasible portfolios. The number of feasible portfolios can be determined by generating combinational solutions to the equation $\sum_{i=1}^m w_i = 1$ within the constraints imposed on the values of w_i .

(2) *Generate the admissible (efficient or undominated) portfolios.* The objective here is to reduce the large number of feasible portfolios to a smaller number using certain 'efficient' rules. These rules are derived by making certain stated assumptions on the nature of the investor's underlying utility function. The reduced number of portfolios are termed efficient, admissible, or undominated portfolios. Although a number of efficient rules have been proposed in the financial literature, we concentrate on mean-variance (EV) and stochastic dominance (SD) rules for generating efficient product portfolios.

(3) *Determine the optimal portfolio from the admissible portfolios.* The efficient rules provide a mechanism to divide the feasible portfolios into two groups: those dominated by others and those not dominated by others. The undominated or admissible portfolios provide a smaller set of alternatives from which the optimal choice can be made by obtaining further information on the investor's utility function (risk/return trade-off).

The most widely used efficiency criterion for portfolio selection is the mean-variance (EV) rule suggested by Markowitz [1959]. Since the decisions about investment may be viewed as choices among alternative probability distributions of returns, the EV rule suggests that, for risk-averse individuals, the admissible set may be obtained by discarding those investments with a lower mean and a higher variance. That is, in a choice between the two investments, designated by return distributions F and G , respectively, a risk-averse investor is presumed to prefer F to G , or to be indifferent between the two if the mean of F is as large as the mean of G and the variance of F (reflecting the associated risk) is not greater than the variance of G , i.e., if $\mu_F \geq \mu_G$ and $\sigma_F^2 \leq \sigma_G^2$. Furthermore, if at least one of these inequalities is strict, then some investors prefer F to G in the strict sense, and F is said to dominate G in the sense of EV. In this case, G can be eliminated from the admissible set. If only one of the inequalities holds, the selection depends on the individual's personal mean-variance trade-off, and neither F nor G can be eliminated under the EV dominance rule. The rule can be applied easily to the portfolio-selection problem by ordering all portfolios by increasing means and excluding any portfolio i such that the variance of portfolio i is greater than or equal to the variance of portfolio j where $i < j$.

In spite of its popularity, the mean-variance approach has been subject to criticism as it requires specific information about the firm's utility function and ignores information about the complete distribution of the firm's returns.

To address these concerns, Hillier [1969] has proposed, for instance, the following approach. Let X_j be the random variable that takes on the value of the net cash-flow during the time period j , where $j = 0, 1, 2, \dots, n$. Let i_j be the rate of interest, commonly referred to as the cost of capital, which properly reflects the investor's time-value and time-preference of money during the period j . The present value, P , of this investment or set of investments can then be defined as

$$P = \sum_{j=0}^n \left[\frac{X_j}{\prod_{k=1}^j (1 + i_k)} \right]. \quad (35)$$

Consider a set of m proposed investments. Define the decision variable δ_k as

$$\delta = \begin{cases} 1, & \text{if the } k\text{th proposed investment is approved,} \\ 0, & \text{if the } k\text{th proposed investment is rejected} \end{cases} \quad (36)$$

for $k = 1, 2, \dots, m$.

Let $\delta = (\delta_1, \delta_2, \dots, \delta_m)$. Assume that the investments can generate incoming (positive) or outgoing (negative) cash flows immediately and during some or all of the next n time periods, but not thereafter. Let the random variable $X_j(\delta)$ be the net cash-flow during time period j ($j = 1, 2, \dots, n$). Let $U(p)$ be the utility if p is the realized present value of the approved set of investments. Let S be the set of feasible solutions, i.e. the subset of $[\delta | \delta_k = 0 \text{ or } 1; k = 1, 2, \dots, m]$ whose elements are feasible decision vectors.

The problem that can be formulated to determine $\delta \in S$ so as to

$$\text{maximize } E[U(P(\delta))],$$

where

$$P(\delta) = \sum_{j=0}^n \frac{X_j(\delta)}{\prod_{k=1}^j (1 + i_k) \delta}. \quad (37)$$

This problem can be reformulated in a chance-constrained programming format. Hillier [1969] provides other solutions or approximate solutions under various conditions.

Another approach to the problem is the stochastic-dominance approach [Hadar & Russell, 1971]. Stochastic dominance is a relationship between pairs of probability distributions; in particular, it involves comparison of the relative positions of the cumulative distribution functions. Three types of stochastic-dominance rules have generally been presented for decision-making under uncertainty: first-order stochastic dominance (FSD), second-order stochastic dominance (SSD), and third-order stochastic dominance (TSD). These rules have been derived by considering

certain stated assumptions on the form of the utility function U . If U' , U'' and U''' stand for the first, second and third derivatives of the utility function, the FSD rule assumes that $U' \geq 0$; the SSD rule assumes that $U' \geq 0$ and $U'' \leq 0$, and the TSD rule assumes that $U' \geq 0$, $U'' \leq 0$ and $U''' \geq 0$. That is, the FSD rule requires only that the first derivative of the utility function be everywhere non-negative. These assumptions are clearly more reasonable than the assumptions of a quadratic utility function with increasing absolute risk-aversion implied by the EV rule. These stochastic-dominance rules result in the following:

- (1) the FSD rule provides the efficient set of portfolios for all decision-makers with utility functions increasing in wealth;
- (2) the SSD rule provides the efficient set of portfolios for the subset of decision-makers having increasing utility functions and risk-aversion;
- (3) the TSD rule provides the efficient set of portfolios for the subset of risk-averse decision-makers with decreasing absolute risk.

The optimal portfolio for the investor can then be determined, based on his/her risk–return trade-off, from among the relevant smaller set of admissible choices.

Applications. Cardozo & Wind [1985] have suggested a modification of the risk–return portfolio model which overcomes some of the difficulty involved in applying the conventional model of the product–portfolio decisions. They report an application in one company whose disguised name is The Monitrol Company.

Discussion with executives revealed that Monitrol's performance was affected by three distinct sets of factors, corresponding to three distinct markets. On that basis, the company's product-market investments were divided into three separate business units which shared some support services, but were independent with respect to demand.

The business unit whose experience is described here contained four product lines, each of which had a different application in a technical market. These application markets were not related, and could be considered distinct and independent markets. The four lines shared some production and engineering facilities with each other and with the other two business units. Monitrol executives believed that resources relinquished by any one product line could be readily employed by other lines or units.

Using the portfolio approach required 10 managers within the business unit to: (a) forecast earnings for each product line; (b) identify the principal factors affecting those earnings, construct scenarios around these factors, and estimate the likelihood of occurrence of each of several scenarios or descriptions of future environments; (c) quantify these estimates and array them in table and chart form, then construct an efficient frontier, and (d) assess the trade-off between risk and return. Managers began by forecasting returns for the four product lines in the business unit during the coming three years (Monitrol's planning period), based on projections from historical experience and forecast changes in the environment. Managers' initial responses encompassed a wide range of estimates. They were then asked to specify the conditions under which the lowest and highest estimates would likely occur.

This procedure helped identify several factors on which one set of values would lead to high returns; another, to low returns. Managers next selected the major factors or 'driving forces' that were most critical in influencing returns. They identified two factors that were likely to account for most of the variation in future earnings: (1) whether a dominant competitor would attempt to limit the extent to which Monitrol and other small manufacturers could supply products compatible with a new product line it was introducing to replace existing products, and (2) the rate at which users accepted new technology pioneered by the dominant competitor and the new products associated with that technology.

After managers had described these factors, they were asked to specify ranges of values on each factor that would produce noticeable differences in returns. They divided the first factor into three ranges, 'favorable', 'neutral' and 'unfavorable'; the second into four, ranging from almost no adoption to prompt conversion of the entire industry. On that basis the authors constructed 12 scenarios (three values on the first factor times four values on the second).

Managers were also asked to estimate the likelihood that each of the 12 scenarios would in fact accurately describe the environment during the coming three years. Managers dismissed five scenarios as having less than one chance in 20 of occurring. After comparing and contrasting the remaining seven scenarios, managers decided that the ranges of values they had originally specified on each factor was unnecessarily detailed, and that two values on both the first factor ('favorable' or 'unfavorable' attitude) and the second ('rapid' or 'slow' adoption) would adequately describe what might happen. This redefinition allowed the authors to reduce the number of scenarios to four.

Finally, managers were asked to estimate the likelihood that each scenario would occur. Although individual managers' estimates differed somewhat, the group

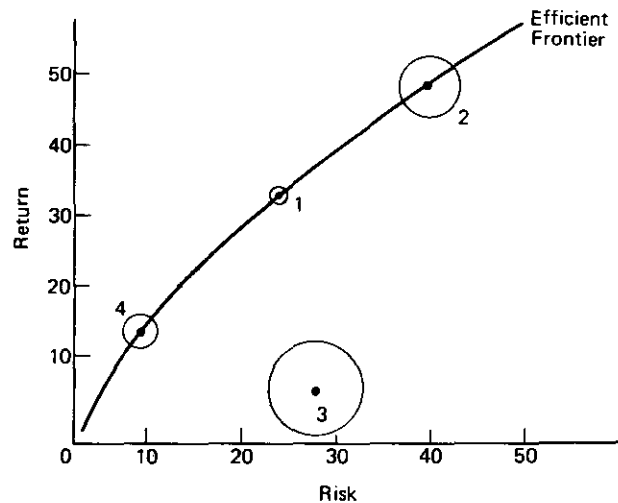


Fig. 17.4. Monitrol's current portfolio (source: Cardozo & Wind [1985]).

agreed that there was little reason to consider one scenario more or less likely to occur than any other. Managers also concluded that together the four scenarios represented a full range of foreseeable outcomes. (Subjective estimates like these could – and to the extent possible should – be supplemented with market research data in the form of conditional forecasts.)

This information was converted into forecast returns for a three-year planning period for each of four investments under four environmental scenarios and then converted into the return–risk chart in Figure 17.4, showing the efficient frontier for the business unit's current investments.

Monitrol managers recognized that investment 3 (control systems) appeared to offer lower returns than investments 1, 2 and 4 and higher variance than investments 1 and 4. This information prompted Monitrol executives to examine ways to reduce resources allocated to the control-systems line.

Mahajan & Wind [1985] describe the limitations of the financial-portfolio approach to product-portfolio problems and modifications needed to make the approach more easily applicable.

3.4. *The shared-experience approach: PIMS*

The PIMS (profit impact of marketing strategy) project began in 1960 at General Electric as an intra-firm analysis of the relative profitability of its businesses. It is based on the concept that the pooled experiences from a diversity of successful and unsuccessful businesses will provide useful insights and guidance about the determinants of business profitability. The term 'business' refers to a strategic business unit, which is an operating unit selling a distinct set of products to an identifiable group of customers in competition with a well-defined set of competitors. By the mid-1980s, the data base of about 100 data items per business included about 3000 businesses from about 450 participating firms.

Perhaps the most publicized use of the PIMS data is in the form of the PAR regression model, which relates return on investment (ROI, i.e. pretax income/average investment over four years of data) to a set of independent variables [Buzzell & Gale, 1987]. Table 17.3 presents that model for the entire PIMS database.

The most widely cited (and frequently challenged) results of the PIMS studies are associated with market selection and strategic characteristics associated with profitability: Table 17.4 summarizes some of those findings.

Firms participating in the PIMS program receive PAR reports for their business, which provides a comparison of the actual return on investment (ROI and ROS) of their businesses and the ROI and ROS (= pretax income/average sales over four years of data) that PIMS predicts for the business (based on its market and strategic characteristics). This type of analysis, showing the deviation of actual ROI from PAR ROI, yields insights into how well and why the business has met its strategic potential. Because PIMS has been the mostly widely publicized and widely supported source of cross-sectional information about business strategy, the results emerging from the program have undergone considerable scrutiny.

Table 17.3

The PIMS profitability equation; multiple regression equation for ROI and ROS (entire PIMS database) (source: Buzzell & Gale [1987, p. 274])

Profit influences	Impact on:	
	ROI	ROS
Real market-growth rate	0.18	0.04
Rate of price inflation	0.22	0.08
Purchase concentration	0.02**	N.S.
Unionization, %	-0.07	-0.03
Low-purchase amount:		
Low importance	6.06	1.63
High importance	5.42	2.10
High-purchase amount:		
Low importance	-6.96	-2.58
High importance	-3.84	-1.11**
Exports-imports, %	0.06**	0.05
Customized products	-2.44	-1.77
Market share	0.34	0.14
Relative quality	0.11	0.05
New products, %	-0.12	-0.05
Marketing, % of sales	-0.52	-0.32
R & D, % of sales	-0.36	-0.22
Inventory, % of sales	-0.49	-2.09
Fixed capital intensity	-0.55	-2.10
Plant newness	0.07	0.05
Capacity utilization, %	0.31	0.10
Employee productivity	0.13	0.06
Vertical integration	0.26	0.18
FIFO inventory valuation	1.30*	0.62
R ²	0.39	0.31
F	58.3	45.1
Number of cases	2314	2314

Note: All coefficients, except those starred, are significant ($p < 0.01$).

*Significance level between 0.01 and 0.05.

**Significance level between 0.05 and 0.10.

ROI = return on investment

ROS = return on sales

These criticisms fall into three main categories: specification problems, measurement error, and interpretation. Most of these criticisms are summarized in Anderson & Paine [1978], Lubatkin & Pitts [1983, 1985], Chussil [1984] and Ramanujam & Venkatraman [1984].

In terms of *specification*, questions have been raised about the structure of the regression model – whether additive effects, multiplicative effects, interactions, multicollinearity, or heteroscedasticity exist. Furthermore, the use of ROI forces a short-term focus on strategy questions, and there is misspecification resulting from the presence of an investment term (investment intensity) among the

Table 17.4

General PIMS principles relating marketing selection, strategic planning and profitability (source: Buzzell & Gale [1987])

Some market characteristics associated with higher profitability

- Market growth
- Early life-cycle
- Higher inflation
- Few suppliers
- Small purchase levels
- Low unionization
- Higher exports/low imports

Some strategic factors associated with higher profitability

- Higher market-share
 - Low relative costs
 - High perceived quality
 - Low capital-intensity
 - Intermediate level of vertical integration
-

independent variables, leading to a significant relationship with the dependent variable. In addition, the omission of business goals and the structure of the organization may be a problem, and the disguising of sales data and other units only allows the modeling of operating ratios. For some analyses this feature may lead to spurious relationships [see Lilien, 1979; Jacobson, 1990a, 1990b; Buzzell, 1990; Boulding, 1990].

In terms of *measurement error*, it is inevitable that different firms, with different accounting methods, interpretations, and levels of understanding of the data requirements, will provide noisy data. The potential significance of this problem was underscored by Rurnelt & Wensley [1980], who report little stability in the market-share estimates when different measures were correlated over different time periods. These types of problems are inherent in shared data; users of the results need to be made aware of the extent of the possible problem.

Potentially, the most serious problem is in the *interpretation*. The PIMS results are norms; therefore, the equations do not have a casual interpretation. High market-share and high profit occur together. Although it is tempting to predict the consequences on profitability of changes in the independent variables of the PAR model, it is not reasonable to do so. Lack of information about goals and the extent to which certain strategies, exercised over time, were able to achieve those goals make the problem more severe.

The PIMS models and database provide an important empirical base and structure for asking questions about strategy. The results, however, should be used cautiously.

4. Non-traditional models for marketing and business strategy

In this section, we highlight some of the models which offer valuable guidance to marketing strategy and marketing-driven business strategy although they do not follow the tradition of analytical models.

The 'non-traditional' models we discuss are of three types:

- (1) Models for generating creative strategic options:
 - approaches borrowed from the new-product idea-generation area,
 - meta-analysis;
- (2) Models addressing specific strategy needs such as:
 - creating a corporate and business vision,
 - scenario planning,
 - benchmarking,
 - portfolio analysis and strategy;
- (3) Models that facilitate integration of 'hard' market data with management subjective judgments.

4.1. Models for generating creative strategic options

One of the most ignored areas of management-science models in general, and marketing strategy models in particular, is the generation of creative options. Yet, option generation may have the greatest strategic impact. Sophisticated evaluation models are not very useful if applied to a conventional set of 'me too' strategic options. Thus, greater attention should be given to the generation of innovative options.

4.1.1. Approaches borrowed from the new-product idea-generation area

In deciding how to generate creative strategic options, one can benefit from the approaches to the generation of new-product ideas.

Most of the approaches for generating new-product ideas can also be used to generate strategic options. Thus, the approaches listed in Table 17.5 (and discussed in Wind [1982, Chapter 9] should be considered.

Table 17.5
Approaches to the generation of new-product ideas (source: Wind [1982])

Source	Research approach	
	Unstructured	Structured
Consumers	Motivation research Focused group interviews Consumption system analysis Consumer complaints	Need/benefit segmentation Problem detection studies Market structure analysis/gap analysis Product deficiency analysis
'Experts'	Brainstorming 'Synectics' 'Suggestion box' Independent inventors	'Problem/opportunity' analysis Morphological analysis Growth opportunity analysis Environmental trends analysis Analysis of competitive products Search of patents and other sources of new ideas

← The R & D process →

Table 17.6
Morphological approaches for generating strategic options

A. The traditional use of morphological approaches for generating new-product ideas (source: Adams [1972, p. 83])

Example: Improved ball-point pen

Attributes

Cylindrical	Plastic	Separate cap	Steel cartridge
Alternatives			
Faceted	Metal	Attached cap	No cartridge
Square	Glass	No cap	Permanent
Bladed	Wood	Retracts	Paper cartridge
Sculptured	Paper	Cleaning cap	Cartridge made of ink
.	.	.	.
.	.	.	.
.	.	.	.

B. Use of the morphological approach for generating strategic options

Market segment	Product-positioning	Product and service offerings	Distribution
Top 20%	Price	A	Outlet 1
Customers with potential for top 20%	Performance	B	Outlet 2
	Guaranteed performance	C	Outlet 3
Prospects with potential for top 20%	Convenience	D	Outlet 4
	Service	.	.
Previous customers	Prestige	.	.
Candidates for deletion	.	.	.
Other customers	.	.	.
.	.	.	.
.	.	.	.

The lessons from using these approaches in generating new-product ideas are:

- generation of new ideas requires both structured and unstructured approaches;
- approaches to idea generation should include both internal (decision-makers) and external (consumer, competition, suppliers, etc.) sources;
- the more approaches one uses for generating new ideas, the higher the likelihood of success; and
- idea generation should be conducted on an ongoing basis.

One of the most valuable approaches for generation of creative new ideas is morphological analysis. Table 17.6 illustrates the morphological approach for the generation of new-product ideas and shows how the same approach can be used to generate strategic options.

In both of these cases, the key is (a) the structuring of the problem, (b) the identification of all possible options for each component, and (c) the evaluation of all possible combinations of options.

In Table 17.6B, marketing strategy consists of the following components: segments, positioning, product and service offering, distribution outlet, and others. For each of these components, a list of options is generated. For example, the positioning strategy includes the possibility of price, performance, guaranteed performance, convenience, service and prestige. Having identified the option under each of the strategy components, strategic options are identified consisting of a pattern of options from each of the components (one from each column).

4.1.2. Meta-analysis

A second approach to the generation of creative strategic options is reliance on hypotheses one can draw from existing theories, concepts and findings. In this context, any theory, concept or study that suggests a specific relationship between some strategic variables and performance can be used as a source of hypothesis for a similar strategic situation.

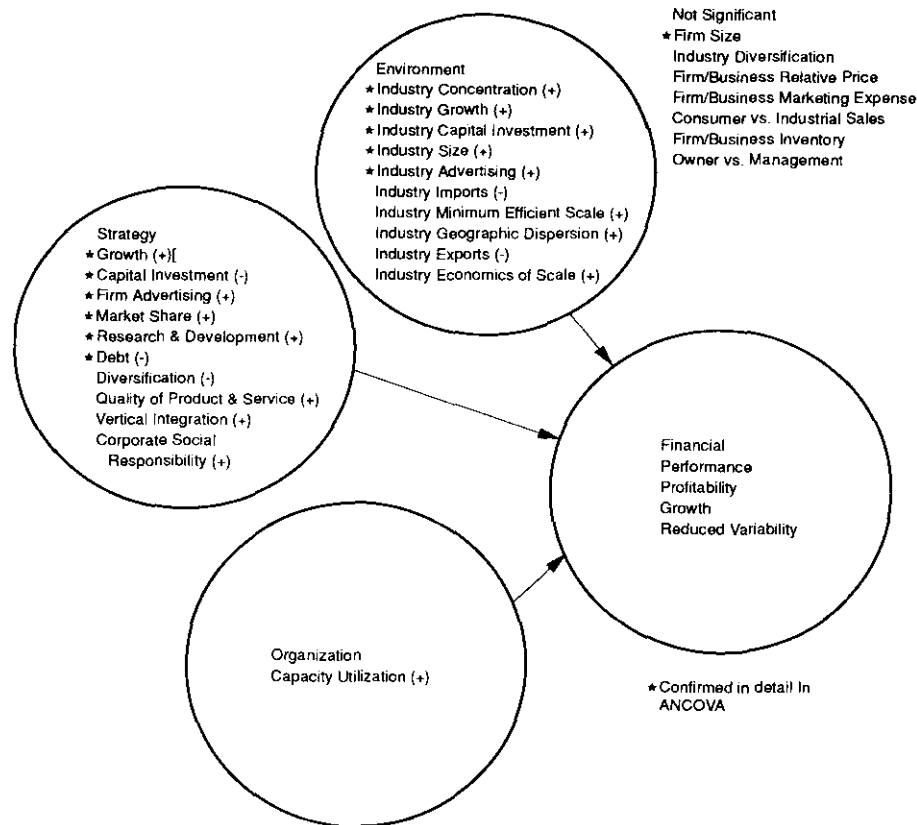


Fig. 17.5. Summary of the Capon, Farley & Hoenig meta-analysis of the determinants of financial performance.

A powerful source of strategic ideas is empirical generalization. These can be developed by either comparing and contrasting the findings of available empirical studies or by conducting a meta-analysis.

A recent meta-analysis of the determination of the financial performance of firms [Capon, Farley & Hoenig, 1990] resulted in the findings highlighted in Figure 17.5, and the following observations:

- High-growth situations are desirable; growth is consistently related to profits under a wide variety of circumstances.
- Having high market-share is helpful. Unfortunately, we do not have a clear picture of whether trying to gain market-share is a good idea, other things being equal.
- Bigness *per se* does not confer profitability.
- Dollars spent on R & D have an especially strong relationship to increased profitability. Investment in advertising is also worthwhile, especially in producer goods industries.
- High-quality products and services enhance performance; excessive debt can hurt performance; capital-investment decisions should be made with caution.
- We can learn from history – the lack of major changes in strength of relationships over time indicates that financial-performance history repeats itself.
- No simple prescription involving just one factor is likely to be effective. The results indicate that the determinants of financial performance involve many different factors. Furthermore, results hint at the presence of strong interactive effects among variables.

These and similar conclusions can serve as useful hypotheses in the generation of strategic options.

To date, a number of meta-analyses have been conducted on published research. The concept and advantages of meta-analysis should not be restricted to such studies; much leverage can be gained by applying the idea to the firm's own experiences.

4.2. Models for addressing specific strategy needs

Some specific strategy needs have drawn attention recently, involving such issues as the creation of a corporate and business vision and benchmarking, as well as some of the more established areas of strategy such as scenario planning and portfolio analysis and strategy.

4.2.1. Creating a corporate vision

With the increased recognition that a vision is a key to the establishment of corporate mission and objectives, the demand has increased for an appropriate approach to the determination of a vision. Figure 17.6 outlines such an approach. This approach is based on three phases:

- (1) Analysis of external environment, identifying the expected business environment and the changing nature of the firm's stakeholders. Given this analysis,

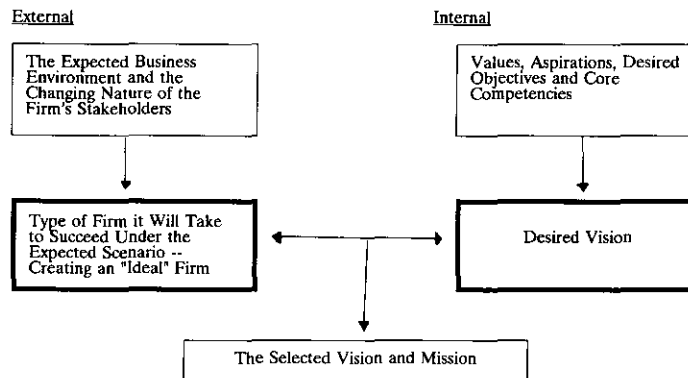


Fig. 17.6. A framework for selecting a vision and global business concept.

the focus is on the question, 'What type of firm could be successful under these expected conditions?' This would lead to the identification of characteristics of the 'ideal' firm.

- (2) Internal analysis of the firm – its values, aspirations, desired objectives and core competencies. Based on this analysis, it is possible to identify an initial vision for the firm.
- (3) A comparison and contrast of the 'ideal' firm resulting from the external analysis and the initial vision resulting from the internal analysis. The result of this comparison is a vision which satisfies the requirements of both the external and internal analyses.

A useful methodology for this problem, described in detail at the end of this section is the Analytic Hierarchy Process. As in most of the strategy applications of the AHP, this approach requires input from a group of executives in a structured brainstorming session. In this case, the group is typically the CEO and his or her executive committee. This procedure stimulates a broad discussion and evaluation of alternative visions. The evaluation should include both fit with internal competencies and aspirations, and appropriateness under the expected business environment.

Another major advantage, which is common to most AHP applications, is the building of consensus and 'buy-in' for the selected vision by the participants.

The weaknesses of this and most AHP applications is that the quality of the process and output depends on the composition of the group and the willingness of the top executives to engage in an open discussion. The analytical weakness of this approach is that the evaluations are typically made informally and at best either as a matrix of options by criteria or as an AHP hierarchy [Saaty, 1980].

4.2.2. Scenario planning

Scenario planning is a commonly used process in strategic planning, and it is increasingly employed in marketing planning as well.

Table 17.7
A framework for a marketing-driven scenario construction for a health-care product

Key success factors as related to key stakeholders	The key needs/objectives/behavior of the stakeholders under three scenarios		
	Status quo	Most optimistic	Most pessimistic
Physicians			
Managed care institution			
Third-party payors			
Government as payor			
Government as regulator			
Channels of distribution			
Media			
Patients			
Competitors			
Our firm			
Employees			
⋮			
Financial analysts			
⋮			

The critical component of scenario planning is the development of a number of expected scenarios – typically status quo, optimistic and pessimistic scenarios. An important marketing perspective in the development of the scenarios is the focus on the various stakeholders of the firm and their needs. Table 17.7 provides a framework for such an analysis in a strategic analysis in the health-care industry.

Scenario planning is based on two key steps: (a) identification of the relevant stakeholders that affect the firm, and (b) identification of their expected needs/objectives.

This analysis results in a profile of each of the expected scenarios. More formal analysis of the scenario can involve a forecast of each of the expected trends as they relate to the various stakeholders and key environmental forces (such as the economy, socio-political trends, etc.). This trend analysis can also be supplemented with a cross-impact analysis which focuses on the interdependencies among the trends.

Once the scenarios have been established, it is typically helpful to assess the likely occurrence of each scenario given such information.

The major advantage of this process is the focus on the stakeholders that can affect the business and their needs. This is an extension of the marketing concept from a narrow focus on consumers to a more appropriate emphasis on all relevant stakeholders (see Figure 17.2). The rest of the planning process can be directed at the development of either the best strategy for each of the scenarios, or the strategy that would be best assuming that any of the scenarios may occur. In the former case, the analysis is typically presented as a strategic plan under the most likely scenario and a series of contingency plans for each of the other likely scenarios.

The difficulty in implementing this approach is its dependency on information about the stakeholders' needs/objectives and their likely evolution under a pessimistic or optimistic scenario. Stakeholder surveys are helpful here and can be effectively supplemented by available secondary information and insights of various members of the firm who have regular contact with the various stakeholders.

For further discussion and illustration of this approach, see Shoemaker [1991].

4.2.3. Benchmarking

The increased interest in quality programs and the widely publicized success of the Xerox benchmarking initiatives [Kamp, 1989] have drawn attention to benchmarking as a strategic tool.

Figure 17.7 outlines design guidelines for a benchmarking system. The basic benchmarking process involves:

- (1) The selection of the factors for benchmarking. These should reflect the firm's key success factors.
- (2) The selection of a benchmarking target. Who do we want to compare ourselves to – best in industry vs. best in any industry and best in our country vs. best in the world?
- (3) The development of a measurement process and collection of data on the benchmark target and the firm's own operations and position.

Once the gap, if any, between the benchmark target and the firm has been established, there are three additional steps that have to be undertaken:

- (4) Analysis of the results and the development of a strategy that could lead to moving the firm's position closer to the position of the best in the class.
- (5) A link of the results to the reward and compensation system of the firm.
- (6) A link of the process to the ongoing data-collection and monitoring activities of the firm and incorporation as part of the DSS of the firm.

Many of the benchmarking applications undertake the first three steps without any rigorous process for the determination of the key success factors, the selection of target benchmark, and the development of the measurement instrument. Marketing-science models and processes could be used in all six phases.

The following marketing-science approaches could be used for each of the six steps:

Step 1. Selection of benchmarking factors. Key success factors can be identified using discriminant, regression, or logit analysis on the characteristics of successful vs. unsuccessful firms. This can be done using available cross-sectional databases such as PIMS or any other available data.

Step 2. Selection of benchmarking target. The firm should sample a broad universe of successful firms or develop models to identify firms similar to a target model ('ideal' firm).

Step 3. Development of a measurement process and data collection. Multi-dimensional scaling, clustering and related approaches used in positioning analysis can be employed in a benchmarking study.

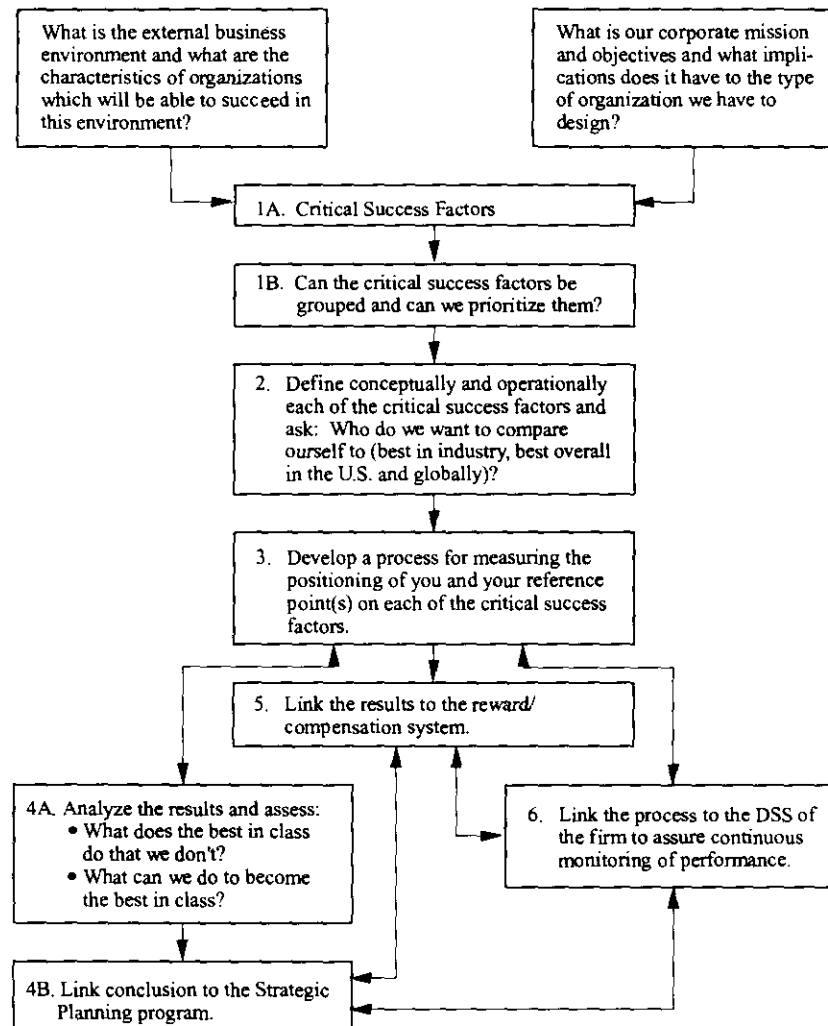


Fig. 17.7. Design guidelines for a benchmarking system.

Step 4. Generation and evaluation of strategies to close the gap between the firm and the benchmarking target. The approaches used for generating options and evaluating options can be employed in the benchmarking area as well.

Step 5. Link to the reward and compensation. Marketing-science models of compensation (see Chapter 13) can be extended to include activities leading to the accomplishment of the benchmarking targets.

Step 6. Link to the monitoring and data-collection activities and the DSS of the firm. This area can benefit from advances in marketing research, modeling and DSS development in general.

To date, only partial application of these models and approaches to the benchmarking area have been conducted. Resistance to employing the approaches has stemmed from the added cost and time these approaches require. Yet, the few (and unpublished) partial applications suggest that the benefit of a more rigorous process may be worth the added cost and effort.

4.2.4. Portfolio analysis and strategy

As illustrated in Figure 17.8, product portfolio models can be divided into four sets – standardized models, customized models, financial models and hybrid approaches. (For a detailed discussion of the models, see Wind, Mahajan & Swire [1983] and for a review see Lilien, Kotler & Moorthy [1992].)

Standardized models. These are useful ways of classifying a firm's products and businesses. The products and businesses are classified as in the GE/McKinsey matrix on their market-attractiveness and business strength. The two dimensions employed in these models are often a composite of a number of key attributes (attractiveness, for example, reflects size of market, growth rate, intensity of competition, etc.).

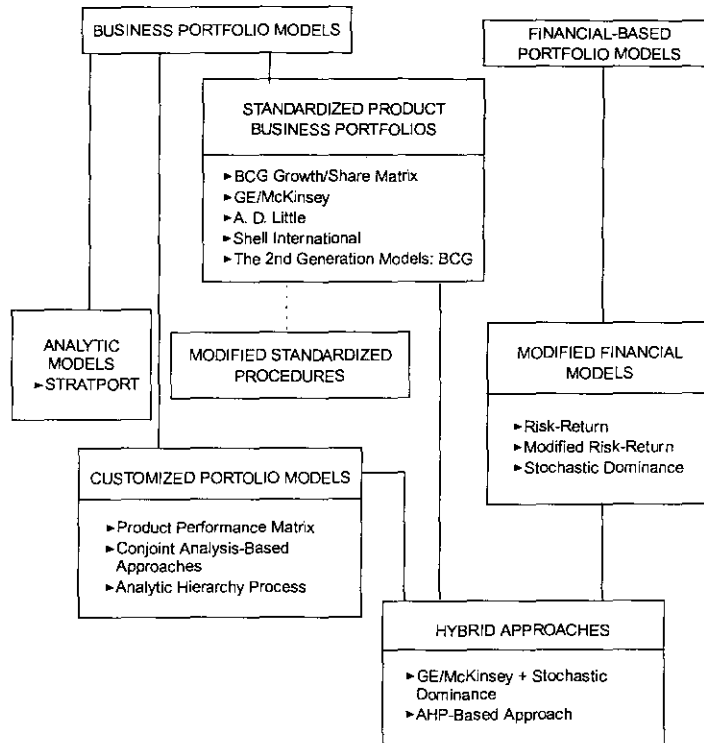


Fig. 17.8. A classification of product/business portfolio models.

Standardized portfolio models are the most commonly used portfolio models. Yet, these models, and especially the Boston Consulting Group's growth-share matrix, have a number of severe limitations. These include a focus on only two dimensions, lack of explicit consideration of risk factors, lack of dimensions weighting, neglect of any interdependency among the portfolio units, lack of rules for portfolio formation, questionable guidelines for resource allocation and, most critically, dependency of the results on the specific operational definitions used to measure the portfolio dimension.

Despite these limitations, the concept of a standardized model as a way of classifying a set of products and businesses on some relevant dimensions has value in making management think about business as a portfolio of businesses, product markets and segments.

Customized models. In contrast to the standardized-portfolio approaches, these do not prespecify dimensions or objectives. In customized approaches, including the product-performance matrix approach [Wind & Claycamp, 1976], conjoint analysis [Wind, 1982] and the analytic hierarchy process [Wind & Saaty, 1980], management chooses the specific dimensions.

The product-performance matrix is similar to the standardized models in its classification of products/businesses. However, in allocating resources, this approach is based on projected results in response to alternative marketing strategies.

The major advantage of conjoint analysis is that it allows management to determine the relative importance of the portfolio dimensions. On the basis of these part-worth utility functions together with data on product performance on the selected dimensions, a number of portfolios can be constructed leading to the selection of a portfolio with the highest utility [Wind, 1982].

The Analytic Hierarchy Process (AHP) can be used to allocate resources in a portfolio. With the AHP, management structures a problem hierarchically and then, through an associated measurement and decomposition process, determines the relative priorities of all entities at the lowest level of the hierarchy consistent with the overall objectives and vision. These priorities can then be used as guidelines in allocating resources among these entities – the portfolio entities (i.e. product/models or businesses) or portfolio options (i.e. concentrated vs. diversified portfolio, etc.). The AHP has been used in a number of portfolio analyses and strategy projects.

Financial portfolio models are discussed in Section 3.3.

Hybrid models. These combine characteristics of the three approaches. In the few applications of this approach, the process starts by classifying the products/businesses on the GM/McKinsey portfolio-type matrix. This analysis is augmented by a stochastic-dominance analysis of the expected return. This process centers on the AHP as the integrative model that allows management to incorporate all other relevant considerations in their evaluation of a target portfolio. An application of a hybrid model combining the GE/McKinsey and stochastic-dominance analysis is described in Mahajan & Wind [1985]. Most of the applications which

incorporate these two approaches with the AHP have not been published. Yet, the experience with these applications suggest that they offer better guidelines than any of the approaches by themselves.

4.3. Models that facilitate integration of 'hard' market data with management subjective judgments

The Analytic Hierarchy Process, mentioned earlier as a key approach to customized and hybrid portfolio analysis, is also a useful methodology for integrating hard data with management subjective judgment.

The AHP is an interactive structured process that brings together the key decision-makers who represent diverse functions and experiences. This group process allows the integration of 'objective' market data with subjective management judgment. The process is based on three steps:

(a) Structuring the problem hierarchically – an illustrative 'generic' hierarchy is included in Figure 17.9. The construction of the hierarchy encourages the generation of creative options and the identification of the criteria for their evaluation.

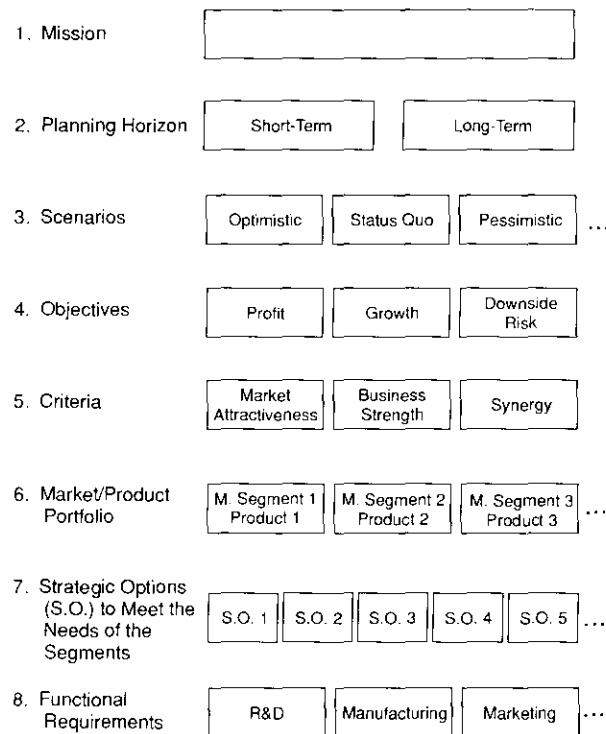


Fig. 17.9. Illustrative planning hierarchy.

(b) Evaluating the elements in each level against each of the elements in the next higher level of the hierarchy. The evaluation is made using a nine-point scale and is based on a series of paired comparisons.

(c) A weighting algorithm that determines the importance of any set of options on a set of multiple criteria/objectives. It is based on the idea that pairwise comparisons can be used to recover the relative weights (importance) of items or objects at any level of a hierarchy. Given, for example, n objects, A_1, \dots, A_n and a known vector of corresponding weights, $w = (w_1, \dots, w_n)$, we can then form a matrix of pairwise comparisons of weights:

$$A = \begin{matrix} & A_1 & \cdots & A_n \\ A_1 & \left[\begin{array}{ccc} \frac{w_1}{w_1} & \cdots & \frac{w_1}{w_n} \\ w_1 & \cdots & w_n \end{array} \right] & & \\ \vdots & & & & \\ A_n & \left[\begin{array}{ccc} \frac{w_n}{w_1} & \cdots & \frac{w_n}{w_n} \\ w_1 & \cdots & w_n \end{array} \right] & & \end{matrix}$$

We can recover the scale of weights, w_1, \dots, w_n by multiplying A on the right by w and solving the eigenvalue problem:

$$Aw = \lambda w. \quad (38)$$

Equation (38) has a non-trivial solution because $1 = n$ is the largest eigenvalue of A . This result follows because A has unit rank and, therefore, one and only one non-zero eigenvalue:

$$\sum_{i=1}^n \lambda_i = \text{trace}(A) = n, \quad \lambda_{\max} = n. \quad (39)$$

In application, w_i/w_j are not known, but must be estimated. Saaty [1990] suggests comparing objects via a 9-point scale, where 1 signifies two activities that contribute equally to the attainment of an objective and 9 represents one activity having the highest possible priority over another. The reciprocal of the rating is then entered in the transpose position of A . The solution to Equation (38), where $\lambda = \lambda_{\max}$, gives an estimate of the weights.

This process produces explicit guidelines for the selection of a strategy based on the prioritization of the strategic options. The resulting strategy satisfies the corporate mission and a set of multiple objectives under alternative environmental scenarios and time horizons.

Secondary output from the AHP includes explicit weights for the objectives/criteria used for evaluating the options. In addition, the system encourages and provides a simple way to conduct sensitivity analysis on the results. Through its computer software (Expert Choice), the process also helps identify areas requiring

the collection of additional information – those relationship on which no consensus can be reached and where the results can vary significantly depending on which of the conflicting points is accepted.

For more details on the development and use of the AHP, see (Saaty [1980, 1990]).

5. Examples of effective use of non-traditional marketing strategy models

In this section, we discuss two examples that illustrate the value of marketing models in enhancing specific marketing and business strategies. The examples include: (a) the application of the Analytic Hierarchy Process to the selection of a portfolio of market segments; and (b) the application of analogies, morphological approaches, and studies of success and failure to the design of a preemptive strategy.

5.1. Selection of a target portfolio of segments using the AHP

The problem. A leading pharmaceutical firm was concerned about the allocation of resources among its various segments. Discussions with management focused the problem on the need to select a target portfolio of segments.

The approach. The AHP was selected as the approach to solve the problem. The president of the division and all his direct reports comprised the decision-making group.

The modeling framework. The group reviewed the various studies they had on the attractiveness of the various market segments and their position in them, and structured the problem as a hierarchy which is illustrated in Figure 17.10. Following the structuring of the problem, the group started the evaluation of the components at each level against each of the items in the level above. The evaluation resulted in the priorities that are included in Figure 17.10. The most valuable part of the process was the discussion among the participants, which led to the identification of ‘hidden’ assumptions and beliefs, and to the resolution of a number of fundamental conflicts among the group members.

The results. The results summarized in Figure 17.10 indicate the following:

- The time horizon focuses primarily on the short term.
- The objectives are driven by: profit (39%), profit growth (34%), and sales growth (20%). Reducing downside risk is not considered very important (7%).
- Criteria: The three criteria for evaluating the segments were strength in segment, segment attractiveness and the synergy among the segments. Each of these was defined operationally as reflecting a number of measurable factors. Effectiveness, for example, included size of segment, growth of segment, and willingness to pay a premium price. The relative importance of these criteria in terms of the importance of the criteria to the achievement of the objective is strength (51%), attractiveness (28%), and synergy (21%).

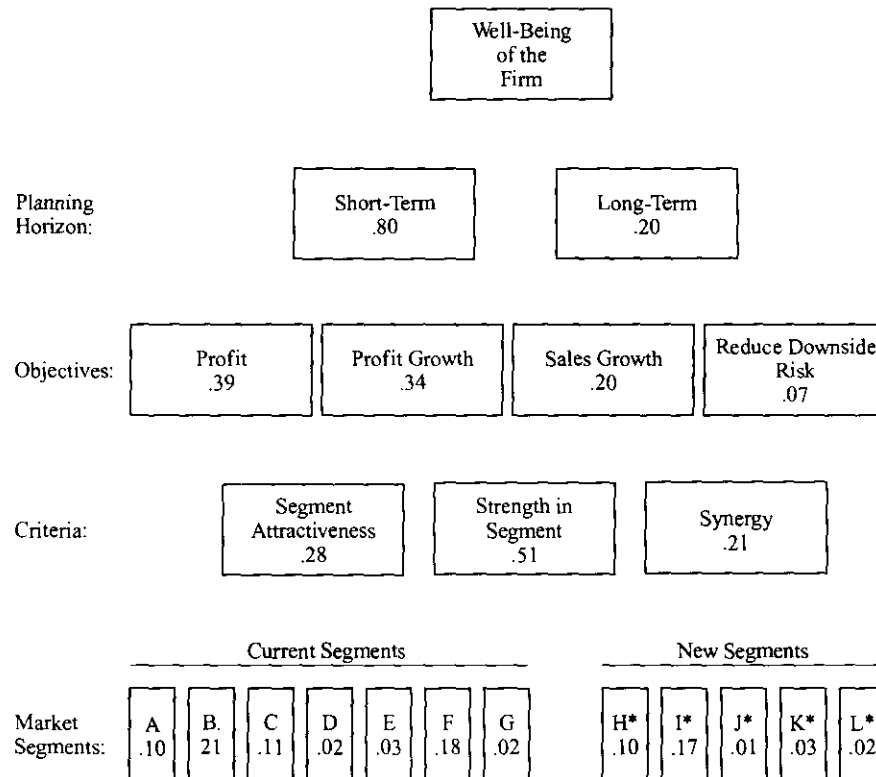


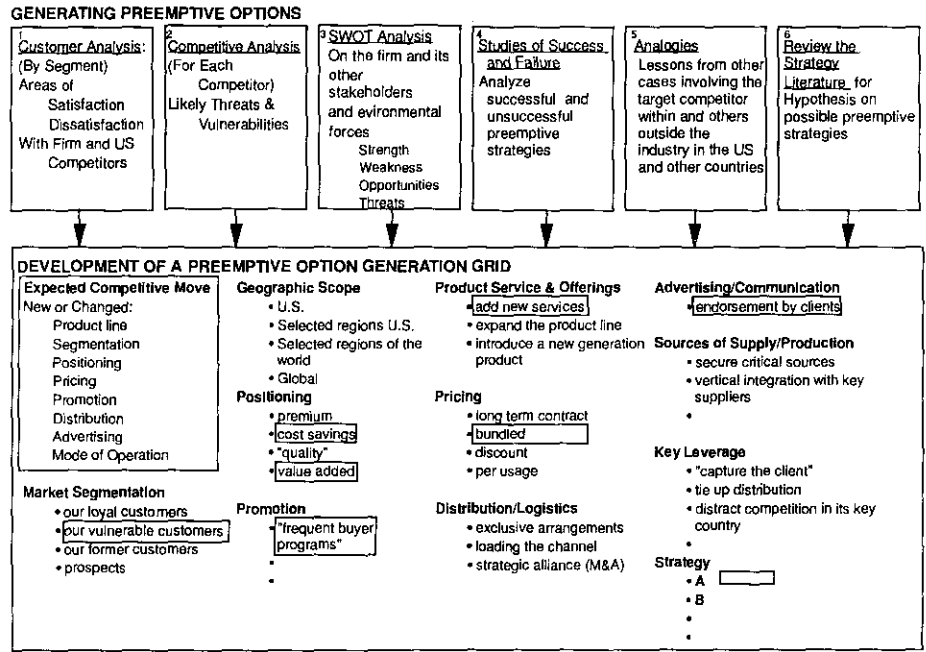
Fig. 17.10. Output of an analytic hierarchy process designed to select a portfolio of market segments for a pharmaceutical firm (note: the numbers are the composite priorities of each item).

– The segments: The initial portfolio of segments included the seven segments that the firm served. As part of the discussion, five new segments were identified. The evaluation of the segments on the criteria, reflecting the relative importance of the criteria in meeting the objective and, in turn, reflecting the importance of the objectives in achieving the mission of the firm in the short and long term, led to the selection of a new portfolio of segments including three of the original segments (A, B and F) and two new segments (H and I).

The process also led to the designation of a task force to explore how to increase the value of some of the less important segments, and to a major reallocation of resources: the original resource allocation was about 40% to segment and about 10% to each of the other six segments.

5.2. Generating a preemptive strategy using analogies, morphological approaches and studies of success vs. failures

The problem. A leading industrial firm was concerned about the likely impact of a competitors' entry into one of their major product markets, and wanted to develop a preemptive strategy.



The Likely Impact Our Preemptive Strategies Might Have on the Competitor's Ability to Achieve its Objective

The Preemptive Strategies	The Competitor's Objectives		
	1	2	3...
A			
B			
C			
•			
•			
•			

Evaluation of the Preemptive Strategies Action/Reaction Matrices

Expected Competitive Move				Preemptive Strategies		
				A	B	C...
Product	Segment	Positioning	Price			
A	Our Customer	A	Low			
B	Our Customer	B	Low			

A Dynamic AHP

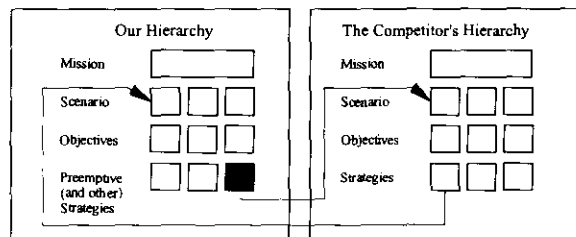


Fig. 17.11. Developing a preemptive strategy for a large industrial firm: the process and illustrative results.

The approach. The normal approach the firm used to generate strategy was typically the result of a brainstorming session of a few managers. Historically, this has led to unsatisfactory results. In exploring possible approaches, a game-theory model was proposed, but rejected by management as being too restrictive and not allowing the generation of truly innovative preemptive strategies. Given that the management team felt confident in their ability to evaluate options, but not in their ability to generate creative options, the firm developed a process utilizing a number of option generation and evaluation approaches. They assembled a team including the president of the division, all those reporting directly to him and a few experts, some experienced salespeople, former employees of the competitor, and an outside industry expert.

The modeling framework. All participants agreed to the process outlined in Figure 17.11 and a staff group undertook the initial analysis of the six approaches to the generation of preemptive strategy ideas.

The task force reviewed the results of the initial reports of the staff group and developed a preemptive option-generation grid. The grid summarized all the options identified in the various analyses and served as the basis for a morphological analysis in which specific options were developed based on combinations of options from the various categories.

Having completed the preemptive option-generation grid, the group developed three approaches to evaluate preemptive strategies.

First, they developed an action-reaction matrix in which each anticipated competitive move led to the identification of a possible set of preemptive strategies (based on a set of actions from the preemptive option-generation grid). Second, they developed an analysis in which each of the preemptive strategies was evaluated on its ability to affect competitors' objectives. Third, they developed a dynamic AHP with two hierarchies – one for the firm and one for the competitor – and evaluated each of the preemptive strategies on its impact on the competitor's hierarchy.

The process resulted in the generation of a number of preemptive strategies which are now being implemented. While it is too early to judge the market success of the process, management has been pleased with the process and plans to institutionalize it.

6. Strategy in the 21st century and implications for marketing strategy models

In previous sections, we have reviewed strategy models and have indicated both why their impact has been below expectations and which 'non-traditional' models have demonstrated value. Like new-product developments, model developments must be programmed for the environment in which they will be introduced. In the strategy area, that means looking ahead to the type of organization that will be successful in the next several decades, an organization we call the successful '21st century enterprise'.

Table 17.8
Toward a new marketing paradigm

From	To
1. Function	1. Philosophy
2. Separate function	2. Integrated with others
3. Product management	3. Market management
4. Mass market	4. Segmented market
5. Domestic focus	5. Global focus
6. Consumers	6. Stakeholders
7. Limited use of information technology	7. Expanded use of information-technology strategies
8. Limited scope of research and modeling and limited utilization	8. Expanded view of research and modeling and broader utilization
9. Limited learning	9. Focus on organizational learning
10. Traditional institutions	10. Innovative marketing institutions
11. Focus on transaction	11. Long-term relationship
12. Self-sufficiency bias	12. Co-marketing and other strategic alliances

We have been involved [Wind & West, 1991], with a continuous study among hundreds of top executives (mostly of US firms), trying to identify key characteristics of the successful '21st century enterprise'. The types of characteristics that emerge that are of most concern to us here are that those organizations will be (a) flatter, less hierarchical and cross-functional, (b) based on information and information technology as competitive advantage, (c) networked with a global perspective, (d) customer-driven with a focus on customer value and total quality, and (e) organized to incorporate all stakeholders in the strategic focus.

As a result of the emergence of these critical characteristics, we envision a new marketing paradigm. The characteristics of that paradigm are outlined in Table 17.8. That paradigm has critical implications for the development of marketing strategy models.

The paradigm broadens the scope of marketing from that of a function to a philosophy that drives all business decisions. It also establishes the strong cross-functional integration between marketing and the other management disciplines.

It further suggests that the focus of marketing should be on market management and not on the traditional brand/product management. This focus can be captured as a market-driven matrix organization of product by markets.

The domestic mass-market perspective is being replaced by a focus on market segments in a global-strategy context, and the traditional focus on the consumer is being augmented by considering the needs of all stakeholders (including employees, security analysts, regulators and the like).

The current emerging use of information-technology strategies will take a broader reliance on appropriate, shared IT as input to all decisions, as well as on IT-based marketing strategies drawing on deep knowledge of the customer and customer needs.

Table 17.9

The desired characteristics of marketing strategy models for the 21st-century enterprise

-
- | | |
|----|--|
| 1. | <i>Scope</i> |
| | • Permit <i>any</i> strategy issues to be addressed (at any level) while linking the strategy to higher-level strategies, objectives and mission, and assuring integration with other business functions. |
| 2. | <i>Geographic scope</i> |
| | • All relevant levels from the target segment to global considerations. |
| 3. | <i>Objective</i> |
| | • Multiple objectives ranging from problem definition, through the generation of creative options, evaluation of the options, and selection of a strategy, to help in implementing it. |
| 4. | <i>Input</i> |
| | • Incorporate 'hard' data on all relevant stakeholders (customer, prospects, competitors, distributors, suppliers, etc.), the outcome of formal market analysis, <i>and</i> management subjective judgments. |
| 5. | <i>Type of model</i> |
| | • Linked to the strategy process and as part of a DSS that includes an expert system, the model should have relevant dynamic and stochastic components and facilitate sensitivity analysis. |
| 6. | <i>Output</i> |
| | • Adds value to the strategy process by improving the quality and speeding up the strategy process and helping the unit create value. |
-

Changes in the needs of the various stakeholders, the globalization of the consumer and resource markets, and the dramatic advances in technology are likely to result in the creation of innovative marketing institutions and especially new media and distribution vehicles.

Finally, the traditional transaction focus is being replaced by an emphasis on long-term relationships and the realization that increasingly marketing and business services require the reliance on strategic alliances and other forms of co-marketing activities.

As a result of the expected changes in the characteristics of the 21st-century enterprise and the marketing paradigm, the desired characteristics of marketing strategy models must change quite dramatically from the characteristics of the models used most frequently today.

Table 17.9 outlines our view of desired characteristics of marketing strategy models. A comparison of this table against the characteristics of current models offered in Table 17.2 suggest that few of the marketing strategy models employed today measure up well. (The AHP appears to be an exception here.)

These desired models are broader, more flexible and more adaptive than most models in place today, mirroring the flexibility and adaptive nature of the 21st-century organization.

7. Conclusions

Despite the advances in the sophistication and proliferation of marketing-science models, relatively few true marketing strategy models have been developed, and

those that have been developed generally had limited impact on management. The gap between management needs (for models that help them generate, evaluate and implement better marketing strategies) and the available models (especially non-traditional) is narrowing. As the environment and the characteristics of successful businesses are changing, the nature of the marketing paradigm, and the nature of desired marketing strategy models (as outlined in Table 17.9) is changing as well.

Closing the gap between marketing strategy models (as developed by marketing scholars) and management needs, requires a research program that will affect both supply and demand.

On the *demand side*, our suggested research agenda includes:

- (1) Confirming management needs for strategy models. Are the desired model characteristics outlined in Table 17.9 consistent with the expectations of management? How should the 'market for strategy models' be segmented and what 'model' product best meets the needs of those segments?
- (2) Conducting empirical work on the determinants of 'successful' marketing strategy models vs. unsuccessful ones and on the determinants of successful implementation of marketing strategy models. The new-product-success literature [see, Lilien and Yoon, 1989, for a review] provides some guidelines.
- (3) Studying the adoption of marketing strategy models and their diffusion within the adopting firms. (The studies on the adoption and diffusion of conjoint analysis by Cattin & Wittink [1982] and Wittink & Cattin [1989] provide examples here.)

On the *supply side*, our suggested research agenda includes:

- (1) Development of models that both meet the criteria outlined in Table 17.9 and that can be used. These models should consider:
 - market response to the complete set of marketing-mix variables of the firm and their interactions;
 - interaction of marketing and other strategy variables (i.e. manufacturing, R & D, etc.);
 - incorporation, as needed, of analysis based on multiple products, segments, (geographical) markets, time periods, and objectives;
 - competitors' actions and reactions.
- (2) Studies among potential developers of marketing strategy models, on what can be done to stimulate the development of valid and applicable models.
- (3) Experiments with different approaches to stimulate the development of strategy models that meet the criteria outlined in Figure 17.11 including support for joint projects with industry, promotion of such models as research priorities of key research institutes and the like.

Undertaking such research could help capitalize on the potential that MS/OR can offer the marketing strategy modeling area. Such effort is likely to lead to the development and implementation of higher-quality and more relevant marketing strategy models. It will also require that MS/OR broaden its scope and its toolkit if it is to truly address real management problems.

To conclude, we have seen that there are many OR/MS models and tools that have been developed whose impact has been less significant than they might have been. Part of the reason for that lack of success has been the rather inflexible and limited scope of the models to date. As we better learn how to make our models broader, more flexible and adaptive, we will have models that more closely mirror the marketing strategy environment of current and future organizations.

There are many fine ideas and developments in the literature of OR/MS in marketing at the moment that can and should be modified and adapted to address the needs of marketing strategists. Our hope is that adoption of those developments and execution of portions of the research agenda we have outlined above will lead to both more realistic and more widely used marketing strategy models.

References

- Aaker, D.A. (1992). *Strategic Market Management, 3rd edition*. Wiley, New York.
- Abraham, M.M., and L.M. Lodish (1987). PROMOTER: An automated promotion evaluation system. *Marketing Sci.* 6(2), 101–123.
- Adams, L. (1972). *Conceptual Blockbusting*. The Portable Stanford, Stanford, CA.
- Amstutz, A.E. (1967). *Computer Simulation of Competitive Market Response*, MIT Press, Cambridge, MA.
- Anderson, C.R., and F.T. Paine (1978). PIMS: A reexamination. *Acad. Management Rev.* 3 (July), 602–612.
- Basu, A.K., R. Lal, V. Srinivasan and R. Staelin (1985). Salesforce compensation plans: An agency theoretic perspective. *Marketing Sci.* 4 (Fall), 267–291.
- Boulding, W. (1990). Commentary on 'unobservable effects and business performance: Do fixed effects matter?'. *Marketing Sci.* 9(1), 88–91.
- Burke Marketing Services (1984). Bases: Introduction, services, validation, history. Descriptive brochure, Burke Marketing Services, Cincinnati, OH.
- Burke, R., A. Rangaswamy, Y. Wind, and J. Eliashberg (1990). A knowledge-based system for advertising design. *Marketing Sci.* 9(3), 212–229.
- Buzzell, R.D. and B.T. Gale (1987). *The PIMS Principles*, The Free Press, New York.
- Buzzell, R.D. (1990). Commentary on 'unobservable effects and business performance'. *Marketing Sci.* 9(1), 86–87.
- Capon, N.J., J.U. Farely, and S. Hoenig (1990). Determinants of financial performance: A meta-analysis. *Management Sci.* 36(19), 1143–1159.
- Cardozo, R., and Y. Wind (1985). A risk return approach to product portfolio strategy. *Long Range Planning* 18(2), 77–85.
- Cattin, P., and D.R. Wittink (1982). Commercial use of conjoint analysis: A survey. *J. Marketing* 46, (Summer), 44–53.
- Chussil, J. (1984). PIMS: Fact or folklore – Our readers reply. *J. Business Strategy* (Spring), 90–96.
- Cohen, M., J. Eliashberg and T.H. Ho (1992). New product development: Performance, timing, and the marketing–manufacture interface, Working Paper, Wharton School, University of Pennsylvania, Philadelphia, PA.
- Cooper, R.G. (1988). *Winning at New Products*, Addison-Wesley, Reading, MA.
- Crawford, C.M. (1991). *New Products Management*, Irwin, Homewood, IL.
- Day, G.S. (1986). *Analysis for Strategic Market Decisions*, West Publishing Co., New York.
- Dunn, E., and Y. Wind (1987). Analytic hierarchy process for generation and evaluation of marketing mix strategies, in: G. Frazier and J. Sheth (eds.), *Contemporary Views on Marketing Practices*, Lexington Books, Lexington, MA, 111–131.
- Dyer, R.F. and E.H. Forman (1991). *An Analytic Approach to Marketing Decisions*, Prentice-Hall, Englewood Cliffs, NJ.

- Eastlack, J.O. and A.G. Rao (1986). Modelling response to advertising and price changes for 'V-8' Cocktail vegetable juice, *Marketing Sci.* 5(3), 245–259.
- Eliashberg, J. and A.P. Jeuland (1986). The impact of competitive entry in a developing market upon dynamic pricing strategies, *Marketing Sci.* 5 (Winter), 20–36.
- Eliashberg, J., and A. Manrai (1992). Optimal positioning of new product concepts: Some analytical implications and empirical results. *Eur. J. Oper. Res.* 63(3), 376–397.
- Eliashberg, J. and R. Steinberg (1987). Marketing–production decisions for an industrial channel of distribution, *Management Sci.* 33(8), 981–1000.
- Everett, (1968). Generalized Lagrange multiplier method for solving problems of optimum allocation of resources, *Oper. Res.* 11(3), 399–417.
- Forrester, J.W. (1961). *Industrial Dynamics*, MIT Press, Cambridge, MA.
- Green, P.E., J.D. Carroll, and S.M. Goldberg (1981). A general approach to product design optimization via conjoint analysis. *J. Marketing*, 45 (Summer), 17–37.
- Green, P.E., and A.M. Krieger (1985). Models and heuristics for product line selection. *Marketing Sci.* 4, 1–19.
- Green, P.E., and A.M. Krieger (1989). Recent contributions to optimal product positioning and buyer segmentation. *Eur. J. Oper. Res.* 41, 127–141.
- Hadar, J., and W.R. Russell (1971). Stochastic dominance and diversification. *J. Econom. Theory* 3(3), 288–305.
- Hillier, F.N. (1969). *The Evaluation of Risky Interrelated Investments*, North-Holland, Amsterdam.
- Horsky, D., and L.S. Simon (1983). Advertising and the diffusion of new products, *Marketing Sci.* 2(1), 1–17.
- Information Resources, Inc. (1985). Assessor-FT: The next generation, Descriptive Brochure, Information Resources, Chicago.
- Jacobson, R. (1990a). Unobservable effects and business performance, *Marketing Sci.* 9(1), 74–85.
- Jacobson, R. (1990b). Unobservable effects and business performance, Reply to the comments of Boulding and Buzzell. *Marketing Sci.* 9(1), 92–95.
- Kalwani, M.U., and D.G. Morrison (1977). A parsimonious description of the Hendry system. *Management Sci.* 23, 467–477.
- Kamp, R.C. (1989). *Benchmarking*, Quality Press, Milwaukee, WI.
- Kleindorfer, P., and J. Wind (1992). The strategic impact of marketing driven quality, ORSA/TIMS San Francisco Conference, November.
- Larréché, J.C., and V. Srinivasan (1981). STRATPORT: A decision support system for strategic planning. *J. Marketing* 45(4), 39–52.
- Larréché, J.C., and V. Srinivasan (1982). STRATPORT: A model for the evaluation and formulation of business portfolio strategies, *Management Sci.* 28, 979–1001.
- Lilien, G.L. (1979). Advisor 2: Modeling the marketing mix for industrial products, *Management Sci.* 25(2), 191–204.
- Lilien, G.L., P. Kotler, and K.S. Moorthy (1992). *Marketing Models*. Prentice-Hall, Englewood Cliffs, NJ.
- Lilien, G.L., and E. Yoon (1989). Determinants of new industrial product performance: A strategic re-examination of the empirical literature. *IEEE Trans. Engrg. Management* 36 (February), 3–10.
- Little, J.D.C. (1975). BRANDAID: A marketing mix model. Part I: Structure; Part II: Implementation. *Oper. Res.* 23, 628–673.
- Lorange, P. (1980). *Corporate Planning: An Executive Viewpoint*, Prentice-Hall, Englewood Cliffs, NJ.
- Lubatin, M., and M. Pitts (1983). PIMS: Fact or folklore, *J. Business Strategy* (Winter), 38–44.
- Lubatin, M., and M. Pitts (1985). PIMS: and the policy perspective. *J. Business Strategy* (Summer), 88–92.
- Mahajan, V., P.E. Green, and S.M. Goldberg (1982). A conjoint model for measuring self- and cross-price/demand relationships. *J. Marketing Res.* 19, 334–342.
- Mahajan, V., and Y. Wind (1985). Integrating financial portfolio analyses with product portfolio models. In H. Thomas and D. Garner (eds.). *Strategic Marketing and Management*, Wiley, New York, 193–212.
- Mahajan, V., and Y. Wind (1986). *Innovation Diffusion Models of New Product Acceptance*, Ballinger, Cambridge, MA.
- Markowitz, H. (1959). *Portfolio Selection*. Yale University Press, New Haven, CT.

- Monahan, G.E. (1984). A pure birth model of optimal advertising with word-of-mouth. *Marketing Sci.* 3(2), 169-178.
- Moorthy, K.S. (1984). Market segmentation, self-selection, and product line design. *Marketing Sci.* 3 (Fall), 288-305.
- Ramanujam, V., and N. Venkatraman (1984). An inventory and critique of strategy research using the PIMS data base. *Acad. Management Rev.* 9, 138-151.
- Rangan, V.K. (1987). The channel design decision: A model and an application. *Marketing Sci.* 6 (Spring), 156-174.
- Rangan, V.K., A.A. Zoltners and R.J. Becker (1986). The channel intermediary selection decision: A model and an application. *Management Sci.* 32(9), 1114-1122.
- Reality Technologies (1990). *Business Week's Business Advantage*, Business simulation software, Reality Technologies Philadelphia, PA.
- Rurnelt, R.P., and R. Wensley (1980). In search of the market share effect. Working Paper, University of California at Los Angeles.
- Saaty, T.L. (1980). *The Analytic Hierarchy Process*, McGraw-Hill, New York.
- Saaty, T.L. (1990). *The Analytic Hierarchy Process: Planning, Priority Setting Resource Allocation, 2nd edition*. RWS Publications, Pittsburg, PA.
- Shocker, A.D., and W.G. Hall (1986). Pre-test market models: A critical evaluation. *J. Product Innovation Management*.
- Shoemaker, P.J. (1991). When and how to use scenario planning. *J. Forecasting*, to appear.
- Silk, A.J., and G.L. Urban (1978). Pre-test market evaluation of new packaged goods: A model and measurement methodology. *J. Marketing Res.* 15, 171-191.
- Thurstone, L.L. (1927). A law of comparative judgment. *Psychol. Rev.* 34, 273-286.
- Urban, G.L., and J.R. Hauser (1980). *Design and Marketing of New Products*. Prentice-Hall, Englewood Cliffs, NJ.
- Wilson, D.R., and D.K. Smith, Jr. (1989). Advances and issues in new product introduction models, in W. Henry, M. Marasco and H. Takada (eds.), *New Product Development and Testing*. Lexington Books, Lexington, MA.
- Wind, Y. (1982). *Product Policy: Concepts, Methods and Applications*. Addison-Wesley, Reading, MA.
- Wind, Y. (1987). An AHP based approach to the design and evaluation of a marketing-driven business and corporate strategy. *Math. Modelling* 9(3-5), 285-291.
- Wind, Y. (1990). Positioning analysis and strategy, in G. Day, B. Weitz and R. Wensley (eds.), *The Interface of Marketing and Strategy*, JAI Press, Greenwich, CT.
- Wind, Y., and H. Claycamp (1976). Planning product line strategy: A matrix approach. *J. Marketing* 40 (January), 2-9.
- Wind, Y., and S.P. Douglas (1981). International portfolio analysis and strategy: The challenge of the 80's. *J. Intern. Business Studies* (Fall), 69-82.
- Wind, Y., S.P. Douglas, and P. LeMaire (1972). Selection of global target markets: A decision theoretic approach, in *Marketing in a Changing World: Their Role of Market Research*, Proceedings of the 24th ESOMAR Congress, Cannes, France.
- Wind, Y., and V. Mahajan (1981). Designing product business portfolios. *Harvard Business Rev.* 59(1), 155-165.
- Wind, Y., V. Mahajan and D.J. Swire (1983). An empirical comparison of standardized portfolio models. *J. Marketing* 47 (Spring), 89-99.
- Wind, Y., and T.S. Robertson (1983). Marketing strategy: New directions for theory and research. *J. Marketing* 47 (Spring), 12-25.
- Wind, Y., and T.L. Saaty (1980). Marketing applications of the analytic hierarchy process. *Management Sci.* 26, 641-658.
- Wind, Y., and A. West (1991). Reinventing the corporation. *Chief Executive* 71 (October), 72-75.
- Wittink, D.R., and P. Cattin (1989). Commercial use of conjoint analysis: An update. *J. Marketing* 53 (July), 91-96.
- Yellott, J.I., Jr. (1977). The relationship between Luce's choice axiom, Thurstone's theory of comparative judgment, and the double exponential distribution. *J. Math. Psychol.* 15, 109-144.
- Zoltners, A.A., and P. Sinha (1983). Sales territory alignment: A review and model. *Management Sci.* 29(11), 1237-1256.