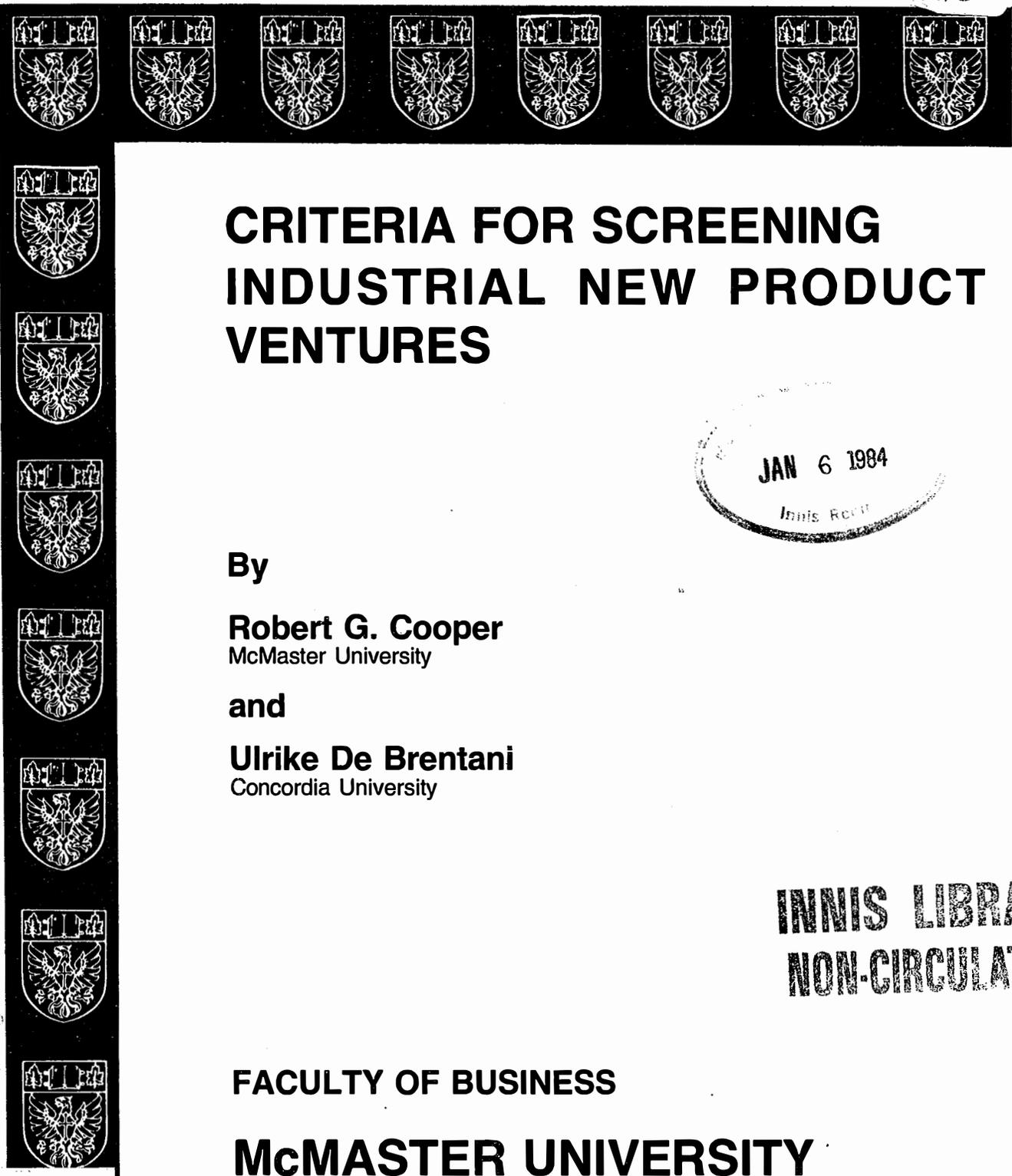
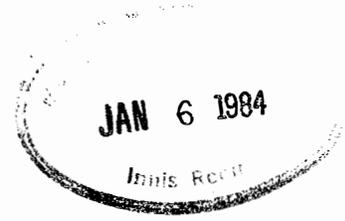


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# CRITERIA FOR SCREENING INDUSTRIAL NEW PRODUCT VENTURES



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INTRODUCTION

The screening of new product proposals is the first critical evaluation in the new product process. While many normative approaches have been proposed for screening new products, there is little evidence that these methods have seen widespread application, nor that the screening decision is undertaken in a proficient manner. A need exists, therefore, to probe how managers screen new products in order to gain a better insight into this vital decision area. The purpose of the research reported in this article was to identify the new product screening criteria used by managers, and to determine how these criteria are weighted and combined in order to yield a GO/NO GO decision.

New product screening is the initial decision to commit resources to a new product project. It is a critical decision, and also a difficult and complex one. At the screening stage, relatively little reliable information is available on the proposed product's market, its costs, and the nature of the investment required [1,13]. Screening then, for many projects, amounts to an investment decision, but made in the absence of concrete financial data [6]. The lack of data highlights the major conceptual and methodological differences faced in new product screening decisions versus traditional investment-and-return decisions [1].

A number of normative approaches to new product screening have been proposed. These include: portfolio models, based on linear, integer or dynamic programming; benefit contribution methods, such as check lists, scoring models, and paired comparisons; financial return models, both deterministic and probabilistic; and market research approaches [2,14]. But of all approaches, only benefit contribution, notably check lists and scoring

models is regularly used by managers [3,4]. Indeed, check list and scoring models are deemed most appropriate for screening, where only rough distinctions among projects are required [12].

The fact that few normative approaches see widespread application, together with the questionable predictive abilities of firms' screening decisions raises serious questions about the nature of the screening decision in firms. The research reported in this article was designed to probe managers' screening decision behavior and sought answers to the following questions:

- o What are the screening criteria or screening variables used by managers?
- o Can these be reduced to a subset of screening factors - a multi-dimensional representation of the screening decision?
- o What is the relative impact of these criteria or screening dimensions on the GO/NO GO decision?

#### THE RESEARCH

A two phase research study was designed. The objective of Phase 1 was to develop a comprehensive set of screening criteria that managers indicate they employ. Phase 2 focused on actual screening decisions and related the GO/KILL decisions made on actual new product projects to the ratings of these projects on the set of screening criteria.

##### Phase 1

Personal interviews were arranged with managers closest to the screening decision in a sample of 45 firms known to be active in new product development. Three separate approaches were used during the lengthy interview to elicit the set of screening criteria used by the managers:

- o attribute elicitation: where managers were directly asked to indicate what screening criteria they used.
- o modified repertory grid: respondents were asked to compare several recently screened proposals, and to indicate how each proposal differed from the others in terms of the reasons for the GO or KILL decision. By shifting the focus from screening criteria to actual

projects, a number of additional criteria were uncovered.

- o list completion: a comprehensive list of screening criteria, developed from the literature, was shown respondents. Respondents were asked to check off or add criteria that they used.

Content analysis yielded a list of 86 screening items.

## Phase 2

In phase 2, the sample was expanded to 63 industrial product firms and 243 managers in these companies, who were regularly involved in screening decisions and agreed to participate in the study. The unit of analysis became individual new product proposals: each manager was asked to identify two new product proposals, one an "accept", the other a "reject." Respondents rated the proposals on each of the 86 items identified in phase 1 using seven point Likert scales. A degree of project acceptability was also measured: minus five to plus five, "strong accept" to "strong reject". A total of 192 managers completed the questionnaires (response rate of 58.1%), yielding data on 370 projects.

## RESULTS: SCREENING DIMENSIONS

An analysis of the ratings of each of the 370 projects studies showed that many of the 86 screening criteria were strongly correlated with each other. Therefore factor analysis of the screening variables, as suggested by Schocker, Gensch and Simon [11], was undertaken (principal component analysis, varimax rotation). The appropriate number of factors was determined using the scree test which identified 9 and 11 factor solutions [5]. The eleven factor solution was chosen based on interpretability of factors. The factor solution was validated by calculating Cronbach alphas (internal consistency) for each of the 11 factors [9]; the results were positive, 's ranging from 0.46 to 0.90.

The eleven factors proved to be easily interpreted, featured strong variable loadings, and together explained 49.1% of the variance of the

original 86 variables. Table 1 presents these factors and the more important variable loadings.

Three of the screening factors capture the magnitude of the product opportunity: the product's expected advantage (F-1), its financial potential (F-5), and its probable life (F-6). The first, Product Differential Advantage (F-1), denotes the likely advantage the product will enjoy in the market, largely because of its innovativeness and technology. Products strong on this dimension were the first of their kind in the market, represented a revolutionary innovation, and were clearly differentiated from competitors' products. Moreover the product presented an opportunity for the firm to become a technological leader in the market, while the product itself had technological strength in the market.

The second product opportunity factor gauges the expected financial potential for the product (F-5). Product ideas rated high on this dimension had a high profit and sales growth potential, a large expected market share, a strong likelihood of success, and were aimed at high growth markets.

The final product opportunity factor, Product Life (F-9), describes the expected life and stability of the proposed product. If introduced, such products were not expected to change for a long time, and the product was thought to have a long life. Moreover the future development pattern for the product was clear and predictable.

Another three factors portray a second facet of the proposed product, namely its market opportunity. These are:

- o Size of Market (F-6): the market is a mass market, has high dollar volume, is broad geographically and has a large long term potential.
- o Rational Market (F-10): the customers use objective decision criteria, have a sound understanding of the product, and are commercial (versus institutional) customers.
- o Domestic Market (F-11): the market is a domestic one, and competition is primarily domestic.

Table 1

## Factor Analysis Results: Screening Dimensions

Factor Name	Variables Loading On Factor	Factor Loading
F1	First to introduce product to market	0.783
Product Differential Advantage	Opportunity to become technological leader in market	0.777
	A revolutionary innovation	0.724
(13.4%; $\alpha = 0.90$ )*	Clearly differentiated from competitors' products	0.703
	Achieves an important technological strength	0.690
	Makes the firm a major entity in the market	0.605
	Involves the application of a different technology to a problem	0.604
	(Not) similar to competitive offerings	-0.582
	Product is patentable	0.572
	Product is of higher quality than what is on the market	0.564
	Technologically delivered product - in house	0.564
	Requires considerable technological expertise	0.553
	Produces important savings for customer	0.528
F2	Uses firm's distribution and salesforce	0.827
Corporate Synergy	Fits firm's present business	0.771
	Aimed at firm's current customers	0.761
(10.4%; $\alpha = 0.89$ )	Uses firm's marketing research resources	0.737
	Fits the firm's organizational set-up	0.708
	Fits the firm's managerial capabilities	0.700
	Prospective competitors are known/understood	0.592
	Fits top management's preferences	0.571
	Fits into firm's corporate strategy	0.570
F3	Uses firm's engineering/design resources	0.716
Technological & Production Synergy	Fits production facilities	0.704
	Firm knows production methods	0.702
(4.5%; $\alpha = 0.79$ )	Product is comprised of current products or materials	0.584
F4	Outside funding is required	0.720
Project Financing	Major customer investment is required	0.681
	Complex financing is required	0.647
(3.7%; $\alpha = 0.69$ )		
F5 Financial Potential	Expected ROI/profit potential is high	0.673
	Expected sales growth is high	0.594
	Expected market growth is high	0.551
(3.3%; $\alpha = 0.80$ )	Expected market share is high	0.481
	Likelihood of success is high	0.480

.../cont'd.

Table 1 (Cont'd...)

Factor Name	Variables Loading On Factor	Factor Loading
F6 Size of Market (3.0%; $\alpha = 0.65$ )	Market is a mass market	0.666
	Dollar market potential is large	0.579
	Market is broad geographically	0.537
	Future market potential is high	0.495
	Product has variety of applications	0.475
	Aggressive competition	0.426
F7 Diversification Strategy (2.6%; $\alpha = 0.65$ )	A key to entering a new product class to firm	0.669
	Market has room for a new competitor	0.553
	A key to entering a new market to firm	0.552
	A key to entering a new technology to firm	0.482
F8 Market Maintenance Strategy (2.3%; $\alpha = 0.69$ )	A defensive (maintain share) product	0.657
	A survival strategy	0.632
	Replaces present products	0.518
	Represents a technological update/enhancement	0.467
F9 Product Life (2.0%; $\alpha = 0.49$ )	Product will not change for long time	0.649
	Future development pattern is clear and predicable	0.547
	Has long expected life	0.484
F10 Rational Market (2.0%; $\alpha = 0.46$ )	Customers use quantitative/objective decision criteria	0.559
	Competition is oligopolistic, not monopolistic	-0.481
	Customers understand product	0.452
	Customers are commercial as opposed to institutional users.	0.409
F11 Domestic Market (1.9%; $\alpha = 0.47$ )	Market is a domestic one	0.657
	Competition is domestic	0.558
	Serves need previously poorly satisfied	0.410

\* %'s indicate % of variance explained, prior to rotation, and add to 49.1%. The Cronbach  $\alpha$  is also indicated.

Three screening dimensions capture the fit or synergy of the project with the firm's existing resource base, and denote the ease with which the firm can undertake the project utilizing existing resources. The first synergy factor is Corporate Synergy (F-2): a good fit in terms of distribution channels and salesforce, business, customers, marketing research resources, organization, and management capabilities. The second dimension is Technological and Production Synergy (F-3): a fit in terms of production resources engineering and design skills, and in-house availability of component parts. The final dimension that describes the firm's ability to undertake the project is a financial one, Project Financing (F-4). This factor describes projects where outside funding is both required and available for the project; e.g., from customers or government agencies.

The final two screening dimensions uncovered in this analysis deal with product strategy. Both factors describe the role of the proposed product when viewed in the light of the firm's new product mission or overall new product strategy. They include:

- o Diversification (F-7): the product is the key to entering a new product class, a new market, or a new technology to the firm.
- o Market Maintenance (F-8): the product is important to defending a market, to surviving in the business, or replaces or updates a current company product.

These four major categories of screening dimensions, namely Magnitude of Product Opportunity, Market Opportunity, Synergy and Product Strategy, closely parallel screening dimensions suggested in the literature. For example, O'Meara's model speaks of Marketability, Durability, Productive Ability and Potential [10]. Similarly, the NewProd screening model, based on the analysis of actual successes and failures, identified three major categories: Marketability, Product/Company Fit, and Market Opportunity [6].

## IMPACT OF SCREENING DIMENSIONS

The 86 screening items elicited from managers were reduced to an 11 factor representation of the screening domain (above). The next question concerns the impact or relative importance of each of these dimensions to the GO/NO GO decision; that is, what factors are most important to the decision to move ahead with a project, and what are their relative weightings?

A generalized screening model - one which portrays the screening decisions for the average project - was developed by relating these 11 screening dimensions to actual screening decision outcomes. Two-group discriminant analysis was used to relate the outcome of the screening decision - GO or NO GO - to the project's factor scores on each of the 11 dimensions. Multiple regression was also used, where the criterion variable was the degree of acceptance or rejection of the project, a continuous variable.

The results of both analyses were virtually identical. A total of nine statistically significant factors were identified ( $\alpha \leq 0.01$  for the discriminant solution;  $\alpha \leq 0.05$  for the regression). The regression equation explained 56.4% of the variance in the degree of project acceptance, while the discriminant analysis correctly classified 86.2% of the cases (jackknife method of validation). Both solutions were strongly significant ( $\alpha \leq 0.0001$ ). Only results of the regression analysis are shown (Table 2).

### The Dominant Criteria

The most important single screening dimension, not surprisingly, is the Financial Potential (F-5). Products where the expected profit and sales growth, the market share expectation, the likelihood of success, and the market growth were all high were strongly favored in the initial GO/NO GO decision. Not only were these measures of market and financial performance strongly related to each other, but taken together, they were most influential in the decision to move ahead with a project. Quantifiable performance

Table 2  
 Regression Analysis Results: Degree of Acceptance/Rejection  
 Versus Screening Dimensions

	Screening Factor In Solution	Standardized Regression Coefficient	F Value	Significance of F
F5	Financial Potential	1.398	158.2	0.0001
F2	Corporate Synergy	1.285	134.2	0.0001
F3	Technological & Production Synergy	0.932	69.9	0.0001
F1	Product Differential Advantage	0.881	62.7	0.0001
F9	Product Life	0.576	26.7	0.0001
F8	Market Maintenance Strategy	0.425	14.6	0.0002
F6	Size of Market	0.384	12.0	0.0006
F7	Diversification Strategy	0.270	5.8	0.0161
F11	Domestic Market	0.223	4.1	0.0450

Adjusted  $R^2 = 0.564$ ; F of relationship = 54.3, significant at the 0.0001 level.

measures thus dominated the project evaluation, even at this early screening stage, and despite the limited reliability of such measures at this early stage.

The next two most critical screening criteria both describe synergy or fit. Corporate Synergy (F-2), where there existed a good fit in terms of distribution channels and salesforce, the firm's current business, the firm's customers, etc., is the more important dimension. Next in importance is Technological and Production Synergy (F-4): a fit in terms of engineering and design skills and resources, and production facilities and knowledge. The key role of these two synergy factors is strong evidence of management's desire to select projects which can make use of the firm's existing resources at marginal cost, and which exploit the firm's previous experiences and skills.

One more factor was found particularly important in the screening decision: Product Differential Advantage (F-1). Products that were first to market, promised a leadership position, were innovative, and had a technological edge were most often accepted at the screening stage. The fact that a differential advantage is a strong positive factor in the acceptance of a new product project is not surprising. Perhaps of greater concern is that management rates two synergy dimensions, both internal resource criteria, ahead of differential advantage, a proxie for potential success and payoffs.

These four dimensions dominated the screening decision, together accounting for 86.5% of the variance eventually explained by the regression model. To a large extent, therefore, criteria that describe financial potential, synergy and product differential advantage determine whether or not firms move ahead with a new product project.

#### Secondary Criteria

Another five screening factors were found related to project GO/NO GO decisions, but in a less dramatic way. Product Life (F-9) was positively

related to the GO decision. Products which were expected to remain unchanged, to have a long life, and to have a clear and predicable development pattern tended to be evaluated more positively in the screening decision. Management appears to be seeking projects where a predicable and long life are possible, to diminish uncertainty and to ensure a steady stream of future returns. Note that all three factors describing the product potential - Financial Potential (F-5), Product Differential Advantage (F-1) and Product Life (F-9) - were important criteria in the screening evaluation.

Both strategy criteria were tied to screening decisions and in a positive fashion. The market maintenance criterion is the more important of the two.

- o Projects which promised to maintain markets (F-8) - defend a market, survive in a business, or replace or update a current product - were more positively rated.
- o Projects which created opportunities for diversification (F-7) - a new product class to the firm, a new product or a new technology - fared better in screening.

Those dimensions that describe the nature of the marketplace, surprisingly had a moderate-to-low impact on the screening decision. None of these dimensions are among the dominant criteria. Moreover, the factors, Size of Market (F-6) and Domestic Market (F-11), entered the regression relationship as the seventh and ninth most important criteria. Projects tended to fare better at the screening evaluation when they scored high on:

- o Size of Market (F-6): a mass market, large dollar volume, large long term potential, and broad geographically; and
- o Domestic Market (F-11): a domestic market with domestic competition

Note, however, that certain market items - namely expected market share and market growth - were included in the dominant screening factor, Product Potential (F-5).

### Dimensions With No Impact

Only two of the 11 screening dimensions appear to have no consistent or significant influence on the screening decision. The result is surprising when one considers that the screening variables, hence dimensions, were in fact derived from what managers indicated they considered in their decisions. But actual decision behavior was not tied to two dimensions in a consistent fashion. The least significant factor was Project Financing (F-4). Although often mentioned by managers, it appears that whether a project requires and/or receives outside funding from government or customers has little bearing on whether the project moves ahead or not.

The second factor with little effect on screening outcomes was the Rational Market dimension (F-10). Whether potential customers are rational buyers or not, whether they understand the product, and whether industrial users versus institutional, had little effect on the GO/NO GO decision.

### IMPLICATIONS

Screening decisions appear to be dominated by four main considerations. Two of these describe the magnitude of the product opportunity itself, namely Financial Potential and Product Differential Advantage; the other two are synergy factors: Corporate Synergy and Technological Synergy. None portrays the nature of the market at which the new product is aimed.

These results are in part reassuring. The key criteria identified in this study of decision behavior parallel, to a certain extent, the criteria obtained from studies of actual product outcomes. Screening dimensions that emphasize synergy and differential advantage of the product were found important in the current research, and coincide with normative screening models and with studies on actual product outcomes:

Dominant Screening Criteria From  
This Research (Managerial  
Decision Behavior)

Factors Found Important To New Product  
Successes [6,7]

- 
1. Financial Potential.
  2. Corporate Synergy.
  3. Technological Synergy.
  4. Product Differential Advantage.

- 
1. Product Uniqueness and Superiority  
(Differential Advantage).
  2. Project/Company Resource  
Compatibility.
  3. Market Need, Growth and Size.
  4. Economic Advantage of the Product  
to the User.

The fact that these four criteria are so dominant - explaining the great majority of screening decisions - also raises provocative questions. First, the results suggest that many managers may oversimplify the screening decision by reducing it to a handful of evaluative criteria. That is, a comprehensive and complete set of criteria, as is suggested in the literature, appears lacking in this critical evaluation. Second, the fact that almost no market criteria are present in these dominant dimensions points to an unbalanced screening approach; perhaps there exists too much emphasis on internal issues, for example, synergy questions, and not sufficient consideration of external market considerations. One might speculate that managers are either not aware of the importance of market factors in project evaluation, or else are unable to assess market variables and to build these assessments into their screening decisions. In a similar vein, the product's differential advantage, of first importance in product success/failure studies was a lower priority item in managers' decisions. The relative emphasis placed by managers on screening criteria must be questioned. Third, the fact that the most critical criterion, namely Financial Potential (F-5), is comprised largely of financial, sales and market gauges raises concerns, particularly when one realizes that such quantifiable gauges are likely to be highly unreliable at the point of early screening. It could be that management is placing too much faith in traditional, simple, and quantifiable evaluative criteria when in fact such measures are of questionable reliability.

A surprising finding is the lack of impact of the factor, Project Financing. The importance of outside funding for projects - either from customers or government agencies - was often mentioned by managers during the phase 1 interviews. Yet an analysis of projects that passed versus failed screening shows no consistent pattern in terms of outside financing. In practice, whether a project requires or receives outside funding simply has little impact on the GO/NO GO decision. This finding has obvious implications to public policy, where the assumption in many countries is that corporations require government support of R&D projects. Our results suggest that such funding probably has little effect on the decision to move ahead with a project.

A final conclusion concerns the use of the current research findings as a guide to managerial practice. In the first place, a comprehensive list of screening items and dimensions has been identified in the research. Such a list provides a useful starting point for a manager in the development of his or her own firm's screening model. Second, a model based on the actual decision behavior of managers may indeed be useful as a normative guide to future decisions. Considerable evidence exists that supports the notion of replacing a manager with a model of his or her actual behavior [8]; and that an average model based on behavior is fairly close to an optimal decision model. If this is true, then the results of the current research can provide a useful guide to future screening decisions, both in terms of which items are important to consider, and the relative importance of these.

New product screening at best will remain a speculative decision. But effective screening is critical to the overall performance of a firm's new product program. Improved screening approaches and models, in part based on the findings of this research, have considerable potential to heighten the effectiveness of the screening decision.

REFERENCES

1. Albala, A. (1975), "Stage Approach for the Evaluation and Selection of R&D Projects," IEEE Transactions on Engineering Management, EM-22, 4, 153-164.
2. Baker, N.R. (1974), "R&D Project Selection Models: An Assessment," IEEE Transactions on Engineering Management, EM-21, 4, 165-171.
3. Baker, N.R. and James Freeland (1975), "Recent Advances in R&D Benefit Measurement and Project Selection Methods," Management Science, 21, 10, 1164-1175.
4. Bradbury, F.R., W.M. Gallagher and C.W. Suckling (1973), "Qualitative Aspects of the Evaluation and Control of R&D Projects," R&D Management, 3, 2, 49-57.
5. Cattell, R.B. (1966), "The Scree Test for the Number of Factors," Multivariate Behavioral Research, 1, 245-276.
6. Cooper, Robert G. (1981) "An Empirically Derived New Product Project Selection Model," IEEE Transactions on Engineering Management, EM-28, 3, 54-61.
7. Cooper, Robert G. (1979), "The Dimensions of New Industrial Product Success and Failure," Journal of Marketing, 43, 93-103.
8. Goldberg, L.R. (1970), "Man Versus Model of Man: A Rationale Plus Some Evidence for a Method of Improving Clinical Inferences," Psychological Bulletin, 73, 6, 422-432.
9. Horn, John L. (1969), "On the Internal Consistency Reliability of Factors," Multivariate Behavioral Research, 2, 115-125.
10. O'Meara, J.T. Jr. (1961), "Selecting Profitable Products," Harvard Business Review, January/February, 83-89.
11. Schocker, A.D., D. Gensch and L.S. Simon (1969), "Toward the Improvement of New Product Search and Screening," in 1969 Fall Conference Proceedings of the American Marketing Association, ed. by P.R. McDonald, 168-175.
12. Souder W.E. (1972), "A Scoring Methodology for Assessing the Suitability of Management Science Models," Management Science, 18; 10, B526-543.
13. Souder, W.E. (1978), "A System for using R&D Project Evaluation Methods," Research Management, 21, 55, September, 29-37.
14. Urban, G.L. and J.R. Hauser (1980), Design and Marketing of New Products, Englewood Cliffs, N.J.: Prentice-Hall Inc., Chapters 9 and 10.

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