Designing Product and Business Portfolios

by Yoram Wind and Vijay Mahajan

Harvard Business Review

No. 81112

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

HBR
JANUARY–FEBRUARY 1981

Designing Product and Business Portfolios

by Yoram Wind and Vijay Mahajan

As an outgrowth of the diversification trend in U.S. corporations, in which companies are expanding their product lines and entering new businesses, portfolio models have gained wider acceptance. General Electric is perhaps the best-known exponent of the portfolio approach. The models fall into two general categories—the standardized approaches, which usually concentrate on growth and share of market, and the tailor-made varieties, which offer more flexibility in the dimensions along which the products or business lines are measured. This article outlines seven steps to follow in evaluating an existing portfolio model or in designing an idiosyncratic approach.

In our complex business environment, companies big and small continually assess the compatibility of their strategy for each product or service—existing or planned—with the needs, resources, and objectives of the organization. Should we be in this business? Should we add a new business? How can we win and hold a substantial share of the market?

In seeking answers to such probing questions, many companies view product mix decisions as portfolio decisions. A company offers a variety of product lines, each requiring a certain investment and promising a certain return on that investment. In this view of operations, top management's role is to determine the products (or businesses) that will comprise the portfolio and to allot funds to them on some rational basis.

A number of product portfolio models have appeared over the past several years to assist management in this task. Examples are the growth/share matrix, the business profile matrix, the business assessment array, and the directional policy matrix. *Exhibit I* classifies these four models as well as five others that have also gained acceptance. Conceptually the models differ in three ways:

□ Whether the model offers a general prescriptive framework or a framework tailored to that particular company's needs and its top officers' preferences.
□ The dimensions used to construct the model.
□ The degree to which the model imposes rules for allocating resources among products.

Mr. Wind is professor of marketing and director of the Center for International Management Studies at the Wharton School, University of Pennsylvania. He is also editor of the Journal of Marketing. *Addison-Wesley will soon publish his latest book,* Product Policy: Concepts, Methods, and Strategy. *For HBR he has collaborated on an article on conjoint analysis, "New Way to Measure Consumers' Judgments" (July–August 1975). Mr. Mahajan is associate professor of marketing and director of the Center for Strategic Marketing Research at Wharton. He has written extensively on product diffusion and marketing strategy. In 1981 Addison-Wesley will also publish a book by the two authors on portfolio analysis and strategy.*

Copyright © 1980 by the President and Fellows of Harvard College. All rights reserved.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

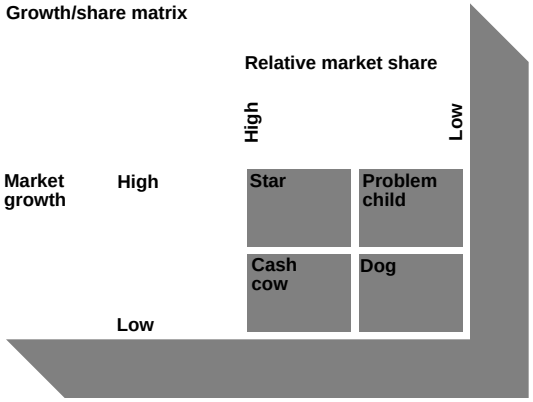
EXHIBIT I Selected Product Portfolio Models and Approaches

Product-based models

Standardized models

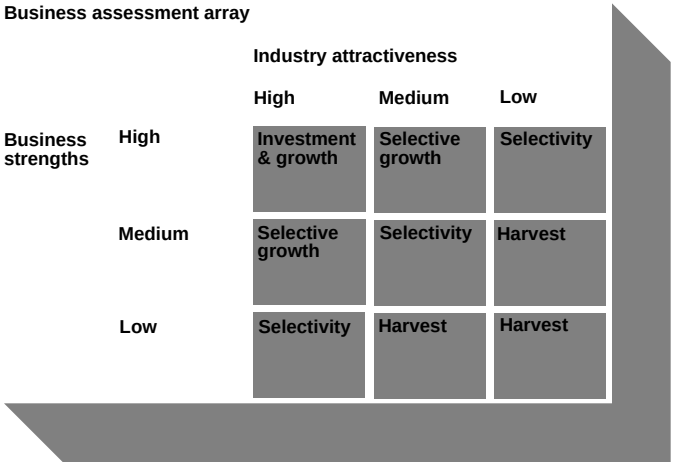
Univariate dimensions

Growth/share matrix

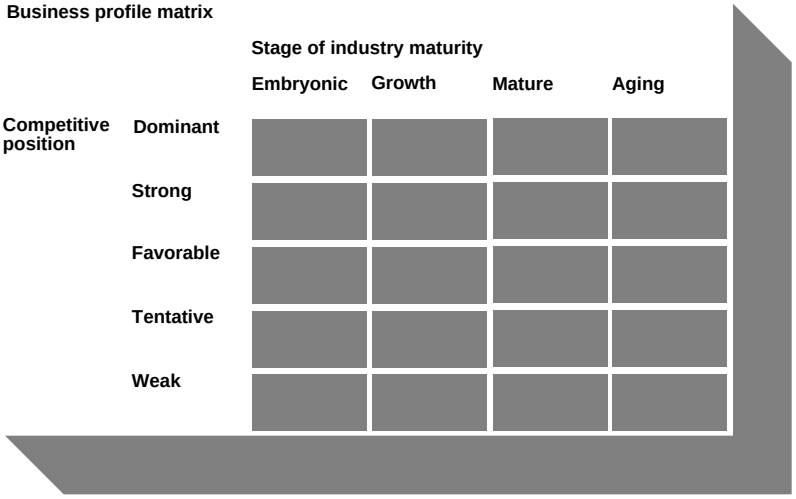


Composite dimensions

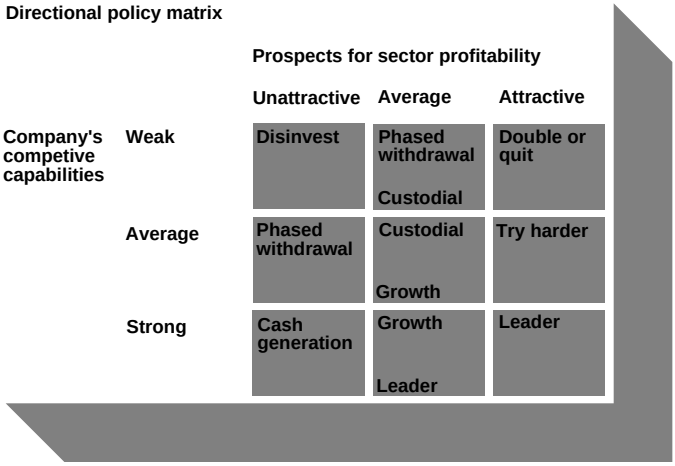
Business assessment array



Business profile matrix



Directional policy matrix



This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

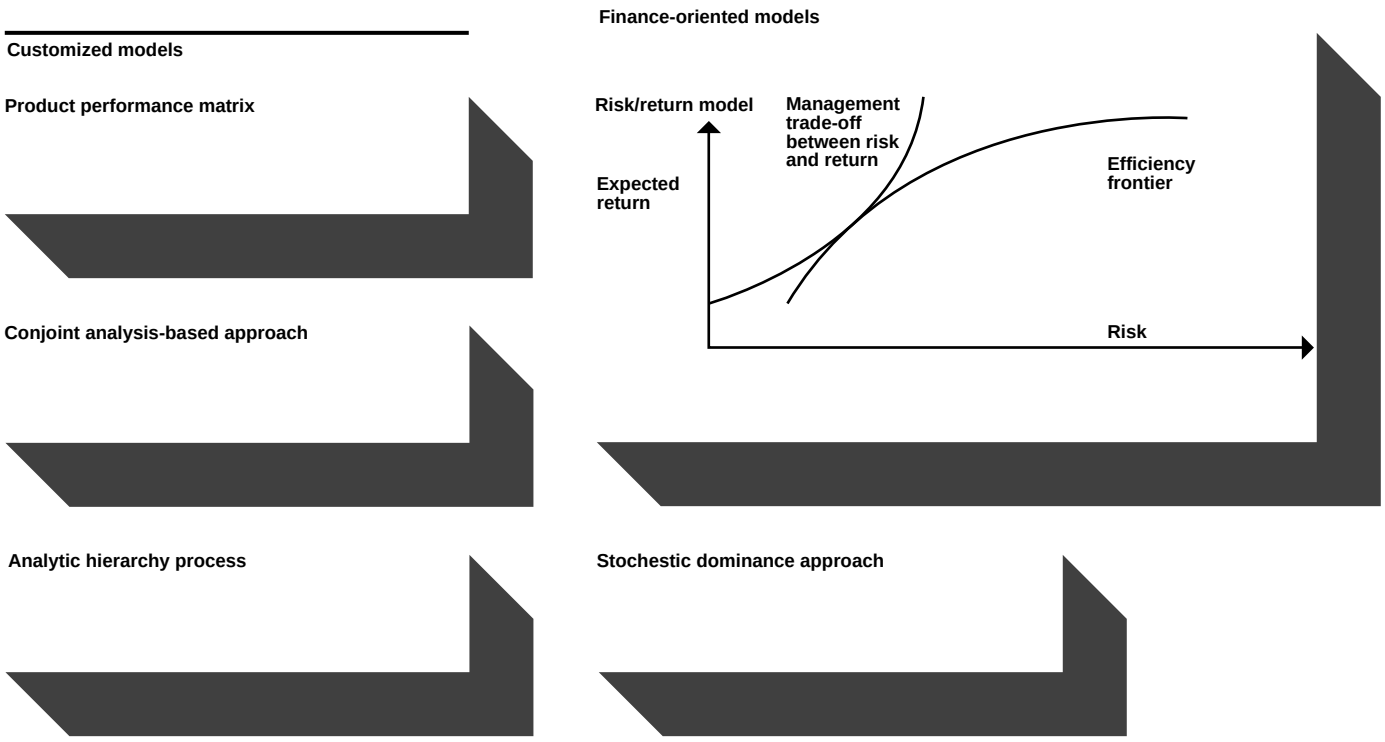


Exhibit II compares the nine illustrative portfolio approaches according to these three characteristics.

The question facing management is which approach, if any, to select. To the extent that the models yield the same results (strategic guidelines), the choice may not matter much. Recently, however, one of us compared three of these models and found that a set of products can be classified quite differently depending on the model adopted. And, more disturbing, product classification can also depend on the measures a model uses to construct the dimensions and evaluate the products.

The importance of the measurement aspect of portfolio analysis is evident even from a cursory examination of the diverse dimensions and definitions various approaches use. But surprisingly, most of the literature on portfolios has focused not on the fundamental issues of definition and measurement but on the selling of one approach or another and on the strategic implications of, for example, the "dog" or "cash cow" status of a certain product.

We contend that, in selecting a portfolio approach or evaluating a model already in place, management should pay more attention to the construction of the model and the likely sensitivity of the results (and hence the strategic conclusions) to the dimensions employed and their measures. The selection of the correct dimensions (and a careful evaluation of their measures) is a critical matter.

Framework for Design

Analysis of a product portfolio requires seven major steps:

1. Establishing the level and unit of analysis and determining what links connect them.
2. Identifying the relevant dimensions, including single-variable and composite.
3. Determining the relative importance of the dimensions.
4. To the extent that two or more dimensions are viewed as dominant, constructing a matrix based on them.
5. Locating the products or businesses on the relevant portfolio dimensions.
6. Projecting the likely position of each product or business on the dimensions if (a) no changes are expected in environmental conditions, competitive activities, or the company's strategies and if (b) changes *are* expected.
7. Selecting the desired position for each existing and new product (as a basis for developing alterna-

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

EXHIBIT II Key Characteristics of the Nine Portfolio Models

Growth/share matrix

Degree of adaptability	Dimensions
None; a rigid framework.	1. Relative market share (cash generation. 2. Market growth (cash use).
Allocation rules	**Comments**
1. Allocation of resources among the four categories (move cash to problem child). 2. Consideration for product deletion (e.g., dogs). 3. No explicit portfolio recommendations (as to the optimal mix of stars, cows, and dogs, etc.) except with respect to the balance of cash flows.	Widely used but conceptually questionable given the forcing of two dimensions, the unique operational definition, and lack of rules for determining a portfolio of dogs, stars, and so forth. No consideration of risk. No weighting of dimensions.

Business assessment array

Degree of adaptability	Dimensions
More flexible than growth/share matrix but limited to two composite dimensions.	1. Industry attractiveness 2. Business strengths. Each of the dimensions is a composite of a number of variables.
Allocation rules	**Comments**
In its basic use, it offers slightly greater precision than the growth/share matrix. (Nine versus four; better definition of dimensions.) In its more sophisticated uses (as by GE), classification of products on these two dimensions is used only as input to an explicit resource allocation model.	Forcing of two dimensions that might not be the appropriate ones. Empirical determination of the correlates of the two dimensions is superior to the growth/share matrix. Yet, given the tailoring of factors to each industry, comparability across industries is difficult. No consideration of risk.

Business profile matrix

Degree of adaptability	Dimensions
Same as business assessment array.	1. Competitive market position. 2. Industry maturity.
Allocation rules	**Comments**
Same as business assessment array.	Same as business assessment array.

Directional policy matrix

Degree of adaptability	Dimensions
Same as business assessment array.	1. Profitability of market segment. 2. Competitive position in the segment.
Allocation rules	**Comments**
Same as business assesment array.	Same as business assessment array.

tive strategies to close the gap between the current and new portfolios) and deciding how resources might best be allocated among these products.

Not present, the reader will notice, is the strategy recommendations step. Despite their attractiveness as a ready cure for any ailment, standardized guidelines such as "all-out push for share" and "hold position" are very dangerous. If a prescription ignores any relevant dimensions or the projected position of the business under alternative scenarios, it will be quite misleading. Portfolio analysis can be an effective vehicle for analyzing and evaluating strategic options only if it exploits management's creativity and imagination—instead of conforming to some general prescription.

Establishment of the Level & Unit

At what level of the organization should the analysis be conducted? Ideally, at all the strategic business levels. And at the lowest level it should include each product (by its positioning, if possible) by market segment. Such thoroughness, however, takes much management time and requires huge quantities of data.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

Product performance matrix

Degree of adaptability	Dimensions
Considerable; the specific dimensions are selected by management.	No general dimensions; International Harvester, for example, has used four dimensions: 1. Industry sales. 2. Product sales. 3. Market share. 4. Profitability. The data are calculated and analyzed by market segment.
Allocation rules	**Comments**
Same as growth/share matrix but based on *projected* results in response to alternative marketing strategies.	Applications are limited; offers the conceptual advantage of management-determined performance dimensions and allocation of resources based on projected rather than historical performance. No weighting of dimensions.

Conjoint analysis-based approach

Degree of adaptability	Dimensions
Fully adaptable to management needs.	No general dimensions; they and their relative importance are determined by management.
Allocation rules	**Comments**
Based on computer simulation which incorporates management utility functions and product performance data (supplemented by management judgment on the performance of current and new products and businessess). No optimal allocation is offered, but any portfolio can be evaluated on the basis of performance on all dimensions.	Limited applications; also time consuming. The approach is analogous to consumer choice of new products based on the relative importance of the key attributes and perception of the product's performance on these attributes.

Analytical hierarchy process

Degree of adaptability	Dimensions
Fully adaptable to management needs.	As with conjoint analysis, dimensions are determined by management.
Allocation rules	**Comments**
Optimal allocation among all items of the portfolio (e.g., products, market segments) is determined algorithmically.	Conceptually and mathematically very appealing, but not widely used. Allows management to evaluate strategic assumptions and allocate resources across products, market segments, and distribution networks under different scenarios. Weighting of dimensions considered.

Risk/return model

Degree of adaptability	Dimensions
Limited. It is a theory-derived model.	1. Expected return(mean). 2. Risk (variance).
Allocation rules	**Comments**
Determination of optimal portfolio.	Conceptually the most defensible yet difficult to make operational for the product-portfolio decision. Limited real-world applications.

Stochastic dominance

Degree of adaptability	Dimensions
Same as risk/return model.	The entire distribution of return.
Allocation rules	**Comments**
Same as risk/return.	Same as risk/return.

On the other hand, the aggregation of product-market segments may mean that they fall into a misleading "average" position in the portfolio, which, in turn, may cause inappropriate strategy designation. Consider the case of a manufacturer of (among other products) shampoo, shaving cream, bath soap, toothpaste, and other personal care items for which a single strategic business unit (SBU) is responsible. The company has constructed a growth/share matrix designating this SBU as a cash cow. Now, clearly this designation may be inappropriate for each line in the product mix and, further, for each item in the line. So aggregation may lead to erroneous positioning in the portfolio matrix as well as to poor resource allocation and strategy recommendations.

A hierarchical structure of portfolios would start at the level of the product line (or product group or division), proceed through the product mix of one SBU to the mix of several SBUs, and culminate at the corporate level, which would, of course, include all lower-level portfolios. This would permit evaluation of relevant strategies at the different levels of analysis and assist in designation and allocation of resources to SBUs and product lines. General

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

Electric has a five-level portfolio approach: product, product line, market segment, SBU, and business sector.

Whereas such a hierarchy represents a considerable improvement over a single portfolio for the entire company, the complexities of modern business, particularly with respect to competition among large corporations (increasingly on a global basis), suggest the need for development of a dual hierarchy—a domestic hierarchy plus a worldwide one. Furthermore, both hierarchies should be examined not only according to patterns of competition among brands and businesses but also according to potential cooperation. That is, the company should ask itself: Which companies or businesses should we consider as candidates for merger or acquisition?

Related to the analysis level is the desired extent of market segmentation and product positioning. Portfolio analysis should be undertaken first in every relevant market segment and product position, then at higher levels across the positionings of the various product-market segments, and finally—if the company is multinational—across countries and modes of entry (such as export, licensing, and joint ventures).

The issue here is: When does it become meaningful to divide the total market into segments? And when to divide the products into specific positionings? The answers become complicated when the market boundaries cannot be identified easily. The risk of aggregating market segments and product positionings is high. Detailed positioning/segment-level portfolio analysis is necessary for higher-level portfolio examination. Without it, the value of recommendations for corporate-level portfolios is questionable, especially when the units are heterogeneous with respect to their perceived positioning and intended market segments.

According to one authority, segmentation should be limited to grouping those buyers who share strategically relevant situational or behavioral characteristics. (In such cases the company must use different marketing mixes to serve the identified segments, which will result in different cost and price structures.) Other manifestations of a strategically important segment boundary are a discontinuity in growth rates, share patterns, distribution patterns, and so forth.[1]

The marketer must take into account consumers' perceptions, their preference for and usage of the various products, their desire for variety, their inventorying activity (for example, hoarding when they expect a price increase), and the multiperson nature of consumption in most households. Traditional approaches to portfolio analysis tend to ignore the consumer and concentrate on product performance. The two focuses of analysis are not alternatives but complementary diagnostic tools.

After adding the second dimension of investigation—markets—to its portfolio analysis, management should evaluate and then settle on the most attractive combination of products and markets. Identification of a product-market portfolio and subsequent selection of the target markets and products are consistent with the concept and findings of market segmentation, which suggest that the demand for any product varies by segment. Resource allocation decisions should not be limited, therefore, only to allocation among products; they should also take into account the trade-offs of investing in various market segments.

In cases where the distribution system figures importantly in the company's marketing mix, management can extend the analysis to include distribution as a third dimension. Of course, acquisition or development of new distribution outlets is often used to improve a company's portfolio.

As a rule, the portfolio should be constructed to include all major options management has for using its resources. The company, however, may not be organized in terms of resource allocation units. If it isn't, it should consider reorganizing so that resource allocation needs will match portfolio levels and units.

Identification of the Dimensions

The most common portfolio approach is based on the dimensions of market share and market growth. In contrast, the directional policy matrix is based on sector profitability and competitive position, while the product performance matrix allows selection of other dimensions as management deems appropriate.

The four standardized portfolio models rely on a matrix in which one axis represents the strength of the product or business in terms of market share or some broader characteristic while the other represents industry or market attractiveness. These models use two approaches to measure the axes: one relying on a single measurable criterion along each axis (for example, relative market share and market growth), the other using composite measures consisting of a number of objective and subjective factors to label each axis (for example, business strengths and industry attractiveness).

The factors defining the composite dimensions naturally vary among companies and even (though not often) among different businesses of the same company. Furthermore, the factors can change over time. In 1980 GE reduced its original 40 factors to 15.

1. See George S. Day, "Diagnosing the Product Portfolio," *Journal of Marketing*, April 1977, p. 29.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

Six of these factors define industry attractiveness—market size, growth, profitability, cyclicality, ability to recover from inflation, and world scope—while nine define business strengths. Business strengths, in turn, have two components: market position (domestic market share, world share, share growth, and share compared with the leading competing brand) and competitive strength, defined according to leadership in five respects (quality, technology, cost, marketing, and relative profitability).

The members of top management who select the portfolio dimensions naturally assume that they are choosing dimensions related to their corporate (and hence portfolio) objectives. Unfortunately, justification for this assumption is often unconvincing or hard to document.

Consider the market share dimension. Its inclusion in product portfolio models reflects the general acceptance of the relationship of share with competitive strength, with profitability, and with the market response function. Indeed, research for the PIMS (profit impact of market strategy) project, which examines the correlates of profitability in the modern corporation, found businesses with large market shares to be more profitable than those with small shares.[2]

This correlation is not perfect, however, and its causes are not completely understood. Is it due to the benefits of the learning curve, with respect to both product and marketing economies of scale for large-share businesses, or due to the fact that many large-share products compete on a nonprice basis and hence command higher margins and profits?

Moreover, studies of industries—for example, brewers and banks—have contradicted the positive relationship between share and profitability found by PIMS.[3] Also, a number of banks that reduced their unprofitable segments thereby boosted their profitability. Whatever the relationship between market share and profit, it is important to examine not only the relationship between share (and its measures) and profitability but also the relationship between a change in share (that is, investment in share) and a change in the resulting profitability.

The connection between market share and the product's market response function is even less understood. Supposedly, a dollar increase in the marketing effort for a low-share brand will yield a smaller return than that achieved by a dollar increase in the marketing effort for a large-share brand.

This supposed relationship, illustrated in *Exhibit III*, assumes that the low-share brand will have lower sales at zero incremental marketing effort, a lower saturation level, and probably also a less effective marketing effort (a gentler slope of the response function). Why? Because a larger-share brand can achieve greater economies of scale and because the advertising and other marketing efforts of well-known, high-share brands often spill over to benefit less-familiar brands.

If this relationship does exist, the marketer of a low-share brand must work harder to differentiate that brand. This relationship further suggests the importance of assessing the response elasticities of the company's various brands and, if it is not closely correlated with another portfolio dimension, adopting elasticity as one of the portfolio dimensions.

Operational definitions Before settling on an existing product portfolio model or designing a new one, management must define the dimensions selected. The importance of operational definitions for the chosen dimensions, both single-variable and composite, should not be underestimated. They could significantly alter results.

Single-variable dimensions: Take account of a relative share measure, such as the one employed in the growth/share matrix (the most notable example of measurement of single-variable dimensions), and then compare it with other possible share measures based on:

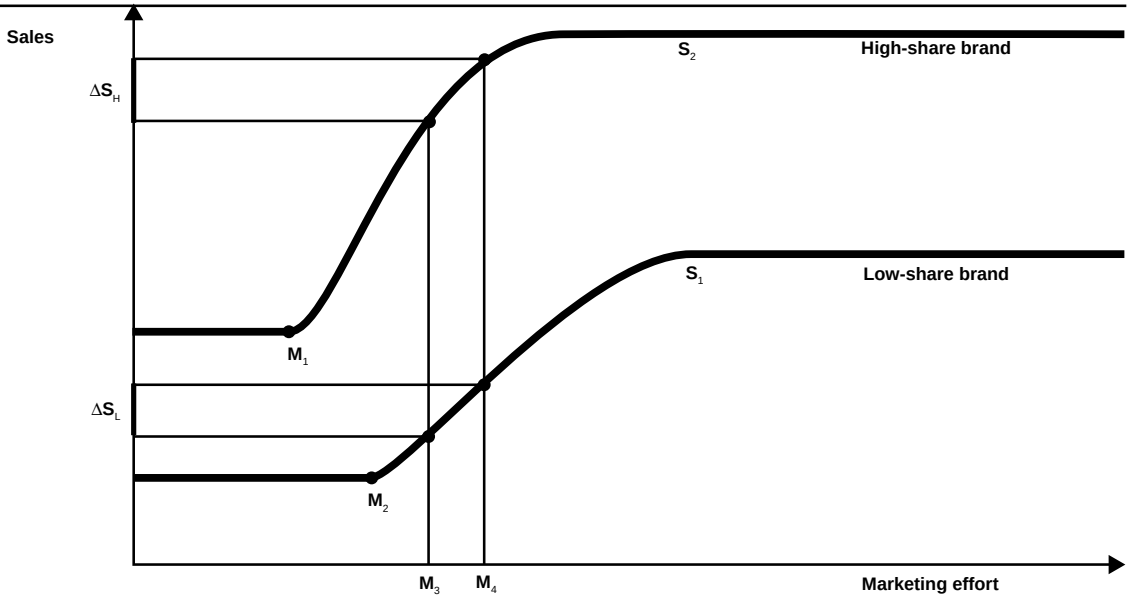
1. Different units of measurement, such as dollar sales, unit sales, units purchased, or users.
2. Product definition (product lines and brands in various sizes, forms, and positionings).
3. Definition of the served market that defines the competitive arena (competitors, customers, and .technology) within which the product is sold, including markets defined in terms of geography, channel, customer segment, or usage occasion.
4. The time horizon involved.
5. The nature of the denominator in the share calculation. Usually the definition of the denominator is based on either: (a) all the brands in the particular market, whether defined by the product category or preferably the perceived position of the brand; or (b) a selected number of brands—an option that includes all brands within a subcategory (like national brands), the leading competitor, or the leading two or three competitors. A third approach, less popular but conceptually more defensible, defines the denominator on the basis of all products serving the same consumer need or solving the same problem.

2. Sidney Schoeffler, Robert D. Buzzell, and Donald F. Heaney, "Impact of Strategic Planning on Profit Performance," HBR March–April 1974, p. 137.

3. Dan E. Schendel and G. Richard Patton, "A Simultaneous Equation Model of Corporate Strategy," *Management Science*, November 1978, p. 1611; and Jean-Claude Larréché, "On Limitations of Positive Market Share-Profitability Relationships: The Case of the French Banking Industry," *1980 Educators' Conference Proceedings* (Chicago: American Marketing Association, 1980), p. 209.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

EXHIBIT III Hypothesized Relationship Between Market Share and Market Response Function for Competing Brands



Threshold effect:
To start having any impact, the low-share brand needs M_2 effort compared with the lower level (M_1) required by the high-share brand.

Saturation level:
The low-share brand reaches a lower saturation level (S_1) compared with the high-share brand (S_2).

Effectiveness (slope):
The low-share brand receives a smaller increment of sales (ΔS_L) than that of the high-share brand (ΔS_H) for each one-unit increase in marketing effort (a move from M_3 to M_4).

Clearly a marketer must make some critical decisions before selecting a definition of market share. Similar complexity faces him with the definition of any dimension. Think of product sales, of which there are at least four measures: absolute level, rate of growth, level by industry or by product class, and industry or product class rate of growth.

Whatever measure is used, it is necessary to establish the relevant instrument in terms of units (such as dollar sales or unit sales), necessary adjustments (such as per capita sales), time (such as quarterly or annually), and data sources used (such as company shipments, wholesale and retail audits, or consumer diaries and reports).

Different yardsticks can, of course, produce different results. A pharmaceutical manufacturer found that sales generated by a promotion varied from success to failure depending on the data used—company shipments, physician panel, drugstore survey, and third-party payments. It is essential, therefore, that top management understand the selected measures and their properties.

Composite dimensions: Several portfolio models use composite dimensions to designate the matrix axes. The business assessment array, for example, labels one axis "business strengths" and the other "industry attractiveness." Each is a composite of a number of objective and subjective factors. The rationale is that the factors and their relative importance depend mainly on customer behavior, the nature of the product, the industry, the characteristics of the company, and the preference of its management.

Unlike the growth/share matrix approach, portfolio models using composite dimensions rely heavily on managerial judgment to identify the relevant factors and determine their relative importance. Identifying those factors requires assumptions about the relationships among them and how they will change over time. This process has the healthy result of nurturing strategic thinking, but unlike the growth/share matrix framework, it makes considerable demands on management's time.

Composite-dimension models have other limitations:

□ They may mask important differences among products. Suppose a manufacturer evaluates three products on a composite dimension (say, business strengths) consisting of two factors. The scale is 1 (low) to 10 (high). The results might be like those in *Exhibit IV*. Obviously the performance characteristics differ markedly. Yet on this particular composite dimension (assuming equal weight for the two factors) the products would be assigned identical positions in the portfolio matrix.

□ The subjective evaluation that is to an extent necessary raises questions as to who the respondents should be or how any discrepancy in their evaluations

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

EXHIBIT IV Two-Factor Rating of Three Products

	Market share rating	Product technology rating	Composite dimension score
Product A	9	1	10
Product B	1	9	10
Product C	5	5	10

should be treated. Should we seek consensus, as in a Delphi approach? Or would any lack of consensus suggest the need to weight the judges' views according to their expertise or importance? Should we even exclude the disputed factor from the analysis?

□ A weighting system that does not take into account close correlations among factors can produce a misleading product classification. This will hold true even if no weights are used to obtain the composite score. In this case, if the company employs five measures of sales and one measure of product technology to define business strengths, the relative weight of the two factors is not equal but 5 to 1.

□ If the weights of the factors that are combined to develop a composite measure are to be determined empirically, based on the historical relationships among the factors, the calculation imposes heavy data requirements because of the type of statistical analysis required—like multiple regression analysis (if a dependent variable can be identified) or factor analysis.

Determination of relative importance Most portfolio matrices, like the growth/share approach, assume equal weight for the dimensions. As we said, in composite dimensions the factors are often weighted, but rarely are differential weights placed on the two major dimensions that constitute the matrix.

In contrast, most customized portfolio models, the analytic hierarchy process (AHP) for one, allow for management's assessment of weights. Conjoint analysis has been used in the design of other customized portfolio models as a way of assessing weights assigned to the risk/return dimensions and other relevant dimensions.

To the extent that weighting calls for subjective evaluation, management must decide who the evaluators will be and how conflict among them will be resolved. These decisions cannot be left to staff members involved in the construction or implementation of the portfolio.

Construction of the portfolio matrix Portfolio models differ in the degree to which they offer a general, rigid, and normative framework or a flexible format reflecting the user's characteristics. The growth/share framework is the most rigid, followed by the risk/return model (which takes into account differences in managers' trade-offs between risk and return). Both the directional policy matrix and the product performance matrix are flexible—the former in the factors determining the dimensions and the latter in the number and definition of the dimensions.

The simplicity of a 2×2 or 3×3 matrix makes it very attractive. It is easy to communicate and it is typically accompanied by some generalized strategic guidelines. But it becomes simplistic and misleading if (a) it ignores major dimensions and the conditions under which the recommended strategy is most likely to be effective or if (b) the grouping of continuous variables, like market share or growth, into two or three categories leads to loss of pertinent information.

Limitations like these make portfolio models not in matrix form attractive. The AHP, the most recently developed model, uses a hierarchical structure and permits complete flexibility in selecting dimensions. The risk-return approach relies on generation of efficient frontiers graphically or mathematically.

Location in the Portfolio

In any portfolio analysis, the most time-consuming task is the collection of data on the products or other items in the portfolio and on their performance in terms of the selected dimensions. This evaluation requires hard data from company records (for instance, on sales and profitability) and from outside sources (for instance, market share, industry growth, and perceived positioning). And of course there is the key element of management's judgment.

Care should be given to collecting valid data. If the company uses consumer surveys, it should examine the projectability of the sample and the accuracy of the measurement instruments. Naturally, obtaining data and measures from several sources will help safeguard the reliability of the data.

Projection of the Product Position

In analysis of the positions of products in the portfolio, should the dimensions be measured only on the basis of historical data or should they also reflect projected positions? Most product portfolio models rely on historical data.

Measuring, say, the sales growth rate in terms of the historical growth rate in the past x years is satisfactory if that growth rate is expected to continue. If, however, the company anticipates deviation from it, the historical data should be supplemented with projected performance and, where possible, conditional forecasts. Such forecasts—also used in the product performance matrix approach—consist of, for example, a series of projections conditional on certain marketing activities.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

For Further Exploration

Readers interested in learning more about the methodological and technical underpinnings of the portfolio models and approaches discussed in this article are referred to the following published and unpublished material.

Growth/share matrix
Bruce D. Henderson, *Perspectives on the Product Portfolio* (Boston: Boston Consulting Group, 1970); and Bruce D. Henderson, *Henderson on Corporate Strategy* (Cambridge, Mass.: Abt Books, 1979).

Business assessment array
Stanley H. Hoch, "Strategic Management in General Electric," mimeographed, February 1980; and Michael G. Allen, "Diagramming G.E.'s Planning for What's WATT," in Robert J. Allio and Malcolm W. Pennington, editors, *Corporate Planning: Techniques and Applica-tions* (New York: AMACOM, 1979).

Business profile matrix
Robert V.L. Wright, "A System for Managing Diversity," in Stuart Henderson Britt and Harper W. Boyd Jr., editors, *Marketing Management and Administrative Action* (New York: McGraw-Hill, 1978).

Directional policy matrix
The Directional Policy Matrix: A New Aid to Corporate Planning (Royal Dutch Shell Company, 1975).

Product performance matrix
Yoram Wind and Henry Claycamp, "Planning Product Line Strategy: A Matrix Approach," *Journal of Marketing*, January 1976, p. 20.

Conjoint analysis-based approach
Yoram Wind, *Product Policy: Concepts, Methods, and Strategy* (Reading, Mass.: Addison-Wesley, forthcoming).

Analytic hierarchy process
Yoram Wind and Thomas Saaty, "Marketing Applications of the Analytic Hierarchy Process," *Management Science*, July 1980, p. 641.

Risk-return model
Yoram Wind, "Product Portfolio: A New Approach to the Product Mix Decision," in Ronald C. Curhan, editor, *Proceedings of the August 1974 American Marketing Association Conference*, p. 460; and Richard Cardozo and Yoram Wind, "Portfolio Analysis for Strategic Product-Market Planning," Wharton School working paper, 1980.

Stochastic dominance approach
Vijay Mahajan, Yoram Wind, and John Bradford, "Stochastic Dominance Rules for Product Portfolio Analysis," *Management Science*, special issue of TIMS Studies on Marketing Planning Models, Andy Zoltners, editor, forthcoming in 1981.

A corporation can also forecast performance for a number of environmental scenarios. The analysis should include at least three scenarios: (1) continuation of the current trend, (2) a scenario in which all environmental, market, and competitive conditions are favorable, and (3) a disaster scenario. Sensitivity analyses for both the short and long term can ascertain the sensitivity of results to these (and perhaps other) scenarios. General Electric, Monsanto, Shell Oil, and Atlantic Richfield, among other companies, use scenarios in strategy formulation.[4]

A variety of econometric forecasting procedures are in use for projecting the performance of existing products. Simulated test market is one of the new-product forecasting models available.

At this stage, management evaluates the projection procedure and the likely future scenarios. As evaluators, the executives should be asking such questions as: Do the assumptions of the approach make sense? Do the projections meet our expectations? As devil's advocates, they can help those designing the portfolio to make sense out of the approach and the projections.

Selection of the Desired Portfolio

It goes without saying that the most critical aspect in portfolio analysis is a decision on what changes, if any, are necessary. Unfortunately, most of the standard portfolio models do not offer explicit guidelines for establishing an optimal portfolio. For example, classifying certain products as dogs, problem children, cash cows, and stars does not help determine their optimal mix.

Obviously management wants many stars and no dogs. Yet in many cases the cash cows, not the stars, provide the funds necessary to fuel growth and yield profits. Furthermore, at times dogs may be essential as insurance against the risk of certain contingencies. A multinational may cherish its foreign dogs as hedges against currency fluctuations, likely government restrictions, or materials shortages.

The standardized portfolio models are useful primarily for analyzing the relationships among busi-

4. For a description of how GE uses environmental scenarios for this purpose, see Ian H. Wilson, "Reforming the Strategic Planning Process: Integration of Social and Business Needs," *Long Range Planning*, October 1974, p. 2.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

Not What They Seem . . .

"You see, this has got to be learned; there isn't any getting around it. A clear starlit night throws such heavy shadows that if you didn't know the shape of a shore perfectly you would claw away from every bunch of timber, because you would take the black shadow of it for a solid cape; and you see you would be getting scared to death every fifteen minutes by the watch. You would be fifty yards from shore all the time when you ought to be within fifty feet of it. You can't see a snag in one of those shadows, but you know exactly where it is, and the shape of the river tells you when you are coming to it. Then there's your pitch-dark night; the river is a very different shape on a pitch-dark night from what it is on a starlit night. All shores seem to be straight lines, then, and mighty dim ones, too; and you'd *run* them for straight lines only you know better."

From Mark Twain, *Life on the Mississippi* (New York: the New American Library), p. 58.

ness units and products. They do not offer answers to questions like: When should a cash cow be milked of its cash? When should a dog be disposed of? Which stars should be selected for investment and which de-emphasized? At the same time, by suggesting simple strategies such as "harvesting," the standard models may constrain management's motivation to try alternative solutions like repositioning products or developing new domestic or international market segments.

Furthermore, most of the current portfolio models, designed to accommodate existing product-market relationships, lack guidelines to deal with corporate directional changes. These models do not answer such questions as: How can we convert a problem child to a star? How can we find new stars? What characteristics should a new product line have to balance the company's portfolio?

Sometimes the way the portfolio model is constructed suggests an unwise change. Conceivably, for example, a low-market share business in a low-growth market may be very attractive in cash flow terms if it is also low in capital intensity. Since the growth/share matrix does not explicitly consider capital intensity, a dog may be inappropriately considered a candidate for divestment.[5] Similarly, a business identified as high in market attractiveness that also has a strong position in the business assessment array could produce a good ROI but not a good cash flow.

In shaping the portfolio, top officers should not leave the generation of strategy options to the staff. Often top managers prefer to position themselves as evaluators, but their involvement in the creative process is critical to the enterprise. The staff members who develop the portfolio should incorporate a resource allocation procedure to guide management in apportioning financial and material resources among the existing and new portfolio parts.

In a portfolio context there are two approaches to resource allocation:

□ General Electric's approach, which uses GE's business assessment array as a product classification device. The company combines information from this process with other data to build a resource allocation model.
□ The analytic hierarchy model, which includes a resource allotment algorithm in the portfolio model.

What Kind of Approach?

Since its emergence in the early 1970s, the portfolio technique—along with related concepts like the SBU and the experience curve—has become the framework for strategic planning in many diversified companies. Now the art has advanced enough to give a diversified company a variety of approaches when it is considering installing such a system or substituting one that evidently meets its needs better than the current portfolio.

Conceptually, we think, the tailor-made approaches are superior because they:

□ Permit inclusion of the conceptually desirable dimensions of risk and return, plus any other idiosyncratic elements viewed by management as important.
□ Stimulate creativity by forcing management's involvement in developing strategic options.
□ Help to gain an advantage over competitors, who are ignorant of the company's portfolio framework

5. See Derek F. Channon, "Commentary on Strategy Formulation," in Dan E. Schendel and Charles W. Hofer, eds., *Strategic Management* (Boston: Little, Brown, *1979).*

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.

and so cannot "read" it with the aim of anticipating the company's strategic moves.
□ Can offer explicit guidelines for resource allocation among the portfolio items.

But a tailor-made system costs more, mainly in data requirements and management time. Even if top management decides not to implement an idiosyncratic approach (based on a cost-benefit analysis), an evaluation of currently used portfolio models, using the seven steps we have described, should add to the value of the portfolio analysis and the quality of the strategies designed to build a new portfolio.

This document is authorized for use only by MASTERS UNION SCHOOL OF BUSINESS (eresource1@mastersunion.org). Copying or posting is an infringement of copyright. Please contact customerservice@harvardbusiness.org or 800-988-0886 for additional copies.