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# Technological Innovation Studies Program

## Research Report

WHY NEW INDUSTRIAL PRODUCTS FAIL

by

Robert G. Cooper

Faculty of Management,  
McGill University.  
January, 1975

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WHY NEW INDUSTRIAL PRODUCTS FAIL

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## WHY NEW INDUSTRIAL PRODUCTS FAIL

### HIGHLIGHTS

This report outlines the results of a study into why new industrial products fail. The results are based on a postmortem review of 114 actual new product failures in 66 Canadian industrial goods firms.

The general reason for most new product failures was that expected sales never materialized. Other general reasons such as low profit margins, excessive development costs, and excessive investment, played a much smaller role in product failure.

A number of specific causes for poor sales performance were identified and quantified. Underestimating competitive strength, overestimating the number of potential users, and inappropriate pricing appeared to be the main causes of low sales. Several underlying dimensions which explained poor sales were identified. The majority of these dimensions involved a lack of understanding of the market-place: the customers, the competition, and the market environment.

In many cases, firms appeared to lack certain key resources which contributed to the product failure. Inadequate marketing research skills and inadequate general management abilities were the most damaging deficiencies. A number of activities were also reported to be poorly undertaken during the product development process; the most deficient activities being the market oriented ones. The results of the research point to the need for a greater market orientation among industrial goods firms. The report also suggests a number of implications for public policy, specifically in the area of IT&C product development assistance programs.

## ACKNOWLEDGMENTS

The author would like to thank the Department of Industry, Trade, and Commerce, Office of Science and Technology, Ottawa, for financially supporting this research project. Additionally, the author is grateful for the time and cooperation of the managers in the 66 firms which provided the data for the study.

## WHY NEW INDUSTRIAL PRODUCTS FAIL

The high incidence of new product failure is a problem which plagues many corporations.<sup>1</sup> Countless articles and books have prescribed approaches and remedies aimed at improving the success rate of product innovations.<sup>2</sup> However, the goal of reducing the risk of product development continues to be an elusive one for the majority of firms.

Perhaps the best place to begin improving one's product development efforts is to study one's past failures. The research reported in this paper focusses on why new industrial products fail -- the causes of failure and areas of weakness in the product development process. Previous research on this topic has suggested some general causes of product failure. An NICB study sought manager's opinions about the reasons for product failure in their own firms.<sup>3</sup> A variety of possible causes were identified, including inadequate market knowledge, technical defects in the product, bad timing, and poor marketing. However, these were subjective and general opinions, and were not based on a specific review of actual product failures. Konopa studied a sample of new products which had failed after passing the initial screen.<sup>4</sup> Here the sample size was quite limited, while the reasons cited tended to be fairly general ones. A recent study by Hlavacek investigated a sample of 21

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<sup>1</sup> See for example: Management of New Products (New York: Booz, Allen, and Hamilton, 1965). See also: J.T. O'Meara, Jr., "Selecting Profitable Products," Harvard Business Review (Jan.-Feb., 1961), p. 83.

<sup>2</sup> See for example: D.M. Phelps (ed.) Product Management: Selected Readings (1960-69) (Homewood, Ill.: Richard D. Irwin, 1970). See also: E.E. Scheuing New Product Management (Hinsdale, Ill.: Dryden Press, 1974).

<sup>3</sup> National Industrial Conference Board, "Why New Products Fail," The Conference Board Record (New York: NICB, 1964).

<sup>4</sup> L.J. Konopa, New Products: Assessing Commercial Potential, Management Bulletin #88 (New York: American Management Association, 1968).

ventures which had been terminated.<sup>5</sup> Among the more frequent reasons cited for termination were inadequate market size; distribution problems; internal conflicts, impatience and resistance; and bad marketing research.

In order to gain a more complete picture of new product failures, what was clearly needed was an in-depth study of a large and representative sample of actual product failures -- a postmortem study of products which failed after commercial introduction. The present research aims at reporting on such a review. Its purpose is to identify the general and the specific causes of industrial new product failure and their relative importances. A second purpose is to reveal areas of deficiencies within firms which most frequently lead to these failures.

#### The Conceptual Model

A conceptual scheme or preliminary structural model of new product failure was first developed (Figure 1). The purpose of the model was to suggest a set of useful categories of causes of failure in order to construct a detailed research questionnaire. The development of the model was based on information from previous research into product failure and from preliminary discussions with new product management.

In the conceptual model developed, the causes of product failure are initially divided into two broad categories: direct and indirect (Figure 1). Direct causes are defined as those which describe decisions, events and outcomes which are immediately linked to the product's failure: Indirect causes include those which tend to underlie or precede the direct causes -- that is, indirect causes describe the elements of the product development process which result in the decisions, events and outcomes considered to be the direct causes of failure.

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<sup>5</sup> J.K. Hlavecek, "Toward More Successful Venture Management," Journal of Marketing, vol. 38, no. 4 (October, 1974), pp. 56-60.

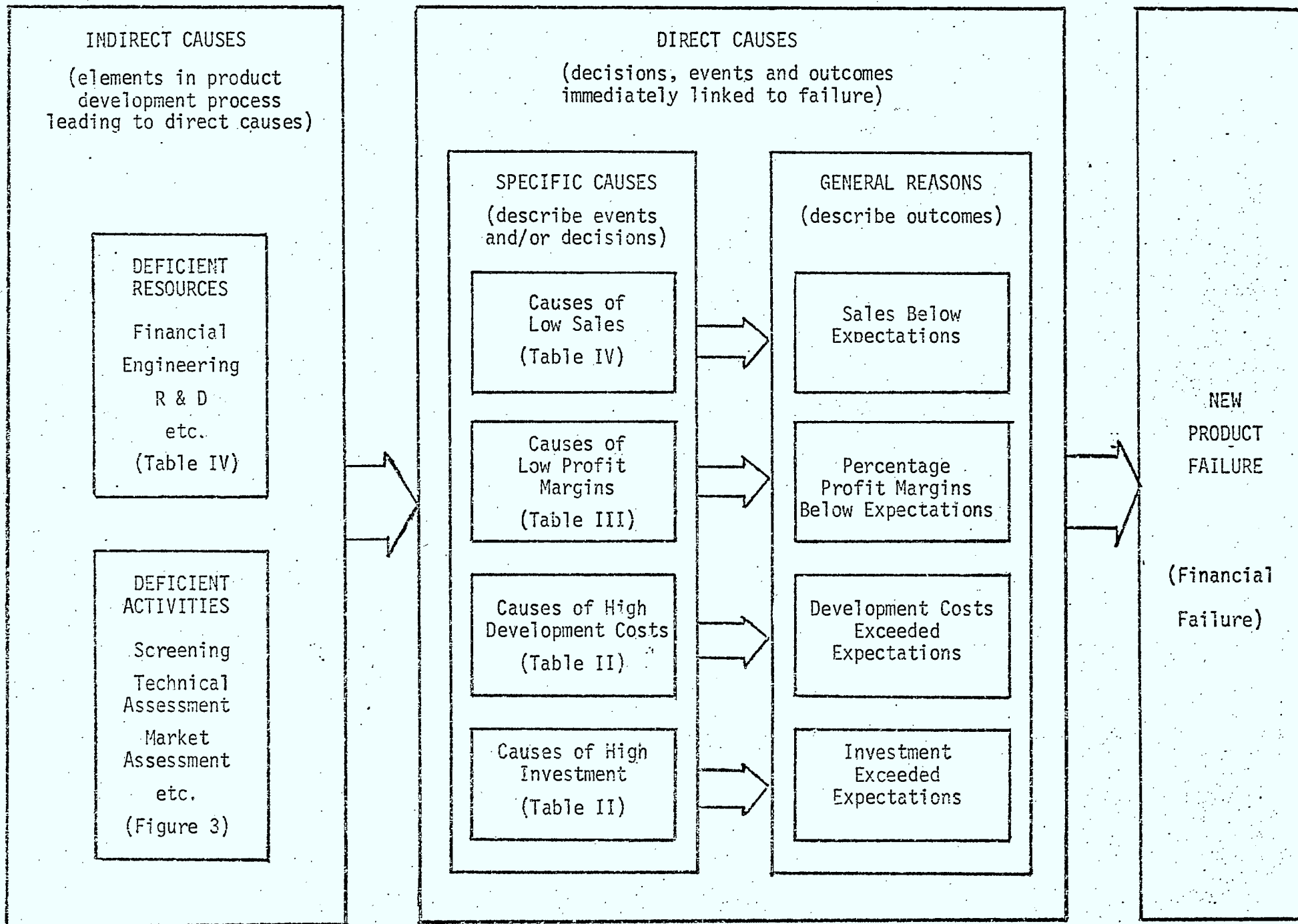


Figure 1. The conceptual model developed to investigate the causes of product failure.



The direct causes of failure are further subdivided into the general reasons for failure and specific causes (Figure 1). The direct and general reasons for failure are those which describe the outcomes of the product venture. Categories of these general reasons or venture outcomes are derived from a review of product success/failure criteria. In this research, a product failure was operationally defined as one which fell far short of profitability expectations. Various profitability measures suggest four general outcomes which would result in financial failure: low sales; low percentage profit margins; excessive development costs; and excessive investment. These four outcomes provide the categories of the direct and general reasons for failure (Figure 1), and are described in greater detail in Table I.

Within each of these general categories are a number of fairly specific and direct causes of product failure (Figure 1). These specific causes typically describe the decisions and/or events leading to the general outcomes listed in Table I. A knowledge of these specific causes -- for example, what event or decision actually led to the outcome, low sales -- provides a more complete picture of the failure, and is a vital concern of the present research.

Additionally, there may be a number of underlying or indirect causes of failure -- causes which are not immediately linked to the failure, but still have an important bearing on the outcome of the venture. These indirect causes are defined to include elements of the product development process which might adversely affect the decisions, events, and outcomes of the venture. Two such elements include the activities which are undertaken during the product development process, and the resources the firm has available to carry out the venture. Both types of indirect causes of failure -- deficient activities and inadequate resources -- are considered in the model of Figure 1.

The conceptual model outlined in Figure 1 summarizes the various categories of causes of failure and the relationships among these causes. Each category is discussed in greater detail below, and a listing of possible causes in each is developed.

#### Direct Causes of Failure

The direct and general reasons for failure describe outcomes of the venture and are outlined in Table I. Each of these general reasons may be attributable to one or more specific causes, which describe the events and/or decisions leading to the particular outcome. Developing a listing of specific causes to explain why development costs or investment might exceed expectations was straightforward (Table II). The same was true for failure to achieve expected gross profit margins: here either the eventual selling price of the product is lower than expected, or the direct costs (for example, labor and material) are greater than expected. A list of specific and direct causes whose result is low profit margins was evolved, and is shown in Table III.

TABLE I  
GENERAL REASONS OR CATEGORIES  
FOR NEW PRODUCT FAILURE

Sales were below expectations.

Gross profit margins were lower than expected.

Development costs exceeded expectations.

Investment in plant and facilities were higher than expected.

TABLE II  
POSSIBLE CAUSES OF EXCESSIVE  
INVESTMENT AND DEVELOPMENT COSTS

We underestimated the difficulties we would have in developing the product.

The product concept changed during development, necessitating much more development work.

Our dollar estimates for production facilities were far too low.

The way we thought we'd produce (or manufacture) the product changed, necessitating a more costly production investment.

TABLE III  
POSSIBLE CAUSES OF LOW  
PROFIT MARGINS

The price we originally expected was overly optimistic, and we were forced to drop our price.

Competitive products were introduced at lower prices, which forced us to drop our price.

Our materials, labor, or production costs were greater than expected.

Our selling, distribution or promotion costs were greater than expected.

Our volume was lower than expected, resulting in a higher per unit cost.

Products where sales fell short of expectations proved to be more difficult to diagnose. Clearly, the sales a new product achieves are a function of a number of variables, any one of which might lead to a product failure (Figure 2). The degree of need for the product and the number of potential customers who might use the product are determinants of the potential market. The share of this potential market the product achieves depends on the marketing mix -- the offering itself (product and price) as well as the supporting elements of the marketing mix (selling, promotion, distribution). Timing of the product introduction is another important facet of the marketing mix. The share of market and hence the sales achieved also depend on the competitive situation -- competitors' strengths and strategies. Finally, other environment considerations, such as government action, may affect the sales of a product.

These variables which help determine the sales of a new product and its eventual success or failure are summarized in Figure 2. The model of Figure 2 provides a useful framework for developing a comprehensive list of specific and direct causes which result in low sales for the new product (Table IV).

To summarize, four categories of general but direct reasons for product failure were derived from a review of profitability measures. Each general reason was subdivided further to obtain a list of direct and specific causes. The complete lists of direct causes of failure are shown in Tables I through IV.

#### Indirect Causes of Failure

The indirect causes of failure are those which describe elements of the product development process which precede the direct causes (Figure 1).

Indirect causes are subdivided into two categories:

- (a) deficiencies in the activities involved in the new product development process;
- (b) the lack of needed resources to undertake the venture.

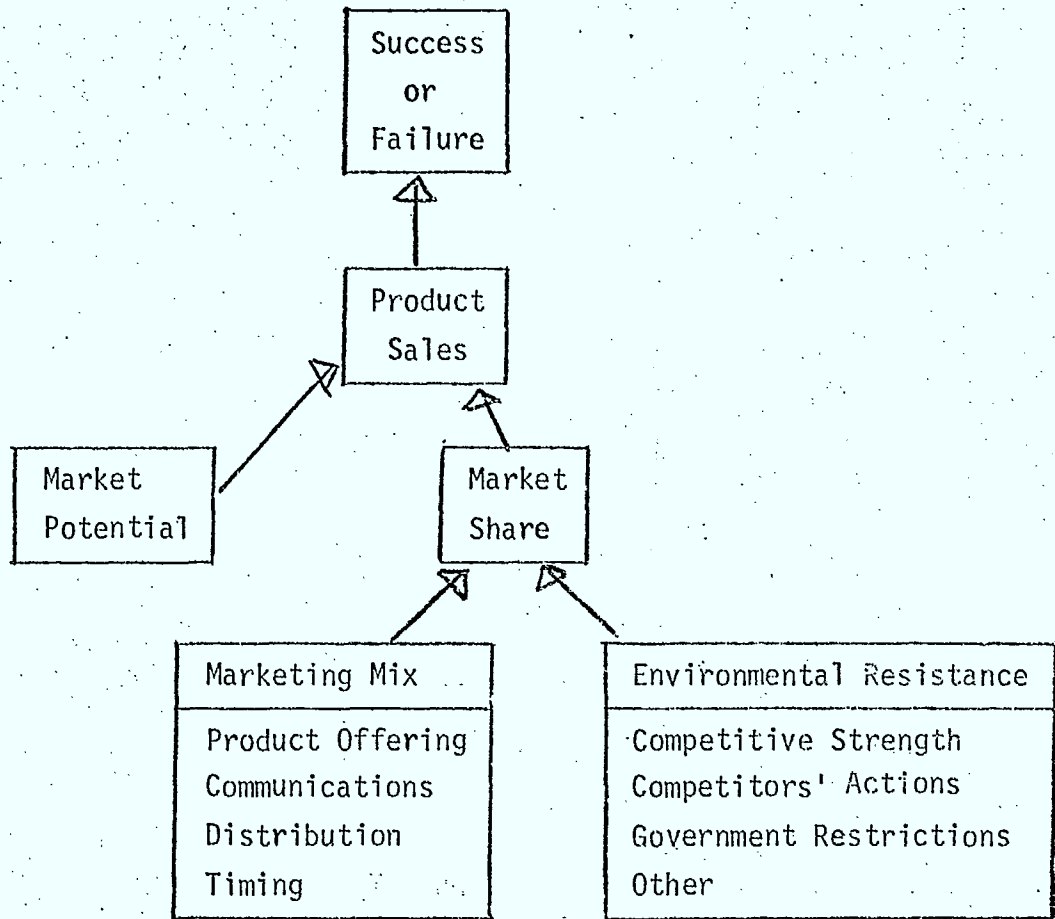


Figure 2. A classification scheme to identify variables which might affect a new product's sales and hence success. Sales depend on market potential and share. Share in turn depends on the marketing mix and environmental resistance.

TABLE IV  
POSSIBLE CAUSES  
OF LOW SALES

The number of potential customers who might use this type of product was simply overestimated.

There really wasn't a need for this type of product.

Our product was essentially the same as directly competing products - a "me-too" product.

We failed to understand customer requirements, and our product did not exactly meet their needs, wants or specifications.

We understood customer requirements, but were unable to develop or produce the product exactly as desired.

Our product had some design, engineering or manufacturing deficiencies and encountered technical difficulties.

Our price was higher than the customer was prepared to pay.

Our timing was premature.

Our timing was too late.

A similar competitive product was introduced which hurt the sales of our product.

Competitors lowered their prices (or took other defensive action) which hurt the sales of our product.

Competitors were firmly entrenched in the market, and it proved more difficult to break into the market than expected.

Our selling, distribution, or promotional effort was targeted correctly, but was inadequate.

Our selling, distribution, or promotional effort was misdirected - we really didn't understand the market.

Government action, legislation, or other legal action prevented or hindered the sale of our product.

A framework outlining the activities commonly involved in the development of a new industrial product is shown in Figure 3. These activities are classified as Market, Technical and Evaluation. If one or more of these activities were poorly undertaken (or mistakenly omitted), the result could be detrimental to the eventual success of the product. Therefore, a critical concern of this research was to measure how well firms actually performed the various activities outlined in Figure 3.

The lack of certain key resources may also contribute to the failure of a product. The resources commonly required in an industrial product venture include: financial, engineering, R & D, marketing research, general management, production and selling. Table V outlines a set of indirect reasons for failure based on a lack of needed resources.

#### Research Methodology

A sample of 150 industrial product firms were contacted to provide the product failure information. These firms were located in Ontario and Quebec, Canada, and were known to be active in product development.<sup>6</sup> The sample included the larger and more obvious product developers (such as Dupont, G.E., IBM, etc.), as well as a random selection of smaller firms. This bias towards larger firms was deliberate in order to reflect their greater importance in a study of product development.

In each firm, the manager most likely to be familiar with his company's new product activities was contacted.<sup>7</sup> A mailed questionnaire was sent to each manager, who was asked to answer some general questions about

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<sup>6</sup> The source of the population of firms was: Directory of Scientific Research and Development Establishments in Canada (Ottawa: Department of Industry, Trade and Commerce, 1969).

<sup>7</sup> All firms had been previously contacted in former research and hence a list of appropriate managers was available. In larger firms, the manager contacted was usually the corporate product development officer; in smaller firms, generally the president was the source of data.

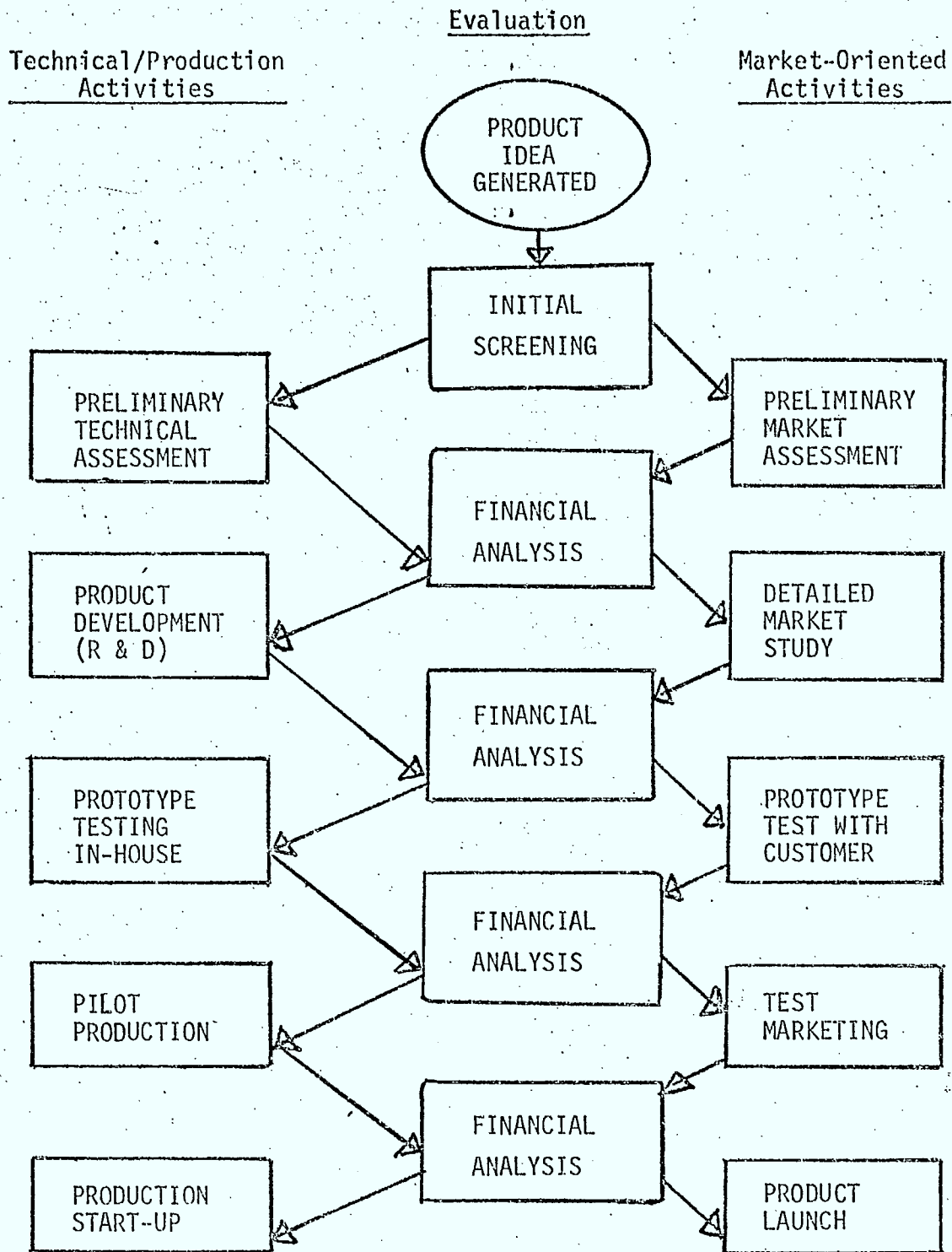


Figure 3. A framework outlining the typical activities of the new product development process.



TABLE V  
POSSIBLE RESOURCE DEFICIENCIES  
INDIRECTLY RESULTING IN PRODUCT FAILURE

A lack of financial resources.

A lack of engineering skills or people.

A lack of R & D skills or people.

A lack of marketing research skills or people.

A lack of general management skills.

A lack of production resources or skills.

A lack of selling resources or skills.

his firm and the nature of his firm's business. Next he was requested to select two typical product failures -- products which had been introduced but had fallen far short of profitability expectations. The criteria for selection were:

- new products (new to his firm);
- recent failures (1965 or later);
- products developed by his firm in Canada;
- products typical to his firm.

For each product, the manager was asked to review the reasons for failure. This was accomplished first by presenting the list of general reasons or categories of failure (Table I), and then requesting him to indicate whether each was a main reason, a contributing reason, or not a reason for the product's failure. (An "other" category with space for comments was provided.) Depending upon how he answered this first question, the manager was then asked to review one or more of the lists of specific causes: causes of low sales (Table IV); causes of low profit margins (Table III); or causes of excessive investment or development costs (Table II). The following response categories were used for each specific cause: a main cause, a contributing cause; or not a cause. Again, "other" categories and space for comments were provided. The respondent was also asked to elaborate on the causes of failure, and to suggest what might have been done differently to have avoided the failure (open-ended questions).

In order to obtain an insight into the indirect causes of failure, the manager was presented with a list of the new product development activities (outlined in Figure 1) and asked to rate how well each activity had been performed for each product failure. The response categories were:

- done more than adequately;
- done adequately;
- done inadequately;
- not done, but should have been;
- not applicable.

The manager was also shown the list of indirect reasons describing resource deficiencies (Table V), and asked to indicate how much each had contributed to the failure. The response categories were: very much, somewhat, or not at all.

The questionnaire was initially pretested on a limited number of respondents to check for clarity and completeness. Next, the questionnaires were mailed to the 150 firms with a personally addressed letter encouraging a prompt response. A few days after the initial mailing, the author began telephoning each respondent to discuss the questionnaire and to request his cooperation. A second mailing to non-respondents took place six weeks later. A telephone follow-up was also used.

The original sample of 150 firms was reduced to an effective sample of 101.<sup>8</sup> A handful of firms were no longer in business. Another 46 firms actually had no recent product failures to discuss: in some cases, the firm was basically a one- or two-product firm, and simply did not undertake enough innovative product development to encounter failures; in other cases, the firm undertook product development on a contract basis (for example, aerospace), and once the contract was awarded, was assured of a profitable product development.

Of the sample of 101 firms which actually encountered product failures, 66 replied to the questionnaire for an effective response rate of 65%. Not all the firms were able to discuss two failures, and the eventual sample numbered 114 product failures. Thus, the sample of products is biased toward firms with more active product development programs. The sample of firms who responded is shown in Table VI by industry and size of firm.

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<sup>8</sup> Based on information on returned questionnaires and discussions during telephone follow-up.

TABLE VI  
 RESPONDENTS: FIRMS AND PRODUCTS  
 BY COMPANY SALES AND INDUSTRY TYPE

Industry	ANNUAL SALES: \$ MILLIONS					Totals
	0 - 3.9	4 - 9.9	10 - 19.9	20 - 49.9	50 +	
Electrical Equipment, small & large; Electronic products; Scientific Instrumentation; Process Instrumentation.	7 (12)	4 (7)	2 (3)	3 (5)	2 (4)	18 (31)
Equipment, light industrial, components; Machine Tools & Supplies; Material Handling, Vehicles & Equipment; Air-conditioning & other Building Equipment.	2 (3)	2 (4)	2 (4)	1 (2)	0 (0)	7 (13)
Chemicals, heavy; Specialty; Pharmaceutical; Protective and Coatings.	0 (0)	3 (5)	2 (4)	2 (3)	6 (11)	13 (23)
Automotive, Aircraft, Agricultural Vehicles Components, & Fabricated Metal parts.	2 (4)	1 (2)	4 (6)	3 (6)	3 (4)	13 (22)
Miscellaneous, including Industrial Textiles; Plastic & Rubber Fabricated Parts, Construction Materials, Packaging Materials, Other Raw Materials.	1 (2)	4 (7)	3 (6)	2 (3)	2 (4)	12 (22)
TOTALS	12 (21)	14 (25)	13 (23)	11 (19)	13 (23)	63* (111)

Note: Numbers of firms in each category are shown first; numbers of products are shown in parentheses.

\* Totals do not add up to 66 firms or 114 products due to "no responses".

## Analysis of Results

### General Reasons for Product Failure

The most important general reason for product failure was the fact that anticipated sales never materialized. In the case of 63.2% of the 114 product failures studied, failure to achieve expected sales was cited as the main general reason for failure (Table VII). In another 14.9% of the failures, poor sales was a contributing reason. In total, more than three-quarters of the product failures had poor sales as either a main or contributing reason for failure.

The other general reasons -- low profit margins, excessive development costs and excessive investment -- appeared to play a much smaller role in leading to product failure (Table VII). For example, low profit margins, the next most frequently mentioned reason, was cited only one-third as often as poor sales as a main reason for failure. However, low profit margins was clearly most important as a contributor to failure, being cited in almost one-quarter of the cases as a contributing reason. In order to compare the relative importances of these general reasons as both main and contributing influences, a weighted rating score (0 - 100%) was determined for each. This rating score was an arbitrary weighted average of the main and contributing frequencies cited, where a main reason was scored 1.0, and a contributing reason scored 0.5. Based upon these calculated ratings, the rank order and relative importance of the four general reasons for failure were:

<u>General Reason</u>	<u>Rating</u>
Sales below expectations	70.7
Profit margins below expectations	33.0
Development costs excessive	29.9
Investment excessive	8.8

TABLE VII  
GENERAL REASONS FOR FAILURE  
(N = 114)

Reason	Percent of Product Failures			Rating**
	Main Reason (%)	Contributing Reason (%)	Main or Contributing Reason (%)	
Sales fell below expectations	63.2 (1)*	14.9 (3)	78.1 (1)	70.7 (1)
Profit margins fell below expectations	21.1 (2)	23.7 (1)	44.7 (2)	33.0 (2)
Development costs exceeded expectations	19.3 (3)	21.1 (2)	40.4 (3)	29.9 (3)
Investment exceeded expectations	4.4	8.8	13.2	8.8
Other	4.4	0	4.4	4.4

\* Numbers in parentheses indicate rank in each column.

\*\* The rating score is a weighted average of the frequencies (percents) of main and contributing reasons. Main reasons are scored 1.0 and contributing reasons scored 0.5 to yield a rating of 0 - 100%.

The fact that sales fell short of expectations in more than three-quarters of the failures strongly suggests that firms have the greatest difficulty with their external environment (the market-place) rather than with their internal environment. That internally oriented reasons -- development costs and investment -- were so much less important than a poor sales performance also supports this view. Clearly industrial product firms must devote more effort towards reducing the uncertainties of the market-place if they are to improve their new product performance record.

#### Specific Causes of Low Sales

That failure to achieve expected sales was cited most often as the main reason is not surprising. Of greater interest, however, are the specific causes of this poor sales performance. The most frequently mentioned main cause of low sales was that "competitors were firmly entrenched in the market and it proved more difficult to break into the market than we expected." This was the main cause for 36.4% of the low sales products, and the contributing cause for another 13.6% of these products. Table VIII provides the cited frequencies and ratings for each of the specific causes of low sales in order of decreasing importance. (Again, a main cause was scored 1.0 and a contributing cause scored 0.5 to yield a 0 - 100% rating.) "Potential users overestimated" and "technical deficiencies in product" were cited next as the main causes of low sales. These causes occurred with equal frequency as the main cause in 20.5% of the cases. The most frequently mentioned contributing cause was "price too high" (33.0%), followed by "inadequate marketing effort" (31.8%).

It is clear that most of the major causes of low sales were market ones and not technical inadequacies. When the frequencies of each cause

TABLE VIII

SPECIFIC CAUSES  
OF POOR SALES PERFORMANCE  
(N = 88; 77.2% of failures)

Specific Cause	Percent of Product Failures			Rating**
	Main Cause (%)	Contributing Cause (%)	Main or Contributing Cause (%)	
Competitors firmly entrenched	36.4 (1)*	13.6	50.0 (3)	43.2
Potential users overestimated	20.5 (2)	30.7 (3)	51.1 (1)	35.9
Price too high	18.2 (4)	33.0 (1)	51.1 (1)	34.7
Technical difficulty	20.5 (2)	25.0 (5)	45.5 (4)	33.0
Selling, distribution & promotion mis-directed	15.9 (5)	23.9	39.8 (6)	27.9
"Me Too" product	14.8 (6)	25.0 (5)	39.8 (6)	27.3
Did not understand customer requirements	13.6	26.1 (4)	39.8 (6)	26.7
Inadequate selling, dist., promotion	9.1	31.8 (2)	40.9 (5)	25.0
Similar competing products introduced	10.2	22.7	33.0	21.6
Could not produce product	11.4	19.3	30.7	21.1
Competitor's defensive actions	12.5	13.6	26.1	19.3
Timing too late	8.0	13.6	21.6	14.8
Was not a need	5.7	18.2	23.9	14.8
Timing premature	6.8	13.6	20.5	13.6
Government action	2.3	3.4	5.7	4.0
Other	2.3	2.3	4.5	3.4

\* Numbers in parentheses indicate rank in each column.

\*\* See Table VII for footnotes.



are considered -- both as a main and a contributing cause -- the five most important causes of low sales were:

<u>Causes</u>	<u>Rating</u>
Competitors firmly entrenched in market	43.2
Overestimated number of potential users	35.9
Price too high	34.7
Technical difficulties with product	33.0
Misdirected marketing effort	27.9

The selection of these five as the most important causes of poor sales was based on their weighted rating scores.

What is surprising in a review of the reported frequencies in Table VIII was to discover how unimportant certain causes of low sales appeared to be. The least important causes, based on their rating scores were:

- Government action (4.0)
- Lack of market need (14.8)
- Defensive actions by competitors (19.3)

The first two are frequently mentioned in marketing literature, yet did not play a key role in the sample of failures investigated. Premature timing and late timing were also seldomly cited on an individual basis (ratings of 13.6 and 14.8 respectively), but when considered together as "bad timing" became a fairly important category of failure causes.

A review of the causes of low sales and the response patterns of questionnaires suggested that many of the causes were closely related, and in fact might be explained by several underlying factors. Analysis of the data identified six important underlying factors or dimensions of the causes of low sales which were interpreted as follows:<sup>9</sup>

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<sup>9</sup> Factor analysis, varimax method, orthogonal rotation. Details of the results are given in Appendix A.

1. Technical Problems:

Technical difficulties/deficiencies with product; unable to produce product as desired.

2. Timing Too Late:

Too late into the market; a "me too" product; competitors were firmly entrenched.

3. Lack of Understanding of Customers' Needs:

Potential users overestimated; really no need for product; did not understand customer requirements.

4. Defensive Actions by Competitors:

Similar competing products introduced; competitors took defensive actions.

5. Lack of Understanding of Market Environment:

Inadequate selling effort; misdirected selling efforts; government action hurt sales.

6. Price Competition:

Price too high; competitors lowered prices.

In order to assess the relative importance of each dimension or factor as a cause of low sales, the weightings of each product failure on each of the six dimensions were calculated. The proportions of failures most heavily weighted on each dimension were determined, and are shown in Table IX. These results suggest that all six dimensions of causes of low sales are approximately of equal importance, with the possible exception of Price Competition, which tended to be more a second than a first cause. Of greater interest is the fact that five of these six equally important dimensions describe a lack of understanding of the market-place: customers, competition and environment.

An attempt was also made to identify possible courses of corrective action. When asked what might have been done to avoid the low sales situation, 32.0% of the firms indicated "nothing at all"; another 32.0% suggested that *better market information* would have been the answer. A variety of other suggestions were made, but with much lower frequencies.

TABLE IX  
PROPORTION OF FAILURES\* MOST  
HEAVILY WEIGHTED ON EACH FACTOR

Dimension (Factor)	Percentage of Failures When	
	Factor is first cause**	Factor is first or second cause**
Technical Problems	21.2%	18.2%
Timing Too Late	17.7%	13.9%
Lack of Understanding of Customers' Needs	20.0%	18.8%
Defensive Actions by Competitors	16.4%	17.5%
Lack of Understanding of Market Environment	18.8%	16.1%
Price Competition	5.9%	15.5%

\* Only products where "low sales" was a reason for failure are considered (N = 87)

\*\* Based on the loadings of product failures on the six factors i.e., the product locations on the six dimensional map. First cause is the factor upon which the product is most heavily loaded; second cause is the factor upon which the product is next most heavily loaded.

These results have a clear message. There remains little doubt that market difficulties rather than technical deficiencies are the main problem areas for industrial new products. The three most important causes of low sales -- competitive strength, overestimated market size, and price too high -- all point to the need for industrial product firms to become more market oriented in their product development efforts. That five of the six underlying dimensions of product failure due to low sales describe a lack of understanding of the market, the customer, and the competition, adds further evidence to support this view. Managers themselves admitted that more marketing research leading to better market information would have gone a long way towards overcoming their new product failures.

#### Other Specific Causes of Failure

Although low profit margins, excessive development costs and excessive investment were much less important as general reasons for failure, the specific causes leading to these types of failures were also investigated (Table X). In the case of products with low profit margins, clearly unexpectedly higher production costs were the main cause (49.4%), followed by low volume situations which resulted in higher per unit costs (25.0%). Where excessive development expenditures was the general reason for failure, the fact that firms underestimated the difficulty of development was the main cause (50.0%). The main cause for excessive investment was that the firms simply erred in their estimates of the production facilities which would be required to manufacture the product (33.3%).

TABLE X  
OTHER SPECIFIC CAUSES  
OF PRODUCT FAILURE

Specific Cause	Percent of Product Failures			Rating*
	Main Cause (%)	Contributing Cause (%)	Main or Contributing Cause (%)	
<u>LOW PROFIT MARGINS (N=52)</u>				
Production costs higher	40.4 (1)*	34.6 (1)	75.0 (1)	57.7
Volume low, costs high	25.0 (2)	25.0 (2)	50.0 (2)	37.5
Price overly optimistic, was dropped	19.2 (3)	25.0 (2)	44.2	31.7
Competitive products introduced; our price dropped	13.5	34.6 (1)	48.1 (3)	30.8
Selling costs higher	7.7	11.5	19.2	13.5
Other	0	0	0	0
<u>HIGH DEVELOPMENT COST (N=41)</u>				
Underestimated development difficulty	50.0	36.9	86.9	68.5
Product concept changed	36.9	36.9	73.8	55.4
<u>HIGH INVESTMENT (N=12)</u>				
Production facilities underestimated	33.3	33.3	66.7	50.0
Production process c changed	16.7	41.7	58.4	37.6

\* See Table VII for footnotes.

## Indirect Causes of Product Failure

A prime concern of the research was to identify some of the indirect causes of product failure. Indirect causes describe elements of the product development process which precede the direct causes of failure. Two types of indirect causes were investigated: the lack of needed resources to undertake the venture; and inadequately undertaken activities during the development process.

Table XI summarizes the extent to which each resource deficiency contributed to the product failures. Again a weighted rating score was calculated to permit combining the "very much" and "somewhat" responses, where "very much" was scored 1.0, and "somewhat" scored 0.5. The single deficiency which contributed most often in a major way to product failure was a lack of marketing research skills or people, followed by a lack of selling resources or skills. Lack of general management skills along with lack of marketing research skills were cited most often as "somewhat" contributing to the failure. On the bases of the rating scores, the most important resource deficiencies which contributed to product failure were:

	<u>Rating</u>
Lack of marketing research skills or people	43.2
Lack of general management skills	30.1
Lack of selling resources or skills	29.7

It is noteworthy that the lowest contributors to product failure were a lack of production resources and a lack of financial resources, with ratings of 12.2 and 14.2 respectively.

The second set of indirect causes of failure included deficiencies in the activities undertaken during the development of the new product.

Table XII summarizes the adequacies of the various activities undertaken in

TABLE XI  
 EXTENT TO WHICH RESOURCE DEFICIENCIES  
 CONTRIBUTED TO PRODUCT FAILURE  
 (N = 114)

Resource Deficiency	Percent of Product Failures			Rating
	Very Much (%)	Somewhat (%)	Very Much plus Somewhat (%)	
Lack of financial resources	5.5	17.3	22.5	14.2
Lack of engineering skills or people	8.2	32.7	40.9	24.6
Lack of R & D skills or people	7.3	30.0	37.3	22.3
Lack of marketing research skills or people	21.6	43.2	64.8	43.2
Lack of general management skills	9.0	42.1	51.1	30.1
Lack of production resources or skills	4.5	15.3	19.8	12.2
Lack of selling resources or skills	13.5	32.4	45.9	29.7

each product venture. The columns in the table indicate the percent of products where each activity in the venture was undertaken:

adequately (or better);  
inadequately;  
not done, but should have been;  
not applicable.

The final column -- "deficient" -- represents the percent of ventures where the particular activity was undertaken "inadequately" or "not done but should have been", and is adjusted for the no response and not applicable responses.

There remains little question that the activities in which firms were most deficient are the market oriented ones. Those activities with the highest deficiency ratings were:

- detailed market study (74.0% deficient);
- test marketing (58.1% deficient);
- product launch (53.9% deficient).

These results can be compared to deficiencies in product development (R & D) and production start-up of 36.3% and 30.6% respectively. Deficiencies in financial analysis (51.5% deficient) were also common.

Overall, every market oriented activity was reported to be much more deficient than its corresponding technical/production activity. A review of the percent deficiencies shows that each market activity was cited as deficient in 45% or more of the cases. On the other hand, not one of the technical/production activities was more than 40% deficient, and all but two were less than 35% deficient. The average percent deficiencies for activities in each category reveals a similar picture: 56.5% deficient for market activities versus 33.8% deficient for technical/production efforts.



TABLE XII  
ACTIVITIES DURING  
PRODUCT DEVELOPMENT PROCESS  
(N = 114)

Activity	Percent of Product Failures				
	Adequately	Inadequately	Not Done	Not Applicable	Deficient*
<u>Market</u>					
Preliminary assessment of market	50.0	36.6	8.9	4.5	47.7
Detailed market study	24.1	46.4	22.3	7.1	74.0
Prototype testing with customer	42.9	29.5	11.6	14.3	48.9
Test marketing	27.7	25.0	13.4	28.6	58.1
Product launch	31.2	33.0	3.6	28.6	53.9
Average	35.2%	34.1%	11.9%	16.6%	56.5%
<u>Technical</u>					
Preliminary technical assessment	66.1	25.0	3.6	5.4	30.2
Product development (R. & D)	58.0	29.5	3.6	8.9	36.3
Prototype testing -- in house	51.8	25.9	6.3	15.2	38.3
Pilot production	50.9	12.5	13.4	18.8	33.7
Production start-up	38.4	11.6	5.4	40.2	30.6
Average	55.0%	20.9%	6.5%	17.7%	33.8%
<u>Evaluative</u>					
Initial screening	61.6	30.4	5.4	2.7	36.7
Detailed financial analysis	42.0	34.8	9.8	12.5	51.5
Average	51.8%	32.6%	7.6%	7.6%	44.1%

\* Deficient includes "done inadequately" plus "not done but should have been", and is adjusted for no response and not applicable.

## Summary and Conclusions

The results of the research are consistent with previous investigations into new product failure. But the results go much further in identifying fairly specific causes of failure and problem areas within firms.

Clearly the main general reason for product failure was the fact that sales failed to materialize. While the result is not surprising, it does imply that much more time, attention and money must be devoted to reducing market uncertainties. The main causes of low sales were chiefly market reasons and not technical ones. This result is quite provocative, particularly when one considers the relatively minor amounts spent on marketing research compared to the large sums spent on R & D. Underestimating competitive strength, overestimating the number of potential users, and overestimating the price customers would pay for the new product were the three major causes of low sales. The majority of the dimensions or factors which appeared to explain many of the causes of low sales were also market ones -- a lack of understanding of the market-place, the customer, and the competition.

Of great interest was the fact that in almost two-thirds of the product failures, a lack of marketing research skills or people was thought to have significantly contributed to the failure. Marketing launch resources and general management skills were also rated as weak. A review of activities which were poorly undertaken or mistakenly omitted altogether reveals a similar story. At every stage of the product development process, market oriented activities fared much worse than corresponding technical/production activities. By far the most deficient activity undertaken in these failures was the detailed market study.

The message for new product managers in industrial goods firms is clear: a much greater market orientation is required. Operationally, this means:

a) Firms must be prepared to balance their heavy R & D expenditures with research of a different nature -- marketing research and assessment. Many of the frequently mentioned causes of failure could have been eliminated had a more thorough market study been undertaken.

b) Industrial goods firms must improve their marketing research skills and resources. The most sadly lacking resource in the product development process was not money, not technical skills, but a deficiency in marketing research capabilities. For some firms the need may be to expand an understaffed department; for others, the implication is better trained personnel; for still others, the formation of a new product marketing research group may be the answer.

c) Marketing researchers must broaden their scope and be prepared to address those issues which frequently led to product failure. The key marketing research questions include:

- i) is there really a need for this type of product?
- ii) what are the customer's design requirements or product specification needs?
- iii) what is the total market potential? what share can we expect?
- iv) at what price should the product be sold?
- v) what is the competitive situation? competitors' market strengths? competitors' likely actions?
- vi) how do customers buy the product? how should the product be launched and sold?

Marketing researchers involved in industrial new product development must accept the challenge of the complex information needs of new product ventures. Clearly, the industrial marketer and marketing researcher have key roles to play in the development of new products.

## Implications for Public Policy

The implications for public policy discussed below are aimed at product development assistance programs, such as PAIT. In offering certain suggestions, two assumptions are made:

- a) that one goal of assistance programs is to stimulate product development in Canada;
- b) that financially successful product ventures are the desired outcome.

The latter assumption is made because it would appear that an important criterion of further corporate spending on R & D hinges on the profitability achieved in past new product ventures: success begets more spending.

Government assistance programs should be concerned, therefore, with both the financial assistance aspect of a product development, and the eventual financial success of the venture funded. The present research focussed on the latter of these concerns -- the reasons for failure, and what might be done to improve firms' success rates in the new product arena. The research suggests that the main causes of product failure are a lack of understanding of the market-place, the customer and the competition; the most deficient resources were marketing research; and the most inadequately undertaken activities were the market oriented ones. The remedy from a corporate standpoint is a greater market orientation and the adoption of the "marketing concept".

Such a reorientation cannot be expected overnight. In most industrial goods firms in Canada, the resources and skills simply do not exist to undertake the needed market studies;<sup>10</sup> in others, a strong

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<sup>10</sup> As many as 80% of the industrial product firms developing new products in Canada do not employ anyone who might be called a full time market researcher. See: Blair Little, Robert G. Cooper, and Roger A. More, "Putting the Market into Technology to Get Technology into the Market", Business Quarterly (Summer, 1972).

commitment to a market orientation by technically-trained management may be lacking.<sup>11</sup>

But the situation does change when the venture is funded in part by an outside investor. Here the outside funder can and should influence the product development process, ensuring that modern management techniques are used to enhance the likelihood of a successful new product. The Department of Industry, Trade, and Commerce, through programs such as PAIT, can play a role similar to such an outside investor.

Operationally, the following steps can be taken to attempt to reduce the incidence of new product failure in programs such as PAIT:

a) Criteria for judging proposals.

Clearly, market criteria deserve equal weighting with technical criteria in judging the viability of a venture proposal. The company involved should be made aware of the importance placed on market criteria, and of the fact that most failures occur because of a lack of attention to market factors.

b) Answers to key market questions.

Any proposal submitted for consideration should deal with each of the topics or market questions outlined in the "Summary and Conclusions" section of this report. Failure to answer these questions led to many product failures. Specifically, a project proposal should outline how the firm intends to obtain the market information needed to answer each of these key questions.

c) Provision for marketing research.

Any venture proposal which contains no provision for a market

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<sup>11</sup> The "roots of reluctance" to adopt a market orientation are discussed in: Little, Cooper, More, "Putting the Market..."; see footnote 10.

study or marketing research should be suspect. The very nature of a new product suggests that we are dealing with new, uncertain and future events. Many of these events involve the market place. It is unlikely that any manager can be absolutely certain about the market, the customer, and the competition in a new product situation. More often than not, a market study is required. A product proposal should clearly describe just what market information will be needed, what studies will be undertaken, and how they will be carried out.

d) Consulting assistance.

Many firms are weak in the area of marketing management and marketing research. Where a firm is unable to delineate the market studies it should undertake, or where the firm is physically unable to carry out these studies, the proposal evaluator should direct the firm to appropriate outside help. Therefore, every IT&C office should have a file of available firms and personnel in their geographic areas which are able to undertake certain types of market studies or marketing consulting work. At the same time, it may be necessary to improve the marketing management and research skills of IT&C field officers. In this way, IT&C men will be more able to evaluate proposals, particularly on market criteria, and to provide appropriate direction for firms. (Perhaps a specially designed marketing management and research refresher course would be the answer.)

To summarize, many product developers appear to be overlooking certain facets of the product development process which most often spell disaster for new product ventures. If programs such as PAIT seek to yield successful product ventures, then IT&C might consider playing a more active role in product ventures, particular in the marketing and marketing research areas where firms appear weakest.

APPENDIX A  
IDENTIFICATION OF DIMENSIONS  
OF LOW SALES

Factor analysis was used to identify the underlying factors or dimensions of the causes of low sales (common factor analysis, varimax method, orthogonal rotation). Each of the variables included in this analysis -- the causes of low sales in Table VIII -- was treated as a continuous variable having values of 1.0 for "main cause", 0.5 for "contributing cause" and 0.0 for "not a cause".

Six factors with Eigenvalues greater than 1.0 were identified, and together explained 66.8% of the variance in the causes of low sales. The interpretations of these factors are given in the Analysis section of this paper, while the important factor loadings are provided in Table XIII.

To assess the relative importance of each factor as a cause of low sales, the product loadings on each factor were determined from the factor score coefficients. The factor upon which each product was most heavily loaded was counted as the first cause; the second cause was that factor with the next highest loading. The relative frequency of factors as first causes and second causes was calculated to yield the results in Table IX.

Although variables in reality were neither interval data nor normally distributed (and hence are not consistent with the assumptions of factor analysis), it should be noted that this statistical technique was not the primary method of analysis nor was it used for inferential purposes. Rather factor analysis was used here as an interpretational aid to supplement other methods.

TABLE XIII  
LOADINGS OF CAUSES  
ON EACH FACTOR\*  
(N = 87)

Factor	Causes Most Heavily Loaded on Factor	Loading	Interpretation
1	Technical difficulties	.922	Technical problems
	Could not produce product	.616	
	Inadequate selling effort (negative)	-.292	
2	"Me too" product	.728	Timing too late
	Timing too late	.703	
	Competitor's firmly entrenched	.526	
	Timing too early (negative)	-.289	
3	No need for product	.678	Lack of understanding of customers' needs
	Did not understand customer requirements	.533	
	Potential users overestimated	.464	
4	Similar products were introduced	.967	Defensive actions by competitors
	Competitive defensive actions	.450	
5	Sales efforts misdirected	.461	Lack of understanding of market environment
	Government action	.452	
	Inadequate selling effort	.276	
6	Competitive defensive actions	.513	Price competition
	Our price too high	.446	

\* Only the main loadings are shown.



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