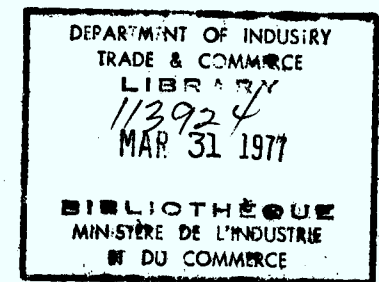


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# Handbook for Product Development

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# Handbook for Product Development



Manitoba.

Produced in co-operation with  
the Manitoba Design Institute,  
by the Product Development Group,  
a demonstration program funded jointly by  
the Federal Department of Industry, Trade and Commerce,  
Office of Design, the Honourable Jean Chrétien, Minister  
and the Manitoba Department of Industry and Commerce,  
Marketing, Distribution and Design Branch,  
the Honourable Leonard S. Evans, Minister.



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# introduction

## Overview ...

The Manitoba Government has led the way in provincial design programs, and from its inception in 1963 as the first provincial organization of its kind, the Manitoba Department of Industry and Commerce's Design Institute has served as a model for the establishment of similar programs in other provinces.

Technological developments, sophisticated production and marketing techniques, and shifting customer preferences result in constantly changing market requirements and businessmen today face an unprecedented challenge to develop new and better products and services. If a company is to compete successfully for customer acceptance in local, national and international markets, it must meet these changing requirements. The ultimate concern is the company's competitive edge in the marketplace. Since effective design management is essential for a competitive market position, *product development must be an integrated and on-going process that is one of the company's priority objectives.*

---

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## ...and Background

In keeping with these objectives the Manitoba Design Institute has actively encouraged Manitoba companies to adopt sound design management principles in product development. The Design Institute's leadership and the Federal Government's support in innovative design programs is evident in the establishment of a demonstration project for product development. To implement this project the Product Development Group was formed blending the expertise of a marketing consultant, an industrial designer, and a production engineer. The project, jointly funded by the Manitoba Department of Industry and Commerce and the Federal Department of Industry, Trade and Commerce, has been in operation since 1974, and has provided a tangible service to selected Manitoba companies.

The innovative aspect of this project is the opportunity available to Manitoba companies for a



practical demonstration of what product development entails, and what can be provided in the way of benefits from organized product planning. Group involvement takes the form of actual implementation of an approved product development plan or, where necessary, co-ordination of outside design, marketing and engineering expertise.

## About the Handbook

This *Handbook for Product Development* is the result of the experience gained through the practical demonstration of what effective design management can accomplish, and a response to the apparent need for a working manual for use by manufacturers, consultants, educational institutions, and government departments.

It is intended as a practical guide to product development. We hope it will not only give you an awareness of the importance of product development but also an understanding of the product development process and how you

can use it to advantage. The first section of the handbook looks at the importance of product development, the reasons for failure, and the principles of success. It examines the product development choices open to you and the best method of approach. The remaining sections of the handbook cover the seven phases of product development in detail. The last four phases are illustrated by actual case histories selected from projects completed under the Product Development Group program.

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# product development

## Why is it important?

Product development is important to your company for two main reasons—to sustain growth, and to improve profit margins.

Products have a characteristic pattern to their sales volume and profit margin curves, with the profit curve tending to decline while the sales curve is still rising (see figure 1). The sales curve has been widely used as the basis for planning, but product development strategy is better planned around the profit curve.

Only planned and sustained product development will generate the additional profit needed to maintain company growth. This is further reinforced by independent surveys which have shown increased demand, market penetration, and new products as the top three sources of growth.

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## Reasons for failure

Although a great deal of time and money is spent on product development, the new-product failure rate continues to be disconcertingly high. It is generally accepted that between six and nine out of ten new products are not successful. It takes some 58 ideas on the average to yield one successful new product, and each stage of the product development process becomes progressively more expensive both in time and money (see figures 2 and 3, page 7).

What is needed is improved management control and better application of the principles of design management to screen out ideas of limited potential before they reach these more expensive stages. This would reduce the risk of failure and also provide a degree of confidence in proceeding to succeeding stages.

Various studies have identified the reasons why so many products are not successful:

- inadequate market analysis
- product defects, technical problems, product performance

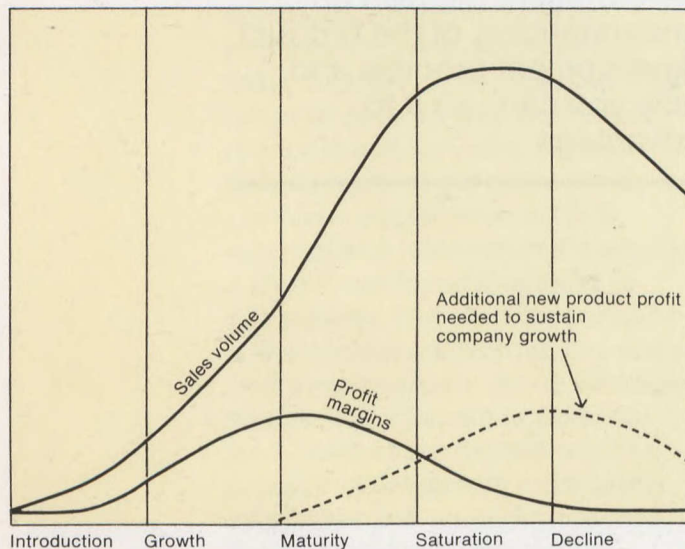


Figure 1. Basic life cycle of products



- higher costs than anticipated, inadequate financing
- poor timing
- competition
- insufficient marketing effort
- inadequate sales force
- weaknesses in distribution
- lack of management depth

**Lack of market orientation is the main cause of new product failure.**

## Principles of success

The principles underlying success are few and simple.

1. Fill a customer need, emphasizing benefits, not features.
2. Give the customer a reason for buying by offering a meaningful, identifiable difference over the competition.
3. Test the product in three stages—the product concept, the finished product, and the product in the market. Be sure it fulfills both the customer's and manufacturer's requirements.

## Some ground rules

New product introduction is always a risky business. However, there are some simple, basic ground rules which can be followed to minimize the risk.

—If the existing product line is giving trouble, new products alone will not cure the underlying problem, but will probably compound it.

—You must know what you are trying to achieve and why—are you trying to develop highly profitable products, or to spread out fixed costs? You must also know which of your company's resources are to be exploited or strengthened.

Fill a customer need... Give the customer a reason for buying... Test the product.

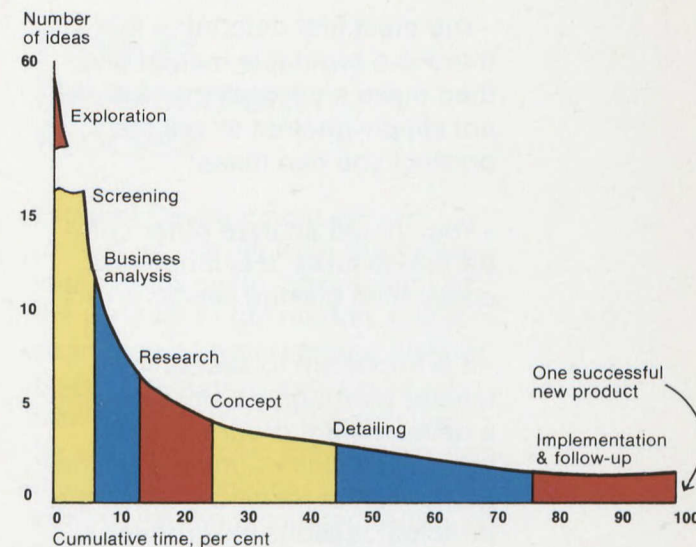


Figure 2. Mortality of new product ideas

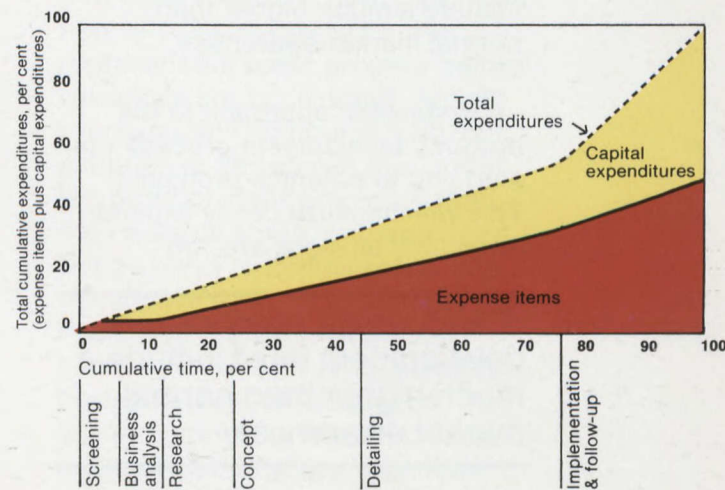


Figure 3. Cumulative expenditures

-You must first determine that there is a profitable market and then make a product that will sell, *not* simply attempt to sell the product you can make.

-You should analyze other companies' failures. It is much less costly than making similar errors.

-It is important to assess the market thoroughly before starting a development program. Most companies do not undertake adequate market research. Since the principal reasons for product failure are marketing-related, successful product development must include a much higher than normal market awareness.

-A systematic approach to the product development process will alert you to potential problems. This will minimize costly expenditures until all signs are "go".

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...successful product development must include a much higher than normal market awareness.

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## Product Development Program

While most of the emphasis in the literature has been on new products, this Handbook intentionally concerns itself with product development as including both existing and new products. In fact, as noted below, obtaining the best results from existing products and markets can be the most important, especially for small to medium sized manufacturers who comprise some 85% of all establishments.

There are four major ways to achieve company objectives:

### 1. You can optimize existing products in existing markets.

This can often make the greatest positive impact on your profit picture. It is only after this step has

been successfully taken that you should move into new product areas.

### 2. You can develop new markets for existing products

This will probably mean some modification of the product. Selling to a new market or through new distribution channels can be a problem. The major advantages are that capital expenditures and product problems should be minimal.

### 3. You can market a new product to existing markets.

Here there should be relatively few marketing problems, but you could be involved in major capital expenditures and product problems.

### 4. You can market a new product to new markets.

This represents the most difficult and costly combination of all—major capital expenditures and major technical and marketing problems. This is the highest risk type of venture.



## Organizing for Product Development

*The method by which a company approaches the product development process can be just as crucial to success as the products and ideas themselves.* It is advisable to give one person the overall responsibility from research stage to product launch. This person can be the owner or manager, a person or group within the company, or an outside consultant from a university, a government department or a private firm. In many areas his role will be that of advisor and co-ordinator but he will be the clearing house for all questions concerning the project.

Having said that the person or team to be given responsibility for the product development project can be from within the company, there are certain advantages to using an outside person or project team, particularly for small businesses.

A smaller company is not likely to have access to the sort of diversified talent and technical facilities available to an outside team spe-

cializing in product development. Also, the small businessman may not have had the same opportunity to acquire a knowledge of national and international markets as the outside specialist.

By using an outside team, moreover, the small businessman can lower his staffing costs because he doesn't have to assign any of his regular staff to full time product development. This gives him greater budgeting flexibility and also eases the peak load when the project demand is the greatest.

Someone from outside the company can often be more effective because he is perceived as neutral or unbiased. His recommendations tend to carry more weight than the advice of an "insider" whose judgements may be suspect because of his personal involvement with the company.

---

...out of ten product ideas emerging from the research stage, perhaps three will go on to prototyping and one will survive for production development.

---

## Product Development Process

Product Development encompasses all activity from preliminary ideas to full scale introduction of the product to the market. It is a sequence of separate and distinct phases, requiring successful co-ordination of individual activities. By breaking down the process into manageable phases, planning and control can be facilitated. Although these phases may be different in detail for different products, or may have a different emphasis with new or existing products, they represent the basic process before variations are considered. Actual programs will, of course, vary but experience has shown that out of ten product ideas emerging from the research stage, perhaps three will go on to prototyping and one will survive for production development. The research stage can account for 5-10% of total project costs, concept development 10-20%, detailing 40-60%. In the implementation stage, manufacturing start-up can account for 5-30% and marketing start-up 5-15%.

## Product Development Plan

Product development includes the various activities from preliminary ideas to the introduction of a product into the market. It is a sequence of separate and distinct phases, requiring careful co-ordination. The first three phases—exploration, screening and business analysis—deal with the search for product ideas, selection of the most promising ideas for further consideration, and evaluation of the commercial feasibility of selected ideas. The last four phases—research, concept, detailing and implementation—deal with the mechanics of product development.

This schematic view of product development shows the interaction of the design, marketing and engineering functions with general management. The different phases of product development, as shown in the diagram, are color keyed to the sections of the handbook where they're examined in greater detail.

### Exploration

Search for product ideas to meet company objectives

# 1

### Screening

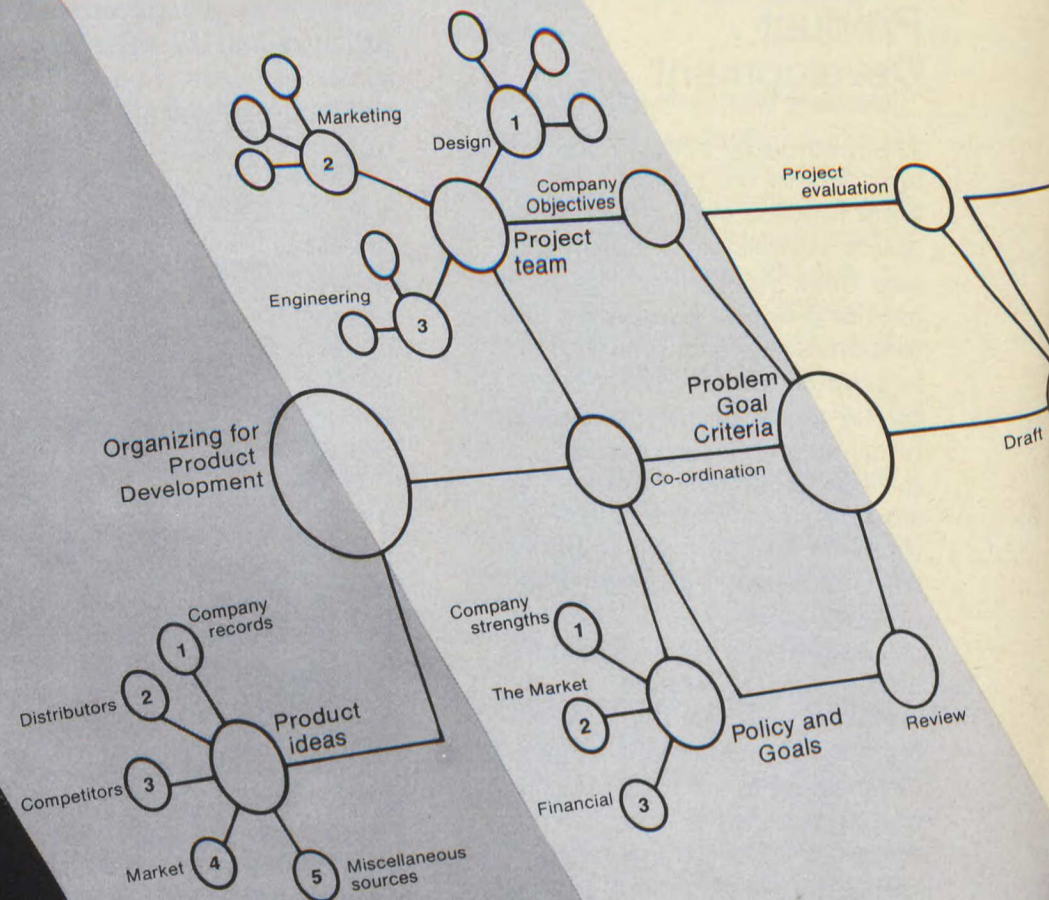
Selection of most promising ideas for further consideration

# 2

### Business Analysis

Expansion of product idea into recommendation and program

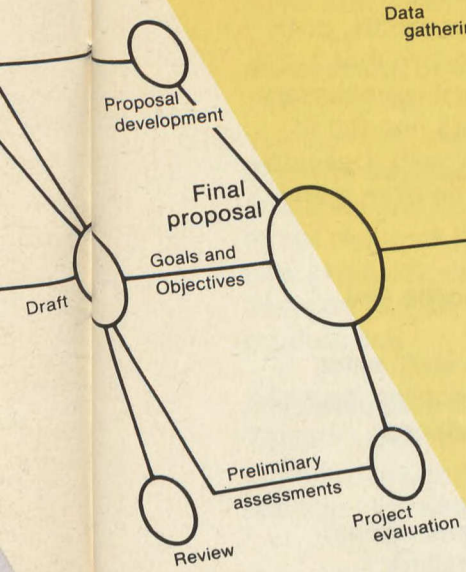
# 3





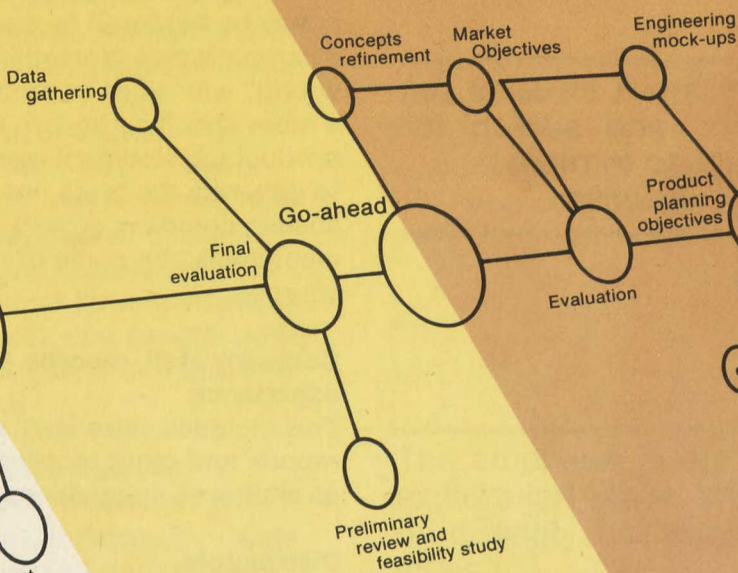
# 3 Research

Gathering information to identify market requirements for product features



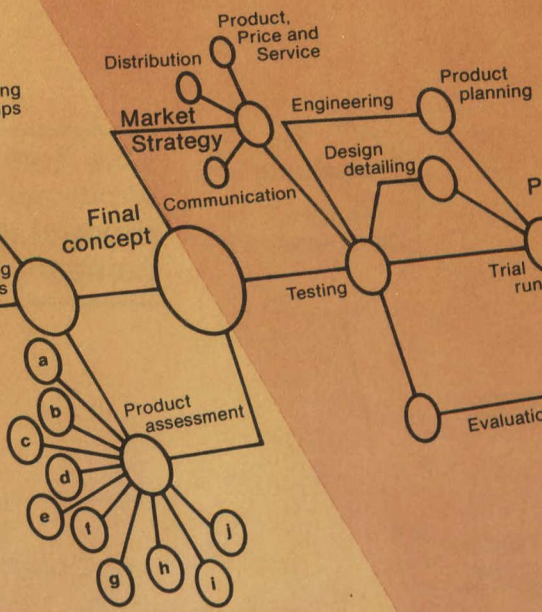
# 4 Concept

Development and evaluation compatible with product planning objectives



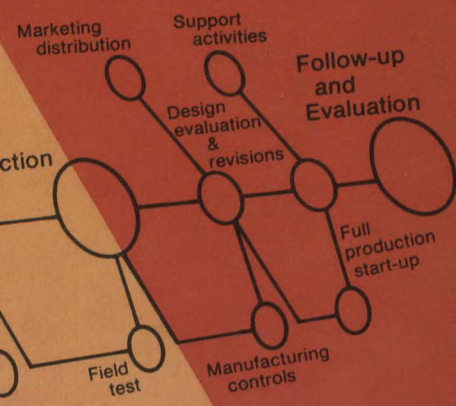
# 5 Detailing

Final details consistent with product development plan

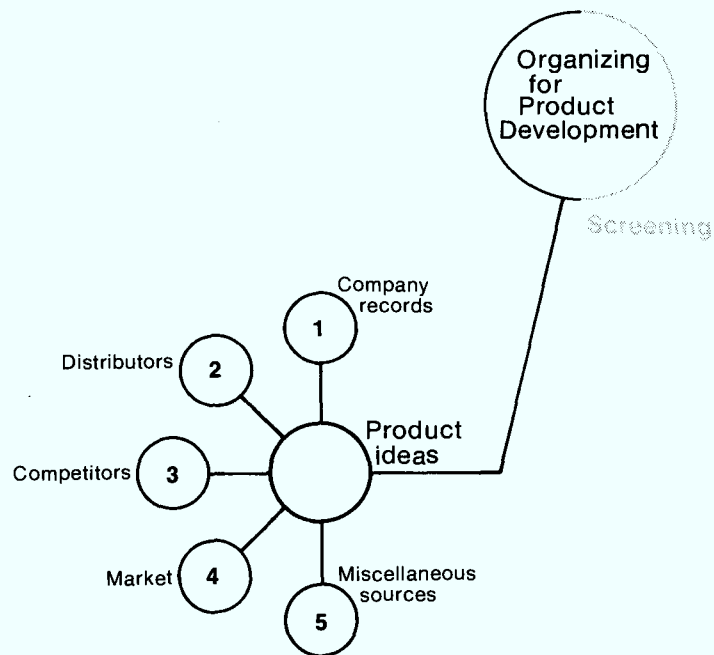


# 6 Implementation

Product launch and follow-up for further product development



# exploration



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This first phase involves the exploration and search for product ideas to meet company objectives.

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This first phase involves the exploration and search for product ideas to meet company objectives. It may be triggered by a vague awareness that "something is wrong" with sales or profits, or by a more specific concern that product development is necessary to generate the profit needed to sustain company growth. Development ideas can come from many sources.

## **Company staff, records and experience**

This includes sales staff, sales reports and other records, as well as employee suggestions.

## **Distributors**

This includes brokers, agents, wholesalers and retailers.



**Competition**

This includes customers of competitors, competitors' products, mail-order catalogues, exhibits and trade shows, foreign products, allied and substitutable products.

**Assessment of Market**

This includes market research, management and salesman contact with the market, customer enquiries and complaints, customer requests for modifications or new products, or a general policy decision to extend or upgrade a product line.

**Miscellaneous Sources**

This includes information from conferences, publications, trade associations and trade journals.

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The emphasis in the exploration stage should be on quantity, not quality, of ideas.

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The emphasis in the exploration stage should be on quantity, not quality, of ideas. It is in this phase that the company begins to identify the problem, and to set goals and criteria by which to judge product ideas.

## Types of assistance available

If a company plans to use an outside person or team for its product development program, the exploration phase is the time to start thinking about the type of services it will require. Expertise is available in the areas of design, marketing and engineering.

### Design

Design skills can be roughly divided into three main areas.

#### 1. Industrial Design

An industrial designer works with a company to develop or design new products as well as improvements to existing products. He is involved with the functional as well as the styling aspects of products.

#### 2. Graphic Design

A graphic designer is concerned with product packaging, stationery, forms, printed materials, signs, etc. This would include such things as:

*Merchandising*—graphics and packaging for the product, point-of-purchase materials to sell the product in a retail area.

*Support materials*—brochures, inserts, direct pieces, catalogues, or other printed materials used to promote a product.

*Other visual identity materials*—stationery, forms, signage, trucks, uniforms.

#### 3. Architectural or Interior Design

This would include the areas of:

*Retail environment*—special architectural or design treatment to merchandise a line of products, or in some cases, create a boutique atmosphere.

*Shows and exhibitions*—design of displays to create a favourable impression on dealers and the general public.

*Commercial space*—planning of offices, showrooms, reception areas.



## **Marketing**

Marketing skills can also be divided into three main areas.

### **1. Technique Oriented**

This category includes specialized approaches such as psychological or motivational research; sociological, observational and mathematical research; group, telephone and industrial interviewing; mail panels and store auditing.

### **2. Functionally Oriented**

This category includes such areas as product planning and testing, test marketing, physical distribution, copy and media research, research by industry, market and channels of distribution.

### **3. General Purpose**

This category involves the use of a range of techniques for a variety of marketing problems, with a blend of technical and functional skills.

## **Engineering**

Engineering skills related to product development can be divided into two main categories.

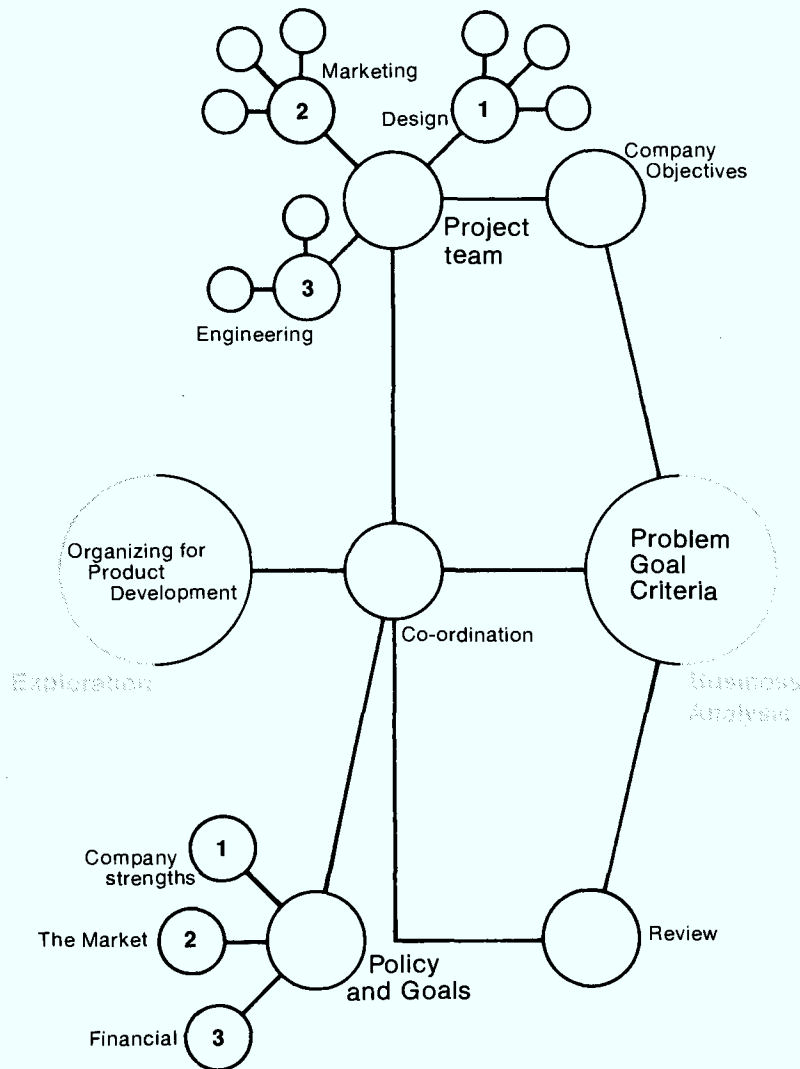
### **1. Design Engineering**

This category includes the areas of mechanical, electrical, and structural engineering, and specialized materials use, which would be incorporated in the product design.

### **2. Production Engineering**

This involves planning, controlling and managing production and uses value analysis, process study and costing, and quality controls to determine the best method of manufacture and co-ordination for efficient full scale production.

# screening



This phase is concerned with the selection of the most promising ideas for further consideration, based on overall company objectives.

Some general criteria are necessary to judge ideas. These include:

## Company Strengths

Are your company's strengths in manufacturing, highly automated production, skilled production personnel? Do you have existing equipment with production capacity available? Is there a strong sales force or a strong capability in a particular technology? Is it high quality or low cost production? Are raw materials readily available? Do you have advantages in materials handling or physical distribution?

## The Market

Is your company involved in retail, industrial or government sales? Is the potential product long usage or consumable? Can it be marketed through existing distribution channels? Would it require specialty selling or mass merchandising? Could it be handled through the present sales department or would it require a new department? What sales volume

would be required? What's the break-even volume? Is the market for the potential product growing or declining?

## Financial

What's the overall budget for the project? What time period is required for the potential product to become profitable and generate cash? Is external long range financing necessary? Do normal trade practices require financial assistance for distribution? Is the potential product seasonal? Is the profit margin compatible with the financial resources and objectives of the company?

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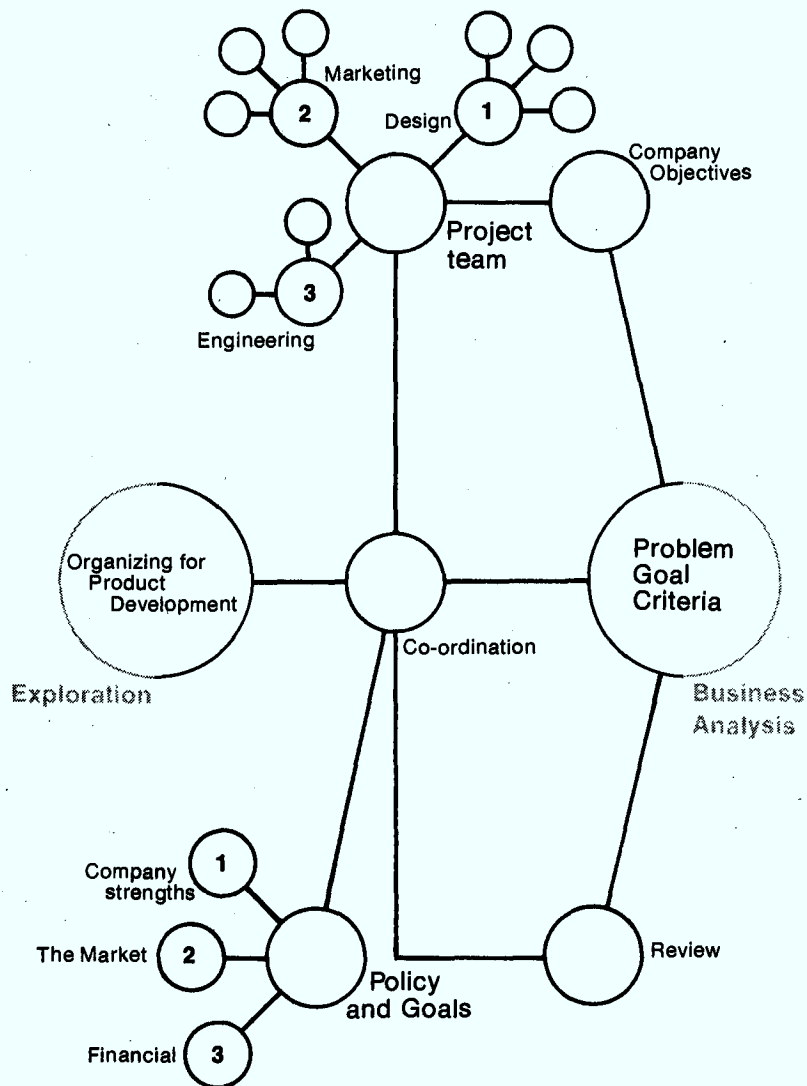
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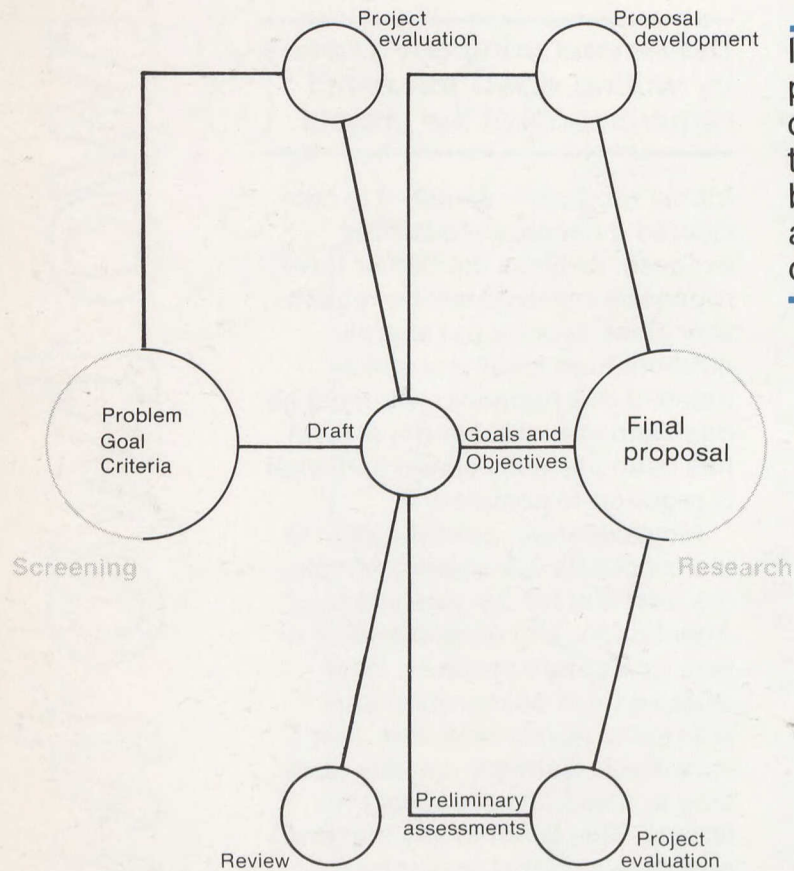
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# business analysis



In the business analysis phase, a product development idea is transformed into a concrete business recommendation and a program for development.

In the business analysis phase, a product development idea is transformed into a concrete business recommendation and a program for development. In this phase, the commercial feasibility of the idea is evaluated, with man hours and funds budgeted. This project evaluation calculates the expected profitability for the firm—investment, costs, revenues—and is the Go/No Go evaluation that is made at the beginning and at intervals throughout the development process. It determines if the project warrants further investment.

Anticipated development costs often become key factors in determining the scope of product development planning. These costs are wide ranging and often difficult to estimate. They include not only the consultant's direct fees and out-of-pocket expenses for travelling, materials, secretarial services, but also an often lengthy list of company expenses. These could include indirect items such as the salary of the personnel involved in liaison with the product development resource, or more obvious expenses for such items as materials, wages and machine time for the construction of mock-ups,



prototypes and a full range of production tooling. Other expenses normally incurred could include:

- salaries for the development of shop drawings
- employee training costs
- purchase of new equipment and tools
- new or revised plant layout
- addition of new employees
- testing and certification fees
- patent, registration and copyright fees
- on-going product and production refinement

The expenses associated with marketing start-up and product launch are usually summarized in the marketing budget which itemizes the dollar allocation for support of the strategy detailed in the marketing plan. These items can be grouped under the following headings:

#### *Advertising*

Media—newspaper, radio, TV, magazine  
 Outdoor—signs, billboard, transportation  
 Co-operative dealer advertising allowance

#### *Selling*

Sales aids, manuals, portfolios  
 Audio-visual, samples and sampling expenses

#### *Sales Promotion*

Indoor signs, streamers, banners, point-of-purchase materials  
 Catalogues and brochures, product sheets  
 Premiums, coupons, advertising specialties  
 Direct mail, telephone selling, Yellow Pages  
 Demonstrations and complementaries  
 Dealer incentives, display space  
 Trade shows, public shows, staffing expenses  
 Displays

#### *Public Relations*

Sponsorship, subscriptions, endorsements, testimonials

#### *Distribution*

Distribution channels, incentives, transportation, financial support; allowances and deals, margins and terms as related to pricing strategy

More general expenses are part of the General and Administrative budget, which would include administrative management and departmental organization; salaries, wages, commissions, and benefits; sales training, contests and incentives. Test marketing and field tests would also be included in this budget as expenses prior to product launch. The product cost-

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In order to achieve a profitable return, all the development expenses must be amortized over the product sales during the growth period of the product life cycle when profits are increasing.

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ing would include packaging and graphics, owner manuals and operating instructions, service costs such as allowance for parts, manuals, warranty reserve, service training. Expenses associated with research will have been included in the overall project budget and would include sales analysis, market potential studies, product research and development, advertising effectiveness and distribution research studies.

The expenses associated with a product development program must be carefully catalogued, estimated and applied to the anticipated returns from the market place over a given period of time. In order to achieve a profitable return, all the development expenses must be amortized over the product sales during the growth period of the product life cycle (see figure 1, page 6) when profits are increasing. This period varies according to the type of product. Any additional new product development must be treated as increased cost and should not be attempted before the former costs have been reasonably recovered. It is not unusual for a product development plan to undergo considerable modification or even cancellation as a result of a careful analysis of development costs.



## The Project Proposal

A well presented proposal should include the following elements:

The *objective* demonstrates an understanding of the total project and the desired results.

A *background statement* serves both to restate the essential facts and to permit others to be rapidly briefed.

The *scope* sets limits on the work by defining not only what is to be done, but just as importantly, what is not included. The proposal should cover the research, concept, detailing, and implementation phases separately, with specific items to be done noted within each phase.

The *methodology* section is usually brief, but where a different approach is being taken, some detail is warranted.

*Assignment of responsibility* is a major factor, and responsibility and authority must be clearly defined.

*Reporting* methods and relationships should be noted. Progress reports by phase should be filed as required, as well as a final report presentation.

*Duration* of the project is sometimes related to cost. But, assuming a certain starting date and no major change in scope, the completion date of the project should be spelled out in the proposal.

*Cost and method of payment* are detailed in the proposal. Management should be made aware of any anticipated cost overrun before it is incurred. Usually, out-of-pocket expenses for travel, materials and other expenses are billed in addition to the consulting fees.

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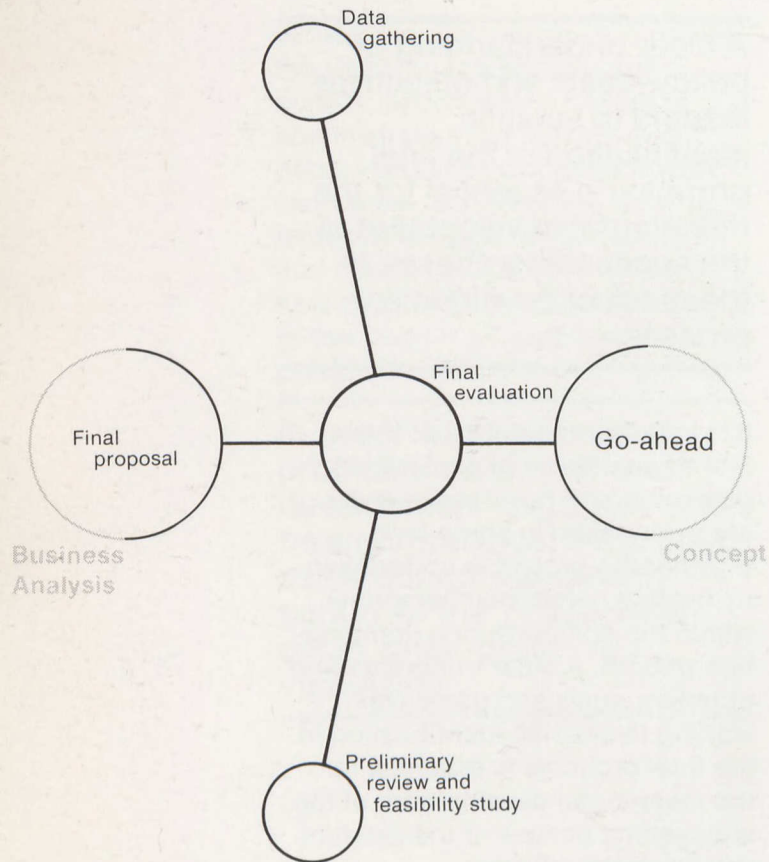
A clear understanding of policy, goals and objectives leading to specific identification in the final proposal is essential for the meaningful development of the succeeding phases of the product development process.

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It is important to note that these first three phases of exploration, screening and business analysis are undertaken in some form, whether the project is undertaken by outside personnel, personnel within the company, or a combination of both. A clear understanding of policy, goals and objectives leading to specific identification in the final proposal is essential for the meaningful development of the succeeding phases of the product development process.

The mechanics of product development are described in the following four phases. Each phase involves the use of marketing, engineering and design skills.

# research



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The research phase is primarily concerned with the gathering and assimilation of data to provide a factual basis for concepts development by identifying market requirements.

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The research phase is primarily concerned with the gathering and assimilation of data to provide a factual basis for concepts development by identifying market requirements. Also, working out basic calculations to determine technical feasibility of the proposed product.

Activities included in this phase are:

## Marketing

- Preliminary market assessment to identify the target market

- Determine the product features and performance requirements

- Estimate the market potential

- Market research on product benefits to potential customers

- Analysis of the competition

- If it is an existing product, analysis of cost, pricing and profit history

- Assess existing distribution channels and the effectiveness of advertising, selling and sales promotion. Also, the buying processes involved

- Preliminary assessment of problems and opportunities

- Market forecast to determine the total market and the company's share of the market in dollars and units

### **Engineering**

- Review the outline of manufacturing specifications
- Identify probable critical problem areas and resolve them in principle

### **Design**

- Study existing product use to identify areas of improvement. This would include a critique of the existing product (or proposed new product) from a design standpoint, including user needs, and from the point of view of company goals.

- Study existing or proposed product components, production techniques and the preliminary budget in order to set limits of design and production improvement. A product can't be designed in a vacuum. The production capability of the company and the needs of the customer must be considered in design decisions. In almost all

cases, some degree of upgrading of manufacturing techniques will be required to produce a new or improved design.

- Document, for future reference, relevant codes, specifications and binding regulations that might influence the design concept. These can be obtained from the Canadian Standards Association, the Canadian Government Book Store (formerly Information Canada), the Federal Department of Consumer and Corporate Affairs and Provincial Government offices.

- Review policy and goals guidelines as well as the situation analysis to determine the product improvement or new product profile desired. A report of some kind outlining the designer's approach should be tabled for evaluation. Erroneous or misleading data incorporated into this stage may have serious repercussions down the line.

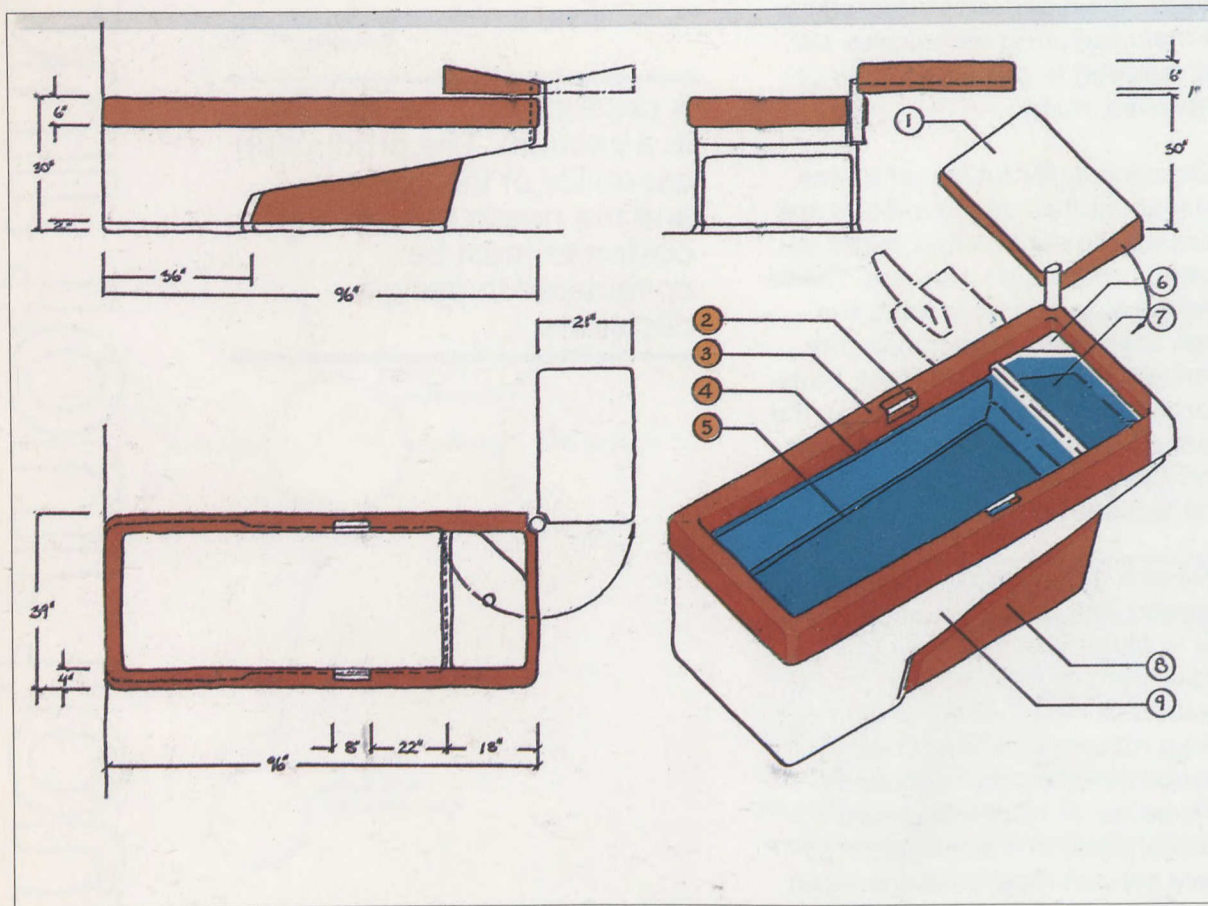
In some cases, the research phase reveals that the proposed product development program is not feasible for the company, as the following case history shows.

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A product can't be designed in a vacuum. The production capability of the company and the needs of the customer must be considered in design decisions.

---





*Dimensional data for immobilized patient bathing station*

### Case Histories

A large **custom fabricating company** working primarily in stainless steel filled an emergency order for a local hospital by fabricating 2 stainless steel bathtubs to specifications developed by hospital staff. These baths were designed for use by extended care patients who were partially or completely immobilized and were used in conjunction with a standard sling lift for the patient.

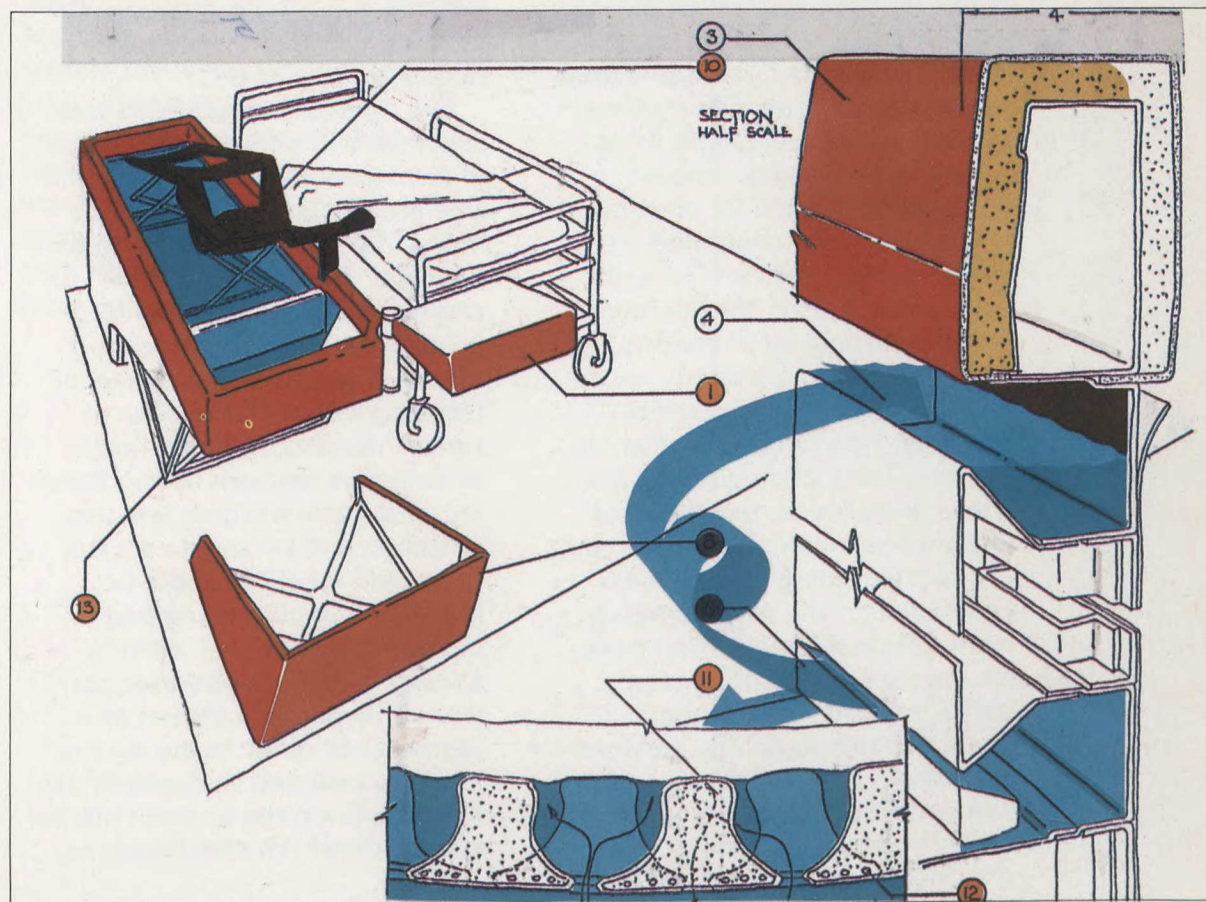
*Develop a standard product line*  
For some time it had become apparent to the management of the company that their labour to bought-in components ratio had been shifting so that it now comprised a ratio of 25% labour to 75% installed components. In addition, they were losing long standing customers whose volume had steadily increased over the years until it became more feasible for them to set up their own fabrication facilities in-house. This led management to believe that more stability could be gained by the creation of a line of standard



products, the first of which was a system of animal feeding and handling equipment. It was thought that another standard product line could be developed from the bathtubs for immobilized patients in hospitals and nursing homes.

#### *Market research*

A marketing and feasibility study was undertaken to assess the market potential. Historical data was based on Statistics Canada 83-201, List of Canadian Hospitals, with the target market defined as general hospitals of over 200 beds, rehabilitative and convalescent units, extended care and specialized facilities, nursing homes and rest homes. Ratios of potential use were estimated for each type of institution with general hospitals as the lowest and chronic care, rehabilitative, and nursing homes as the highest. Adjustment estimates were made for new construction and installation in existing facilities—anticipated market penetration—competitive products. Along with other supportive data, these statistics



*Section showing water circulation and patient suspension system*

gave a unit estimate range for the target market.

Market data was generated from personal interviews with nursing administrators, along with a mail questionnaire, using concept sketches as a guide for discussion. These interviews confirmed the target market users and brought out more detail for consideration in the development of the product, and the marketing strategy necessary. Factors for consideration included: type of treatment within the institution, pricing (initial purchase, installation, maintenance and service), staffing (transfer and transport, training, ease of use), compatibility with existing equipment, product features and benefits, layout (ward arrangement, traffic patterns, new concepts in decentralized planning), services capacity in older hospitals.

A separate evaluation was made of the necessary distribution channels through supply houses, dealers and wholesalers. Also, the marketing and sales organization necessary for contacting architects and wholesalers to become specified and for direct sales contact to the institutions. Additional evaluations were made of mater-

ials use, purchased components, manufacturing and assembly, duties on imports etc.

The information gathered was assembled in a preliminary report to form the basis for more extensive product development and marketing planning. A design concept was developed as shown on pages 24 and 25, based on preliminary research of competing tubs and analysis of user needs. Considered here were ease of patient mobility, reduced height of patient movement during transfer, automatic washing features, cosmetic and personal care options (hair washing, make-up, facial), water circulating and cleansing techniques, service access, and more operable controls. This concept served as a key features guide in the survey and was included primarily to gain further knowledge of exact market requirements not specifically re-

lated to a brand name and in anticipation of project start-up.

It was found that the existing tub did not meet user requirements at either end, being too high priced to compete with standard bathtubs and too restricted in features to compete with the automatic bathing stations. The new concept bathing station was well received and would have formed the data basis for development of more specific concepts.

#### *Major changes required*

It was apparent from the market survey, however, that full scale product development would mean a major shift in the company's manufacturing methods and involve large capital expenditures. A second major factor would be the necessity to establish a new marketing and sales organization, along with a specialized distribution network. In evaluating these factors against the company's strengths, goals, other priorities and lower risk of other products under consideration, it was recommended in the marketing study that the company should not enter into product development for the bathing station.



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#### *Improved productivity*

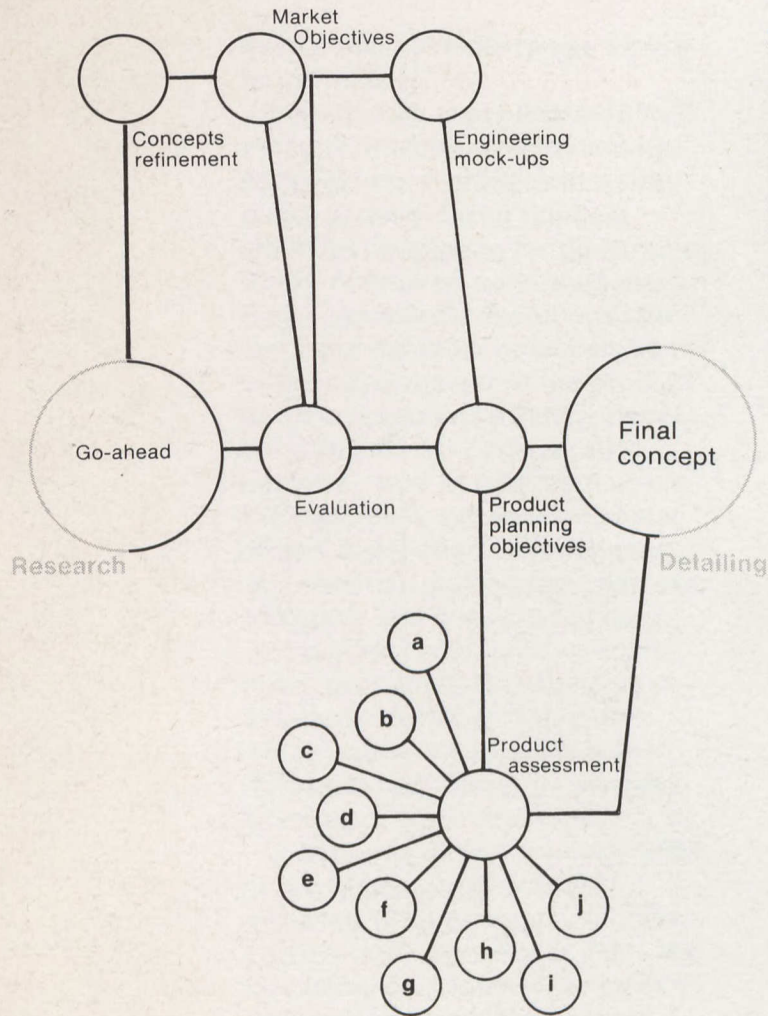
With an **aluminum boat manufacturer**, the research phase took the form of a feasibility study to determine the cost and effectiveness of improving manufacturing productivity. The objective was to increase output from the existing plant with reduced cost per unit. The study was directed at the assembly section and, to a lesser degree, the material preparation section. A time study found an imbalance in the assembly line, and methods study showed too many manual operations and excessive material handling.

#### *Recommendations*

The recommendations were to: reduce the amount of hand drilling by using existing equipment for pre-punching; reduce assembly time by using a locator; use jigs and fixtures as aids to reduce labour and increase repeatability of quality; use a mechanized device for water testing to reduce

manual labour and provide more accurate and consistent testing; reduce the amount of final cleaning by degreasing and pre-cleaning during manufacture. Each of these recommendations was accompanied by a cost-benefit analysis and the completed feasibility study formed the basis for further development and detailing.

# concept



The concept phase is mainly concerned with using the information gathered in the research phase to set objectives and strategy and to synthesize new product or product improvement ideas.

The concept phase is mainly concerned with using the information gathered in the research phase to set objectives and strategy and to synthesize new product or product improvement ideas. This phase is also concerned with investigation of product specifications and manufacturing objectives.

Activities included in this phase are:

## Marketing

- Set market objectives in terms of dollars and units

- Determine your market penetration goals, profit objectives and contribution, as well as the risks and alternatives

- Undertake market research to determine the impact on the target market of the benefits of design development

- Decide your strategy for product line additions or deletions, pricing, distribution channels and sales, support activities

- Identify market requirements and acceptability

-Determine opportunities for increased growth and profit by penetration of present/new markets with existing/new product.

## Engineering

-Preliminary product costing

-Design necessary evaluation trials

-Co-ordinate construction of mock-ups with bench experiments

-Re-appraise production problems and manufacturing specifications

## Design

-Prepare sketches, scale models or renderings depicting design ideas, including features, colours, typical method of assembly, installation, suggested use of materials and reference dimensions.

-Evaluate and grade design concepts according to their compatibility with previously established product planning objectives. The

following questions should form the core of a thorough concept evaluation:

- a. How compatible are these concepts with market profiles as previously defined?
- b. How can this product be made here?
- c. How much will it cost to make?
- d. How many can be sold?
- e. How many can be made? How long will it take?
- f. How much will manufacturing processes, fees and development expenses add to the cost?
- g. Is further development expense justified by anticipated returns from the marketplace?
- h. How will these concepts affect existing product lines within the company? Competing products?
- i. What is the growth potential of each concept? Can it be enhanced (new features, cosmetic changes, cost reduction through increased volume or material change) at a later date to support sales/income curves?
- j. What benefits can be derived from these concepts to improve existing company products?

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It is entirely possible that none of the ideas developed meet the stated objectives. This could indicate a lack of understanding of those objectives, or poorly developed goals.

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The successful concepts are passed on to the next phase for further development. It is entirely possible that none of the ideas developed meet the stated objectives. This could indicate a lack of understanding of those objectives, or poorly developed goals. However, failure to produce at least one workable concept is almost always related to a breakdown in the communication of information to the project team during the research phase. The objectives, which form the most basic design criteria, must be re-evaluated and clearly re-defined and another attempt at concept development made, utilizing the same source.



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## Case Histories

### *Product improvement*

A **recreational vehicle manufacturer** enjoying a growing regional market, recognized the necessity of product improvement, if not design innovation, as a potential means of increasing sales. Management was acutely aware of the sensitivity of the product's pricing structure as well as the interlocking nature of the method of production, which is basically labour intensive throughout the industry. Therefore, a reduction in labour content through the use of pre-formed, pre-finished interior components that could be installed as sub-assemblies could result in more marketable consumer benefits at the same or at a moderately increased price. It was suggested that a product improvement program be undertaken, concentrating on the least developed and most isolated area of the trailer / camper, the bathroom, with a price increase of between 10% and 20% for the area being an acceptable maximum. The theory was that being located in a separate compartment of the vehicle there was a reduced danger of the obsoles-

cence of the balance of the trailer interior by a more advanced component. This would limit impact on the production line also, as the new units would be handled as bought-in components. It was agreed the material best suited was fiberglass reinforced plastic as standards for its use had been set by CSA. It did not require expensive tooling and the technology could be transplanted to the factory at a later date to provide additional FRP parts for fenders and roofs as demand for such parts increased.

### *Design research*

Research was undertaken by the designer to determine what deficiencies were present in the existing, built-up bathroom, how it compared to facilities in competing units, dealer opinions as to impact of improvements on marketability, and binding requirements of CSA. A number of constraints were immediately identified:

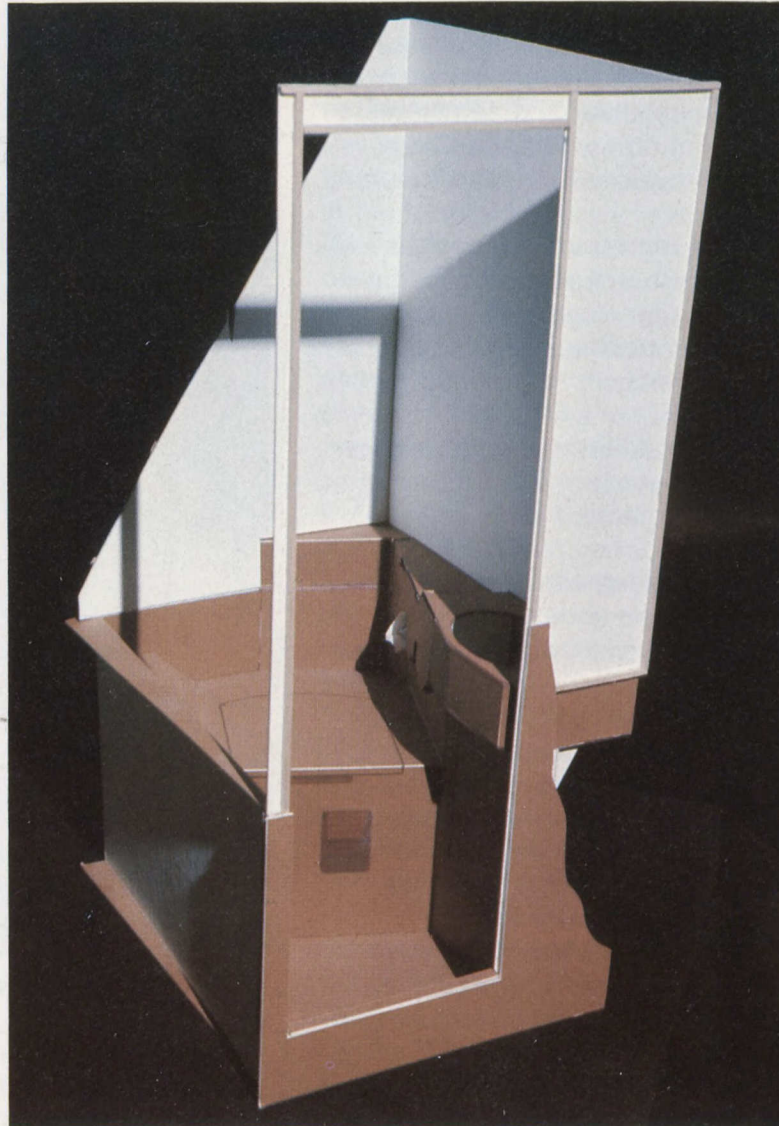
- size and configuration of allocated space could not be increased
- use of purchased components such as toilets, sinks, holding tanks, taps, and plumbing should continue
- toilet sizes and shapes could change without notice, requiring the use of an adaptor
- the room should be functional as either a wet or dry environment, without the aid of curtains and related hardware, and should be easily cleaned
- projections should be eliminated

### *Concepts development*

A full scale space buck was laid out to define the limits of the area for the designer. Literature or samples of each fixed component were obtained and analyzed. A concept or premise was devised that identified the nature of the room: a multi-purpose hygiene area, durably finished, easily cleaned using shower equipment, well ventilated providing one space for showering and toilet activities as well as storage of water, wastes, and toilet articles.

Sketches were developed to give the ideas a physical shape, depicting various room configurations and locations of equipment. The problem became one of providing shrouding or support for the installed components while attaining the maximum amount of free space for showering activities. A 1/4 scale study model in cardboard (see right) was built from the most promising sketch and a rendering of the finished FRP components in exploded view was prepared for presentation (see page 32).

*1/4 scale model of recreational vehicle  
molded bathroom*





### *Recommendations*

The design concept was evaluated by the general manager, plant production engineer and personnel in charge of new product development with recommendations such as:

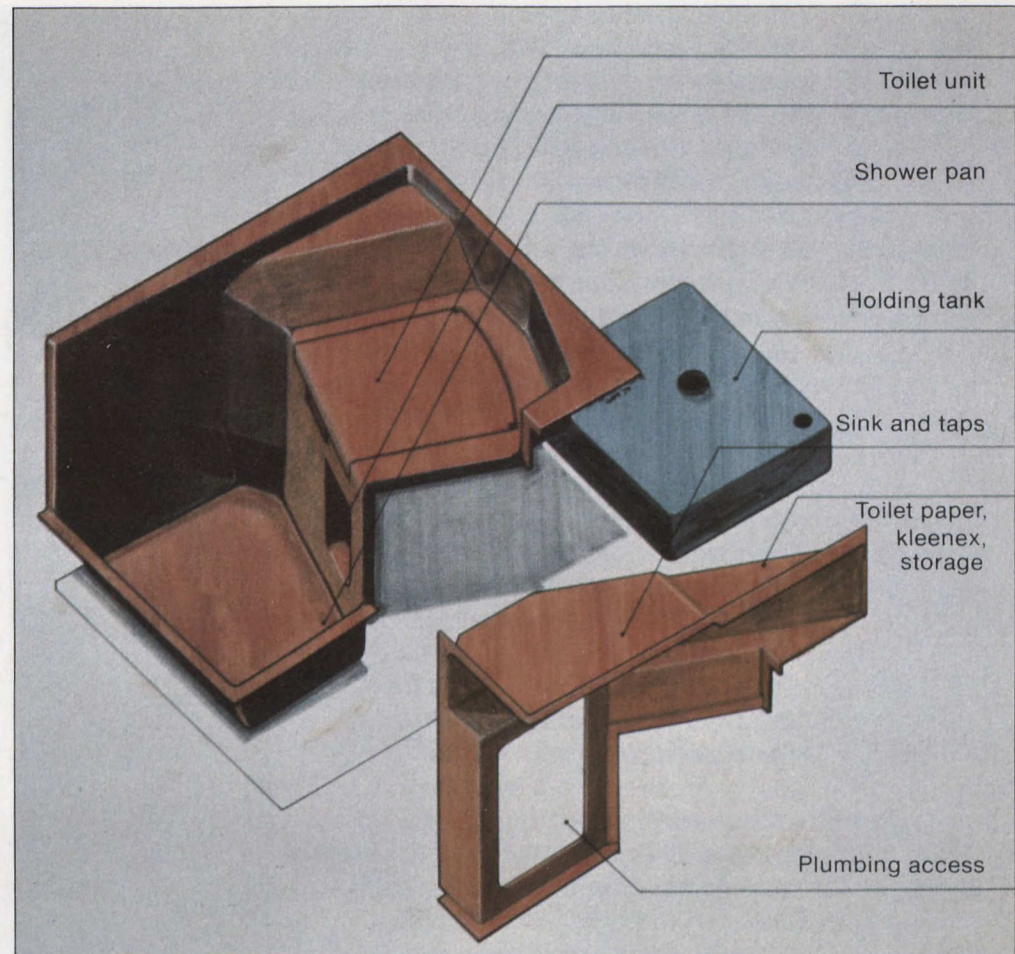
- amend the design concept to adapt parts to a second configuration, in order to gain sufficient volume to satisfactorily amortize tooling costs

- the toilet adaptor should be a low cost, vacuum formed part that could be changed

- alternate methods of production and materials should be investigated to bring production in-house

- scheduling would have to be revised

Concept development was extended to cover the new requirements, resulting in an additional part. The project was reviewed again, including a dimensional layout drawing of each room, and passed for further development. In the detailing phase, dimensional drawings, fabrication details, a 1/2 scale cardboard mock-up and tooling estimates were developed.



*Rendering showing molded components of recreational vehicle bathroom*



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### *Market research*

Extensive market research for a **tent trailer manufacturer** had revealed weaknesses in product design, marketing strategy, support activities and distribution channels through the existing dealer network. Product design was handled by interim changes for immediate correction, through to a new series of models with design undertaken by outside consultants retained on an extension basis. A new brochure was also developed concurrently to support the new product design.

### *Marketing strategy*

The concept development for marketing outlined the need for a new company image with a visual identity program in the areas of sales promotion (signage, banners), manuals (dealer, parts and service, policy, procedures), advertising, and stationery. Further concept development outlined objectives in total units and line balance-of-sale, model identity and pricing strategy through a revised dealer structure, customer and dealer service and policies. A suggested advertising program was

outlined, and sales promotion support including sales aids and manuals, point-of-purchase materials, brochures and owners manuals, display modules with audiovisual equipment, and participation in trade and public shows. Consideration was recommended for accessory packages and promotional event items, along with a line of associated merchandise.

A better defined control of field sales was recommended in setting, recording and evaluating performance. This included quotas for sales, budget and activities; expense and call reports, work plans; reports on new business, lost sales, complaint and adjustment; and general business conditions including competitive activity and revised estimates by model.

### *Distribution channels*

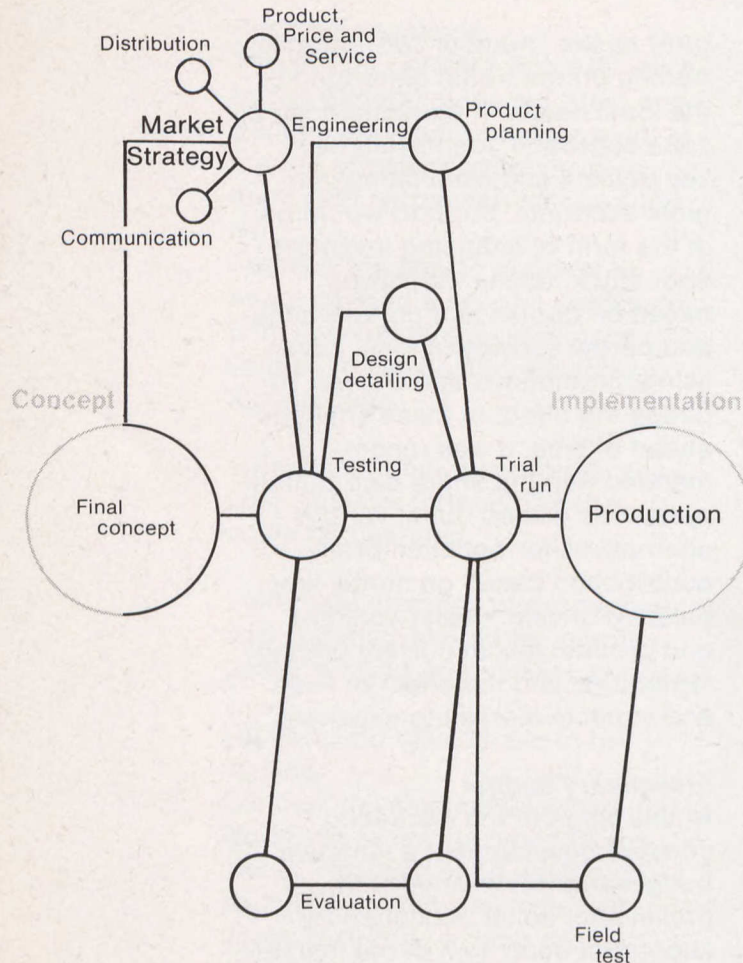
A revision to the distribution channels was recommended, based on medium-sized dealers, with larger dealers acting as distributors to smaller outlets. This required a lower-cost physical distribution system utilizing rail car shipments. The strategy emphasized the need for aggressive merchandising and support to establish the manufac-

turer as the "number two" supplier, trading on the traffic generated by the local dealer. It recommended a zone approach, identifying new key dealers and eliminating marginal accounts. Support would be in the form of financing inventory floor stock, dealer incentives based on quotas and performance, and partial subsidy of local advertising, promotions and shows. To gauge the effect of these changes ahead of time, it was recommended that the entire distribution system be costed out at various alternatives for optimum profit contribution based on model line balance-of-sale, dealer volumes and product mix at current pricing structures, and the effect of fixed and variable marketing expenses.

### *Preliminary budget*

At this stage of the marketing concept development a tentative budget was established with preliminary dollar allocation for support of each item of the marketing plan, to be revised on final budget after the detailing phase. This budget would in turn become the profit plan for implementation, monitoring and follow-up.

# detailing



The detailing phase develops and refines the technical concepts and details consistent with, and as an expansion of, the product development intent established in the concept phase. It includes the marketing plan for product, packaging, and pricing; distribution channels; advertising, selling, and sales promotion. Also, planning for manufacturing, equipment, factory layout, and materials handling.

Activities included in this phase are:

## Marketing

- Assessment of product, packaging and pricing to the customer
- Establish service and guarantee policy; allowances and deals; margins to distributors, credit and returned goods policy
- Strategy and plans for advertising, selling, sales promotion, and public relations
- Design of marketing materials
- Modification if necessary to distribution channels and transportation

- Establish time schedule, staffing responsibilities, profit plan and marketing budget

- Test marketing before proceeding to full-scale production

The visual elements of the marketing plan are the most effective when they are co-ordinated within a corporate identity program (see appendix page 56).

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The detailing phase develops and refines the technical concepts and details consistent with and as an expansion of the product development intent established in the concept phase.

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## Engineering

- Product planning with methods study for manufacturing, time study, value analysis
- Equipment planning for manufacturing parameters, factory layout and materials handling
- Process study and costing
- Design of jigs and tools
- Construct pre-production prototypes

## Design

- Preparation of general dimensional assembly drawings or the construction of three-dimensional, full scale mock-ups and supporting drawings of the selected concept. This does not include, unless by prior agreement, shop drawings, tooling drawings or part development drawings.
- Specifications for use of materials, method of assembly, finishes applicable, manufacturing techniques, sources for purchased components, and colour schemes.

The material produced in this phase would be subject to review and revision by management and the designer, keeping in mind the overall product theme set in the concept phase. In some cases, the designer acts as an advisor or consultant to an in-house development team which assumes responsibility for all design and working drawings. In this capacity the designer is responsible for maintaining the design intent of the concept and may develop detail sketches or dimensional drawings of those components critical to the overall product plan. Often, three-dimensional mock-ups of the proposed part or assembly will be constructed by the designer, (or by pattern makers or modelers hired by him or company staff) to verify overall shape, contour, and human factors (if any), and to demonstrate various theories or principles. If sufficiently detailed and accurate, the mock-up will be used as a basis for the completion of detail drawings by either the designer or company staff. Both approaches are well documented in the product development program undertaken in the following case histories.

## Case Histories

Through a strategy of flexible plant scheduling, prompt delivery, and a willingness to innovate, a **fiber-glass products manufacturer** has become the sole Canadian supplier of interior components to a large franchise restaurant chain. This includes seating, benches, tables, indoor and outdoor trash receptacles, building decor panels, table and chair frames, and related accent elements. These are fabricated in fiberglass reinforced plastic, steel, plastic laminate, and plywood.

### *Design innovation*

To gain access to a market served almost exclusively by two large U.S. companies, the manufacturer had to demonstrate its abilities to their client. This willingness to undertake design innovation proved to be most opportune as both competing companies manufactured virtually identical restaurant components with little or no difference in price. Coincidentally, the U.S. head office, concerned over more advanced decor



schemes offered by competitors in the fast food market, was open to innovations that would increase customer draw, reduce capital costs, or improve and accelerate maintenance activities. Initial enquiries by the manufacturer revealed a good potential in the Canadian market for acceptance

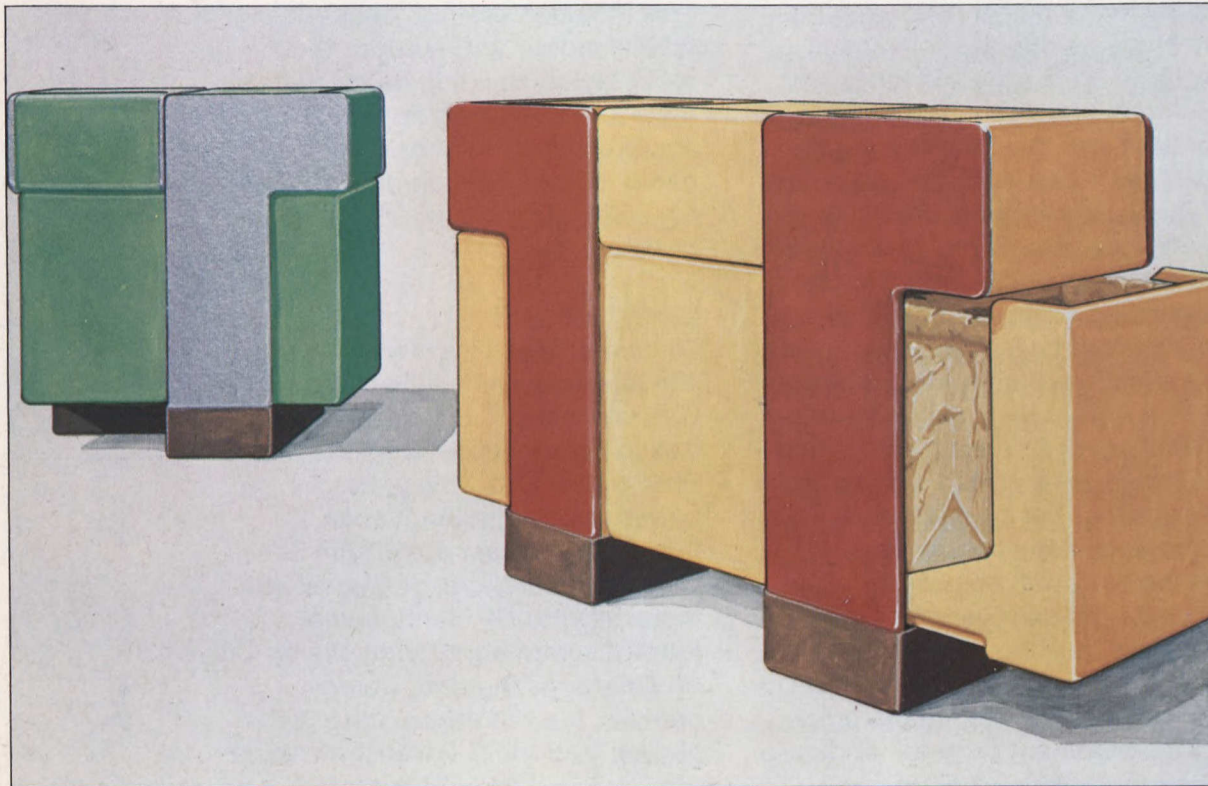
of new ideas, particularly in the areas of seating and trash disposal.

#### *Full scale mock-ups*

A design program was launched to develop alternative concepts for double tandem swivel seating, tables, bench seating, and related

steel support frames, at competitive prices by reducing, where possible, the number of components to be assembled, labour intensive finishing techniques, and factory defects.

A series of concept sketches was developed by the designer, of which two were selected for further detailing. In lieu of detail drawings, full scale mock-ups were developed by the designers, in their shop, of a modified steel support frame and all-molded table with two variations on a swivel seat. These were complemented by general dimensional drawings of the frame and drawings of design modifications to the existing bench seat. The seat mock-ups were constructed of wood, rigid polyurethane foam covered with polyester resin, and painted to simulate actual installed conditions. Fitting trials were carried out on a constant basis during the sculpting of the foam seat mock-ups resulting in a shape that was dimensionally as well as ergonomically correct. Such nuances as the flow of surfaces and control of highlights normally "tuned" or added after prototypes have been developed from drawings, became



*Rendering of an all-molded plastic trash receptacle for fast food outlet*

an integral part of the detailing process. This not only provided a better opportunity to create a more interesting form but also gave a more immediate understanding of possible technical problems.

#### *Implementation*

A sample installation was prepared and the concepts were tested by management for comfort, structural integrity, and compatibility with functional requirements. One concept was selected for further development, and the mock-ups were refined by the designer. A second presentation, mainly concerned with the impact the new design had on production, was held and the mock-up approved for implementation. In this case, the approved parts were forwarded directly to the plant pattern-maker, with final dimensional revisions indicated, for fabrication of production plugs.

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#### *Working drawings*

The mock-up method of detail development described above is in direct contrast to the more traditional method of preparation of detail drawings prior to construc-

tion of prototypes. The latter method was carried out for the same company in support of the trash receptacle design program at a later date.

Again, a series of renderings depicting various concepts for a multiple door trash receptacle were presented by the designer, discussed with the restaurant's technical representatives and the manufacturer, and an all-molded concept selected for further development (see page 36). Strict dimensional and production requirements dictated a modular concept with a rectilinear format, and it was decided that detailing should take the form of working drawings for better control. These were prepared by the designer and a draftsman under his direct supervision, consistent with design and production restrictions unique to the operation. Periodic review of the drawings in progress resulted in two sets of revisions, which, for contractual purposes, were considered as new requirements. The final drawing package consisted of six drawings including:

- general view (top, side, and front) and perspective of the unit with overall dimensions, in scale

- full section (front and side) showing all assembled parts and hardware, with dimensions and critical stations shown, in scale

- sections, details, and other views of individual parts requiring more precise control or individual molds, with dimensions keyed to critical stations, in scale or full size

- general views depicting variations in format, with dimensions, in scale

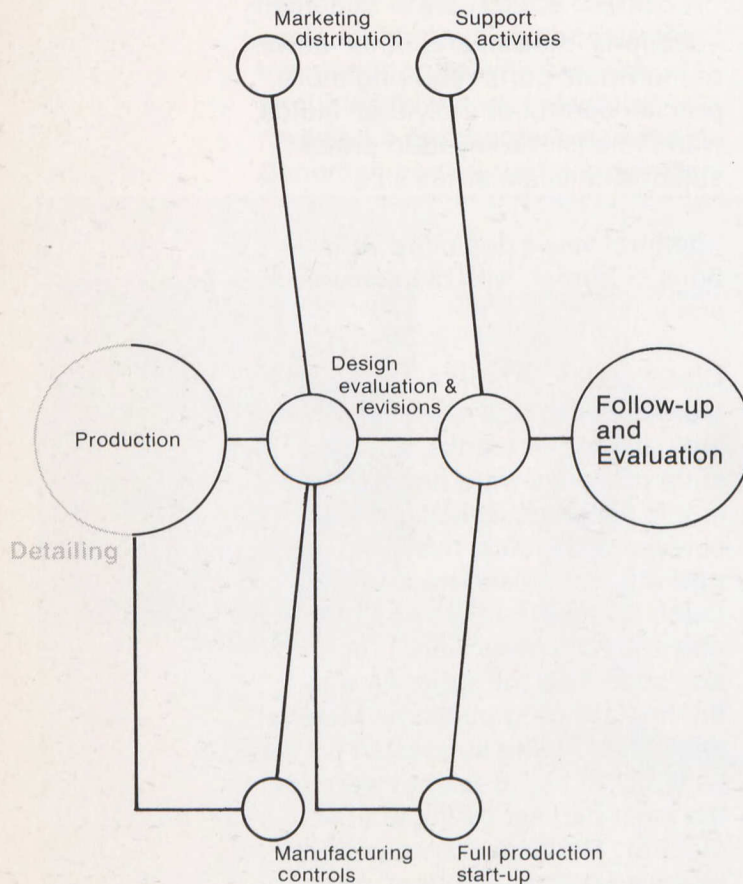
#### *Construction of molds*

Mold drawings, development drawings of parts or blanks, and other shop drawings were not included in this package. Specifications for screws, bolts, nuts, rivets, washers, gaskets, purchased hardware (such as clips, latches and brackets) and adhesives were prepared and submitted for approval with the final drawing package. Material thicknesses were suggested by the designer in key areas but were for the most part set by the manufacturer. The final drawings were reviewed by management, approved for implementation and passed to the plant pattern-maker for construction of molds.



# implementation

The implementation phase of most programs is almost always the least used, yet the most crucial exercise of the product development process.



In this phase, the marketing plan is implemented and the product goes into full production.

Activities included in this phase are:

## Marketing

- Activate the distribution organization and support activities for product launch

- Produce marketing materials

## Engineering

- Set manufacturing controls for co-ordination with the pre-determined plan, including quality control, organization and budgetary controls

- Construct jigs and tools

- Do a trial batch and testing

- Begin production

## Design

- Supervise and maintain design intent to assure proper development of product design concept

- Evaluate prototypes, pre-production samples, pilot production samples and related materials



–Revise product design attributes, established in the detailing phase, to conform to the findings of the evaluation. This may take the form of new drawings, revisions to existing drawings and specifications, or written or verbal recommendations.

Revisions should be limited to correcting errors or omissions, and a major shift in design intent or materials use would not be considered part of the implementation stage.

### Case History

#### *New product design*

As described in the concept phase the **tent trailer manufacturer's** particular dilemma required not only more substantial marketing efforts but the total redesign of their product, which had developed a reputation based solely on the technical misuse of vacuum-

formed ABS plastic. The designer executed a series of concept sketches for improved tent trailer designs in support of management's decision to abandon the troublesome all-plastic camper.

The proposed improvement consisted of a blend of traditional tent camper body technology with molded plastic end caps, lower body skirts and improved frame, open wheel wells, and roof. Concepts were presented to management depicting variations on this theme, its feature content and price range (see page 40). The design approach was approved outright, with the exception of the plastic roof. Due to time restrictions, this was amended to a modified version of the more traditional foam sandwich roof used throughout the industry.

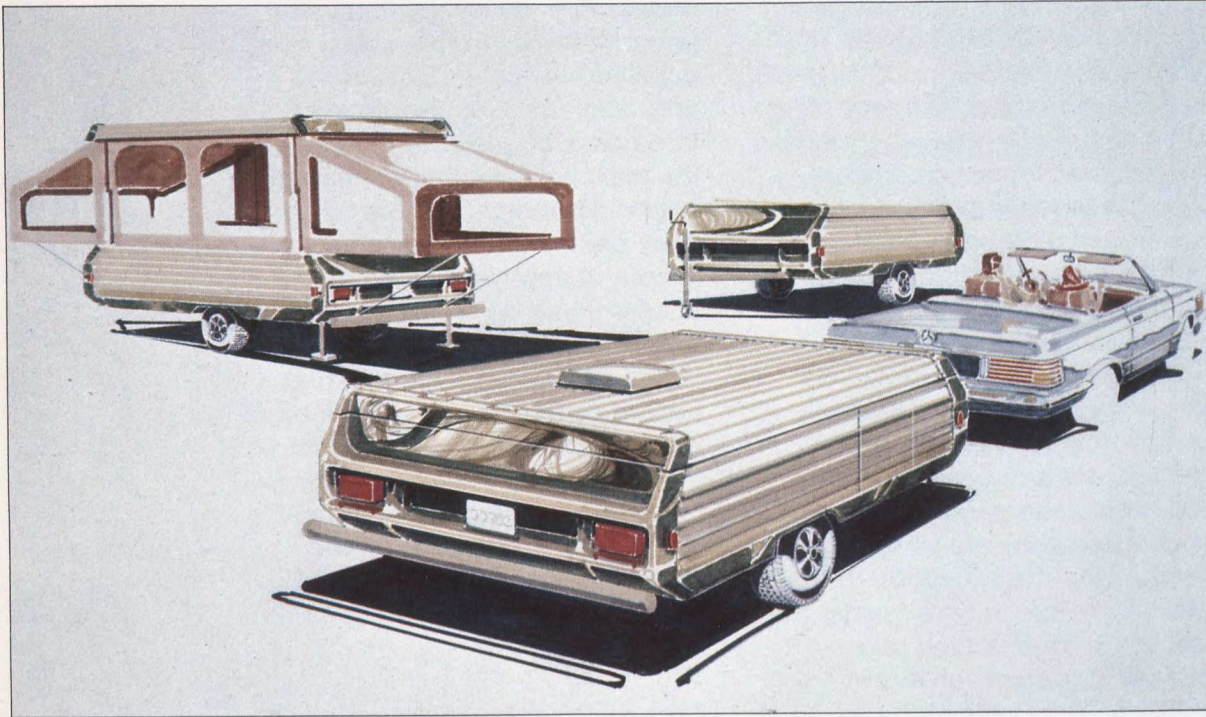
#### *Full scale mock-up*

Detailing was formed by full scale mock-up construction in the client's plant from more specific sketches developed by the designer. Sampled details of corners and radii, and accent areas of the molded end caps were roughed out in rigid polyurethane foam by the designer and passed on to the

Research and Development staff for completion. In this way, a fairly detailed full scale model of the proposed unit was developed in three days of designer time within the plant, with refinement carried out on a continuing basis by company personnel. As items became fixed and approved by both management and designer, patterns would begin for vacuum forming molds. At various stages during tooling development, sample parts were molded and integrated into the mock-up to check the maintenance of critical dimensions, tolerances, and design intent. Modifications to tooling and adjacent parts were carried out on an on-going basis.

#### *Evaluation and recommendation*

At this point, the designer's role became one of evaluation and recommendation. Interior layouts developed in the concept phase were hardened into physical entities and materials selected for use were reviewed by management in terms of costs, availability, durability and market appeal. Revisions were made accordingly by



*Concept sketch of tent trailer*

the designer and resubmitted. A company design draftsman recorded details and dimensions as they became known, and began the design of mechanical items such as a roof lift mechanism, improved suspension techniques, and modified frame and floor details.

#### *Designer / Client liaison*

An example of designer input during implementation occurred as the prototype roof was being developed. Detailing of the roof had been carried out by management, with only moderate success due to the physical limitations of the materials. The designer was called in to inspect a sample roof, installed on a prototype body, with adjacent body elements in place. Unfortunately, the process devised to form the roof had not succeeded in duplicating the required corner radius and tumblehome. After consultation with production staff, a new interim method of fabrication that ensured the maintenance of the proper radius was devised and tested with acceptable results. The design concept was amended and the tumblehome modified, without serious effect on

the overall visual character of the vehicle. This was a decision that could only be made by a person familiar with the logic behind the design theme approved in the concept phase. The method of operation described above is not typical insofar as normal product detailing is concerned but was necessary to produce crash results. However, good designer/client liaison during implementation was essential to the successful development of a virtually new product that most probably created a turnaround situation for the company.

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### **Implementation crucial**

The implementation phase of most programs is almost always the least used, yet the most crucial exercise of the product development process. Communication should increase during this phase to facilitate the identification and solution of problems before they become major hindrances. Management should consider the implementation phase as a protection of its investment in the overall program and a key to the launching of a successful product.

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It is the follow-up that provides the market, user, repair and maintenance feedback that is the basis of recommendations for research and further product development.

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## **Follow-up and Evaluation**

Opportunities for project monitoring and evaluation are built into each phase of the product development process, with clearly defined measurement criteria, in order to maximize your chances of success. A complete appraisal of the project, however, can only be made over time. How did the project recommendations work out in practice? Did the project meet its objectives? Did events occur that could have been foreseen and were not? Did the project create problems for the company in other areas?

It is the follow-up that provides the market, user, repair and maintenance feedback that is the basis of recommendations for research and further product development.

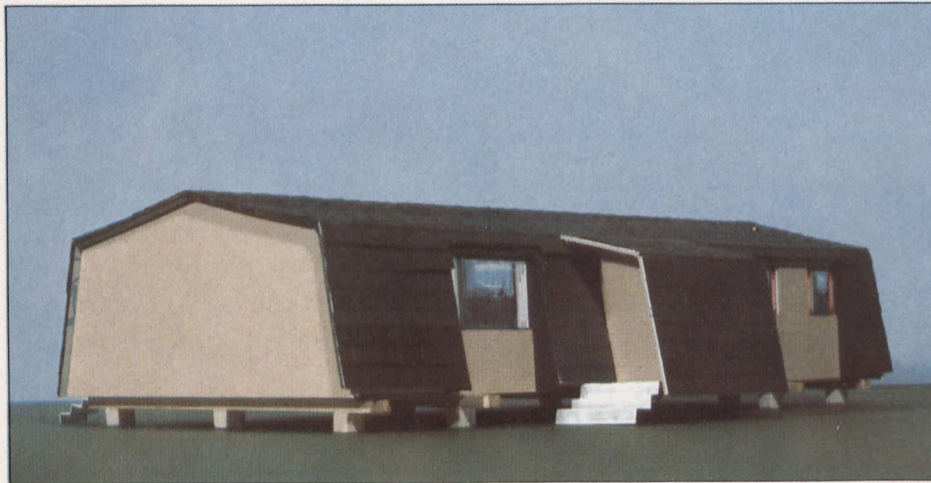


# appendix

## Library of Projects

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<b>Industry</b>	Home building
<b>Product Range</b>	Pre-fab single family dwellings
<b>Trading Area</b>	Northern Manitoba, Saskatchewan
<b>Project Description</b>	Short term product development of 48' and 60' modular house. Long term product planning.
<b>Benefits</b>	Establish viable entry into modular market subject to high social and environmental stresses.



*Scale model of four bedroom pre-fabricated modular home for northern environment*

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<b>Industry</b>	Fiberglass molding, steel fabricating
<b>Product Range</b>	Restaurant furniture
<b>Trading Area</b>	National, U.S.
<b>Project Description</b>	–Improved interior trash receptacle –Product improvements for restaurant furniture
<b>Benefits</b>	Providing manufacturer with design concepts and product development that will demonstrate capabilities to large international franchise chain.

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<b>Industry</b>	Custom fabricator
<b>Product Range</b>	Stainless steel equipment, agricultural products
<b>Trading Area</b>	National
<b>Project Description</b>	Market survey for evaluation of new product potential
<b>Benefits</b>	Assisted management in decision-making on alternatives, and best use of facilities and resources.

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<b>Industry</b>	Agricultural supplies
<b>Product Range</b>	Dairying, poultry equipment
<b>Trading Area</b>	National
<b>Project Description</b>	Combination of industrial design and engineering to produce a new automatic watering system for poultry barns.
<b>Benefits</b>	Creation of a desirable market position, both locally and internationally, by employing new design concept.

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<b>Industry</b>	Seed house
<b>Product Range</b>	Flower and vegetable seeds
<b>Trading Area</b>	National
<b>Project Description</b>	Building graphics to support corporate identity program.
<b>Benefits</b>	Demonstration of inexpensive method for improving appearance of a downtown building and community image.

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<b>Industry</b>	Recreational vehicles
<b>Product Range</b>	Fabricator of aluminum fishing boats and fiberglass pleasure boats
<b>Trading Area</b>	National
<b>Project Description</b>	Feasibility study to determine the cost and effectiveness of improving productivity in certain areas of manufacture.
<b>Benefits</b>	Increased output from existing plant with chance to reduce cost per unit by improving methods.

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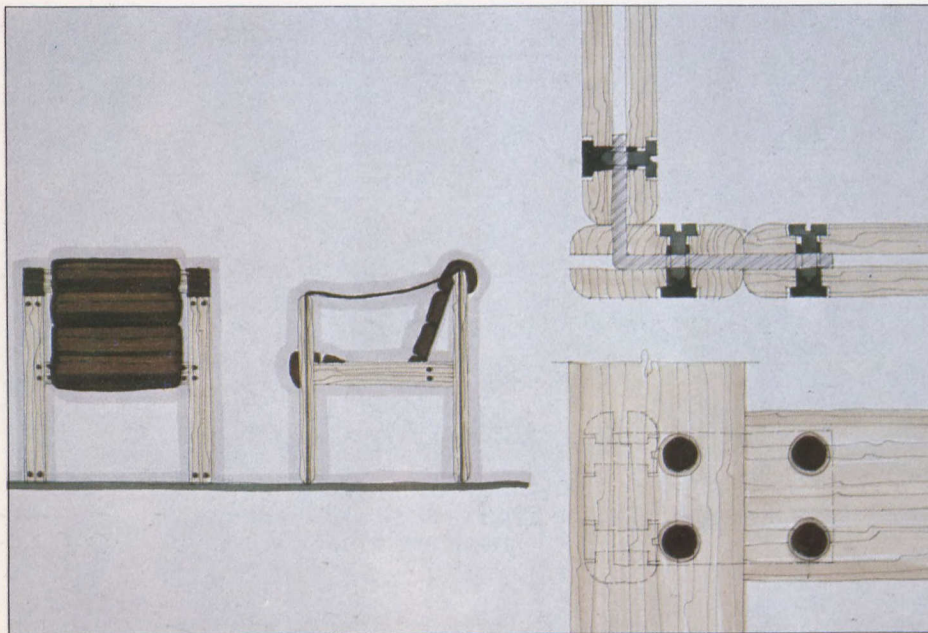
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<b>Industry</b>	Recreational vehicles
<b>Product Range</b>	Tent trailers
<b>Trading Area</b>	National
<b>Project Description</b>	Market research and strategy, product improvement, design of new product line brochures and sales material. Concepts development for corporate identity program.
<b>Benefits</b>	Strengthened manufacturer's competitive position, distribution network, marketing strategy and profitability.

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<b>Industry</b>	Training centre
<b>Product Range</b>	Ladders, wood products, chairs, tables
<b>Trading Area</b>	Western Canada
<b>Project Description</b>	Product graphics, point of purchase signage, brochures for ladders. Design prototyping and production model of new contract chair and container.
<b>Benefits</b>	Providing planning and products for viable entry to the market.



*Knock-down contract chair for reception areas and offices*

<b>Industry</b>	Miscellaneous products
<b>Product Range</b>	Extension cord / tester; bottle opener
<b>Trading Area</b>	Manitoba
<b>Project Description</b>	Redesign bottle opener for consumer acceptance.
<b>Benefits</b>	Assist in marketing with product design and graphics.



*Combination twist and crown cap bottle opener*

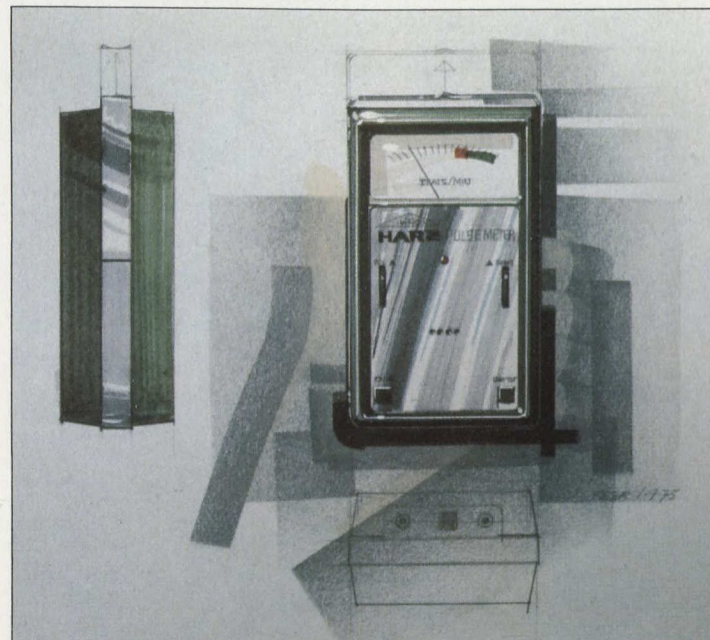


<b>Industry</b>	Light manufacturing
<b>Product Range</b>	Welders, mechanical hacksaws, compressors
<b>Trading Area</b>	Western Canada, U.S.
<b>Project Description</b>	Product graphics to unify corporate identity and product improvement.
<b>Benefits</b>	Demonstrate product improvement process

<b>Industry</b>	Clothing
<b>Product Range</b>	Uniforms for factories, medical and service industries
<b>Trading Area</b>	Western Canada
<b>Project Description</b>	Visual identity program for stationery, catalogues
<b>Benefits</b>	Competitive position will be strengthened by stronger identity and sales support materials.

<b>Industry</b>	Brooms
<b>Product Range</b>	Polypropelene brooms
<b>Trading Area</b>	Regional
<b>Project Description</b>	Graphics design for sleeve
<b>Benefits</b>	Establish visual identity for product

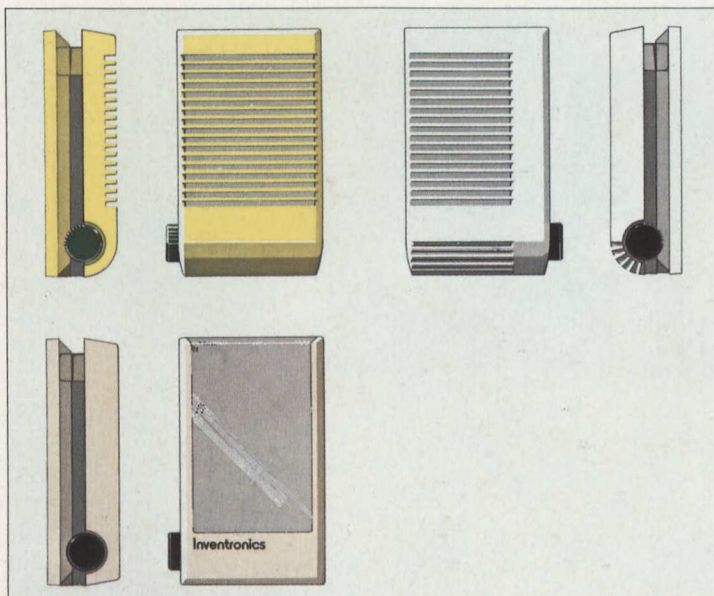
<b>Industry</b>	Instrumentation
<b>Product Range</b>	Medical electronic instruments
<b>Trading Area</b>	National
<b>Project Description</b>	Design concepts and development of plastic body and controls for new product. Develop supporting sales brochure.
<b>Benefits</b>	Provide industrial design consulting services to a company that has a technical and engineering bias.



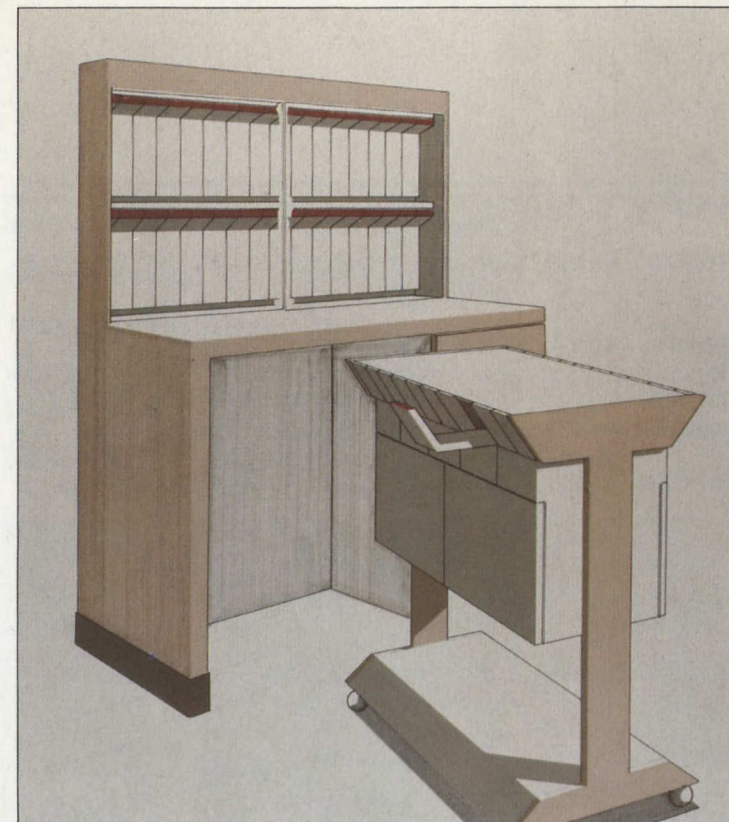
*Sketch concept of casing and controls layout for electronic pulsemeter*



<b>Industry</b>	Electronics, custom powder coating and metal fabricating.
<b>Product Range</b>	Line voltage thermostat, electronic testing equipment.
<b>Trading Area</b>	International
<b>Project Description</b>	Product improvement utilizing existing hardware
<b>Benefits</b>	Increase market acceptance of new product through styling and functional refinements to thermoplastic housing



*Concepts for improved product housing for line voltage electric thermostat*



*Rendering of typical installation of improved hospital medication centre*

<b>Industry</b>	Pharmaceutical equipment supply
<b>Product Range</b>	Unit dose packaging systems, carts, processing machinery
<b>Trading Area</b>	National and international
<b>Project Description</b>	Adaptation of existing system to hospital use.
<b>Benefits</b>	Provide manufacturer with design concepts and materials use to facilitate penetration of new market.



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<b>Industry</b>	Farm services
<b>Product Range</b>	Farm equipment, lumber, contracting, building materials, concrete silos
<b>Trading Area</b>	Western and Northern
<b>Project Description</b>	Market research, strategy, sales promotion program for concrete silos. Corporate identity and capabilities brochure.
<b>Benefits</b>	Planned and integrated approach to entry into new market segment

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<b>Industry</b>	Recreation vehicles
<b>Product Range</b>	Truck campers, travel trailers, mini-motor homes
<b>Trading Area</b>	Western Canada
<b>Project Description</b>	Innovative molded bathroom for recreational vehicles; adaptable to configuration and size.
<b>Benefits</b>	A unique feature in the industry for additional sales penetration and competitive edge.

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<b>Industry</b>	Automotive service
<b>Product Range</b>	Foreign car servicing
<b>Trading Area</b>	Local
<b>Project Description</b>	Reception area design, stationery, logo
<b>Benefits</b>	To demonstrate the importance of corporate and visual identity in a service business.



*Corporate identity logotype*

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<b>Industry</b>	Computer cabinetry
<b>Product Range</b>	Computer cabinets, custom electronics cabinets, reception furniture.
<b>Trading Area</b>	Western Canada
<b>Project Description</b>	Provide dimensions, material specifications, typical layouts and suggested variations of modular system of reception furniture.
<b>Benefits</b>	Demonstrate product improvement



Internal form  
showing application  
of corporate identity  
logotype



Trade show exhibit

<b>Industry</b>	Wood products
<b>Product Range</b>	Paddles, oars, canoe seats
<b>Trading Area</b>	Western Canada
<b>Project Description</b>	Corporate identity program and design of new line of paddles.
<b>Benefits</b>	New manufacturer provided with graphics for stationery, product design, marketing plan, production planning, trade show display.

<b>Industry</b>	Temporary shelter systems
<b>Product Range</b>	Tents and domes
<b>Trading Area</b>	International
<b>Project Description</b>	Liaison and feasibility study for adaptation of product for use as concession booths.
<b>Benefits</b>	Assisted company in establishing contact and demonstrating product feasibility for contract to supply Olympics 1976.

<b>Industry</b>	Wood products
<b>Product Range</b>	Canoe paddles, thwarts, yokes, oars, and recreational vehicle interior components
<b>Trading Area</b>	Western Canada, U.S.
<b>Project Description</b>	Product graphics, packaging, new model for paddle line, improved design and production techniques.
<b>Benefits</b>	Strengthens manufacturer in product, presentation, and profits.

## Glossary of terms

Every profession has its jargon and industrial design is no exception. The following terms have been used throughout the Handbook and there are, of course, many more expressions that are not listed here. However, in the interest of brevity some of the most common, yet often the most misunderstood, terms have been included.

### **buck**

(syn: Space buck) usually a rather rough three dimensional representation of the physical limits of an object or space. Used by the designer to better define the problem. This method is particularly useful in defining proper seat height for a given task, location of controls of visual displays, comfort, leg room and other human factor considerations.

### **camera ready art**

(syn: Final art, paste-ups, mechanicals) one or a series of boards with finished headings, copy illustrations, crop marks (register marks for cutting), color separation overlays, and all other elements of the final printed

graphic. Ready for processing and conversion to metal plates for printing. Changes at this point still possible, though more expensive. Changes are not advised once plate making has begun. Proofs (usually a blue version of the final plates) should be examined by the client *prior to the first printing* for typographical errors, proper location of photographs and captions, and general quality. Changes are still possible at this stage, though again more expensive. The designer should always be present in a supervisory capacity when the proofs are run and when printing actually begins.

### **concept**

A design theme established by the designer around which a number of variations can be constructed, still satisfying the parameters set out in the research phase. Sketches, models, and renderings are often referred to as concepts.

### **design criteria**

A list of features or product requirements the design concept must satisfy, based on research in phase 4.

### **dimensional drawing**

(syn: Detailing)—drawings prepared by the designer or draftsman depicting the product in top, front and side views. All relevant surfaces are shown in auxiliary drawings, including elevations, sections, and details. References should be made directly on the drawings as to type of materials and hardware, sources, finishes, textures, colors and special processes or assembly techniques. Designers do not as a rule supply part or shop drawings.

### **dummy**

A draft of a graphic design concept such as a brochure or letterhead. Includes sample of type styles to be used, location of copy, location and layout of each photograph, some indication of the type of paper to be used, and a reasonable representation of the suggested colors. When approved, the dummy becomes the control mechanism for the preparation of the final camera ready art work. The finished paste-ups and photographs should resemble those depicted in the dummy to a reasonable degree. Printing should never be authorized by the client



prior to comparing the paste-ups with the approved dummy.

**mock-up**

(syn: Maquette, model)—a three-dimensional scale or full sized model of a designed object. Used for the purposes of verifying contour, shape, location and flow of highlights; fit, location of hardware, color, texture, product graphics, etc. The mock-up is often the final design step before detailing and should represent a combining of the design theme set in the research and concept phases, with the functional limitations of three dimensional materials and manufacturing processes. The mock-up should be considered the "proof of the pudding"; if it doesn't work, the concept must be closely re-examined before proceeding. If very carefully developed, a mock-up can often serve as a plug for generating prototype molds.

**plug**

A three dimensional, full scale, accurate model of the desired object. For the purposes of generating molds for plastic or metal forming. A plug should be prepared by

a qualified mold maker (tool and die shop) in close consultation with the designer after detail drawings and pre-production prototypes have been approved.

**proposal**

Essentially a job outline, describing the kinds of activities a consultant will undertake, the estimated length of time to completion and the estimated fees. This will often precede a contract but in some instances, a proposal becomes a contract upon approval and signature of all parties. This document is the control mechanism for a product development program.

**prototype (pre-production)**

A hand-built full scale model of the approved design from detail drawings. Complete with desired materials, textures, finishes, hardware. Suitable for testing purposes and development of drawings. The object should be constructed using processes as closely resembling the actual production condition as possible. Information gleaned from the building of a pre-production prototype will prove indispensable in developing production methods.

**prototype (production)**

(syn: Pilot production) limited production sample of the product. Used for test purposes, verification of production methods, costing, training, materials procurement, market testing, etc. The final step before initiating full production.

**rendering**

A full color visual presentation on illustration board or other fine material, often framed or matted. Depicts the proposed product as it would appear in use, complete with background and figures, as required. Product graphics, type of material, color, texture and even highlights should be evident. The objects depicted should be proportionately accurate and in a reasonable scale. A rendering is a more expensive piece of work than a sketch and is often not really necessary.

**sketch**

A line or full color drawing, done quickly, usually on paper, and not necessarily to scale or in proportion. For purposes of recording and exploring a design concept or thought.



## Questions for consideration in Product Development

One of the most common factors contributing to ineffective product development is the inability of the client to accurately and efficiently communicate relevant information to the designer. The success of any development program depends on the information the designer receives from the client at the outset of the project. Incomplete or erroneous information will often result in a less than adequate concept and in many cases will lead to major revision of the concept which in effect is starting over again from scratch. A design bias will have been formed, making it fairly difficult for the designer to devise a fresh or improved concept. Therefore, a checklist of typical questions a design consultant might ask has been included below. Of course at different phases of any given project the questions will be different; however, the most crucial are the initial queries whose answers will help the designer form the basis for the design criteria.

–What is the nature of your business? Manufacturer? Assembler? Distributor?

–Are there other designers connected with your firm, or with the parent company with direct links to your firm?

–What is the nature of your product? What percentage is manufactured and what percentage is bought-in? How is it sold? To whom is it sold—retail or industrial use? How is it used? Is your product a component of someone else's product?

–What is the nature of your total product line? How is the specific product in question related to the others? What impact could new product development or improvement have on the other products? In these terms, what would be the scope of development?

–What is the nature of your manufacturing operation? What processes do you now have? What processes would you consider developing? What special arrangements do you have with other companies or material suppliers? What special areas of expertise does your firm have?

–How many products of the type in question do you now market? How many do you anticipate marketing and producing after improvement? How will this affect your manufacturing operation?

–What factors have prompted your decision to undertake product development or improvement? How are these related to the existing product's performance?

–How is your product's form related to what it does? How much of its present form has been predicated on competing product specifications, cost or traditional market demands? In what areas do you feel these specifications could be improved or modified to enhance

your product? What areas are absolutely fixed? Are these areas fixed due to cost, production methods, product performance specifications, limited sources of supply of key components, or traditional values?

—What do you expect me to do? What areas do you not want me to investigate? What is the end result desired? Increase in sales, new market penetration, reduction in costs, conversion to new technology or materials?

—Are you converting to new technology or materials? How will this reflect in the new product?

Similarly, the client will certainly have a number of questions in the back of his mind that he would like to ask the designer. These questions will help the client evaluate the potential of the designer to handle his specific problem, how much it will cost, what he might expect in terms of work, etc. When meeting with a designer, ask for a tour of the premises. Take note of

the facilities you see. Are there drafting boards? Does the studio have a shop where models can be constructed? If not, how would this be handled? Are suppliers' catalogues and samples in evidence? Ask to see examples of previous work, but keep in mind the fact that with the proper technical input, the design process can be applied to a varied range of products. If the type of product you had in mind is not in the company's portfolio, ask about their experience in this area. Ask if the company has access to expertise that can be hired. Ask a number of detailed questions concerning the product development process in relation to at least one portfolio project. These might be:

—What were the design constraints (criteria) in this particular project? What special research techniques did you undertake? How far did the firm or designer take the project? Why or why not? How long did it take?

—What was the outcome of the project in terms of sales or a similar yardstick? What did the client think?

Other, more general questions would be:

—What are the consultant's professional affiliations? What are his fees? How are they charged out? What expenses are not covered in the fee schedule? How is the billing conducted? What other methods of payment for design services are there—(royalty, retainer)? What are the advantages of each?

—What areas of discipline (graphics, architectural, engineering) are available to you from the same firm?

—What method of project control is favored by the firm? Critical path, proposal, contract? Whose responsibility would this be?

Once the proposed project has been discussed in some detail, ask the designer how he would approach the project in terms of work methods. Does the outline include at least three of the four major phases of the product development process? If not, why not? Do not, under any circumstances, ask the designer for on-the-spot solutions to a problem or to do a sample job. The designer is selling you his competence in being able to make the design development process work and cannot be judged on his ability to come up with snap improvements for your product. Product design is not a catalogue process.

If you are satisfied that you have selected the appropriate resource, ask for a proposal. This should include some form of schedule, showing date of proposed start, completion dates for the various phases, and overall program completion. Do not expect the designer to be able to start immediately as a healthy design office has a number of projects going at one time and yours will have to be scheduled according to their work load. Do not expect a proposal immediately. A great deal of research

must be conducted by the designer into your requirements before a proposal can be developed. A proposal could take from one to five weeks to receive. Do not expect a proposal perfectly tailored to your requirements. Be critical, do not accept unsatisfactory or vague clauses with the idea of clarifying once the project is underway. The designer expects some revision, which he sees as an essential part of the process of defining your specific problem.



## Elements of the Marketing Mix

### **The market place...**

#### **Marketing Research**

Sales Analysis

Market Potential Studies

Product Research and Development

Advertising Effectiveness

Distribution Research

### **The product to meet market needs...**

#### **Product Price and Service**

Service

Technical Features

The Brand

Industrial Design

Packaging

Guarantee, Warranty

Price to Ultimate User

Allowances and Deals

Margins Offered to Channel Members

Credit Policy

Returned Goods Policy

### **Getting the product to market...**

#### **Distribution Methods**

Channel Members

Transportation

Inventory Control

Plant and Warehouse Location

Materials Handling

### **Communicating to the customer...**

#### **Support Activities**

Advertising

Personal Selling

Sales Promotion

Publicity and Public Relations

## The Marketing Plan — an outline

### I Analysis of Market Situation

- a. Present Position
- b. Problems and Opportunities
- c. Market Forecast

### II Objectives

### III Marketing Strategy

- a. Penetration and Sales Volume
- b. Profitability
- c. Marketing Budget

#### Where are we now?

Section I is a statement of where the company or product is at the present time. It includes size and share of market, competitors' position; analysis of product against competitive products; history of sales, costs, pricing, profit; present and future conditions. The problems restricting profit and inhibiting growth, and opportunities for increased growth and profit. The market forecast is based on no major shifts in the method of operation. Preliminary market research started.

#### Where do we want to go?

Section II is a statement of objectives for the company and the product, based on dollar sales and unit volume, with profit estimate.

#### How do we get there?

Section III on marketing strategy is the plan for how the company will achieve the stated objectives. It includes final market research, product development, pricing strategy, distribution channels, support activities in advertising, selling, sales promotion and publicity. The marketing budget establishes the dollar allocation for support of the action program in implementing the marketing strategy.

## Corporate Identity Program

The corporate identity program is a controlled and co-ordinated system of presenting all aspects of your company by visual means.

### Research

It begins with a management statement of *company objectives—what the company is—its character or personality, what it produces and for whom, what it wants to be*. Evaluation of the existing system will identify its strengths and weaknesses, and from this a plan for development can be outlined with preliminary goals and objectives. Further research will *determine what the company is believed to be by key groups within and outside the company*. This will lead to the formulation of a final plan of

action based on program objectives. Key factors considered will include:

- employees and personnel recruiting
- identity for company, divisions, product lines, brand image
- registered names, trademarks, brands
- trade relations with jobbers, wholesalers, brokers, retail outlets
- public relations with suppliers, customers
- marketing activities in advertising, sales promotion, direct selling, publicity
- product and packaging design, pricing strategy
- plant and office architecture, signage, trucks, uniforms
- stationery and forms, external and internal communications

### Concept

Strategy will be developed to *create an optimum expression of your company, determine parameters and goals, and establish a procedure for implementation*. This stage will include concepts development for a basic design system, a standards manual, recommendations for application of the system on a priority basis.



### **Detailing**

Approved concepts will then be further detailed in the development of the identification system to *communicate the character of your company to its various "publics" so as to reflect the established goals and objectives*. Selected designs and recommendations are presented for preliminary approval and then *tested for compatibility of elements and communication effectiveness against the established goals and objectives*. This research test markets the new identity system prior to its implementation. Based on this research necessary adjustments and refinements are made for final approval.

### **Implementation**

The implementation stage assures the *systematic application of the identification system as a total expression of your company*. This stage will include the development of a corporate identity manual detailing all visual applications of the system, and a preview presentation of the program to employees and other key groups. The physical application will be on a recommended timetable and priorities. The external application will include advertising, sales promotion and merchandising materials, exhibits, trucks and cars, signage, product and package design. Within the company the application will include employee manuals, uniforms, stationery and business forms.

### **Follow-up and Evaluation**

Once the program has been implemented, it must be followed-up to ensure that it proceeds as planned in achieving objectives, and that it provides for continuity and adjustment to new conditions.

## Evaluation Matrix

Wtg Weighting 1–10 Rtg Rating 0–4		Alternatives					
		A		B		C	
Factors	Wtg	Rtg Score		Rtg Score		Rtg Score	
Cleanability	8	3	24	.5	4	4	32
Layout	8	1	8	2	16	3.5	28
Vandalproof	7	2.5	17.5	1.5	10.5	3.5	24.5
Low Cost	7	2	14	1	7	4	28
Aesthetics	6	3	18	3	18	1	6
Modularity	6	1.5	9	3	18	3	18
Ergonomics	6	2	12	2	18	2.5	15
Durability	5	2	10	3	15	3.5	17.5
Structural Integrity	4	3	12	3	12	4	16
Decor Compatibility	4	2.5	10	3	12	3	12
Mfg. Methods	4	3	12	4	16	2	8
Mfg. Materials	4	4	16	3	12	3	12
Low Cost Shipping	2	1	2	4	8	1.5	3
Potential (Wtg × 4)	284	Totals 164.5		166.5		220.0	

### Using an Evaluation Matrix

The evaluation matrix can be of assistance in selecting the preferred solution by assigning a quantifiable value to various factors and alternatives. The key factors being considered are listed and weighted by assigning a value from 1 to 10 depending on their importance. The alternatives are then given a rating of 0 to 4 based on how well each factor is resolved. These two values are then multiplied to give a score, which are added for a total evaluation.

In the examples, cleanability and layout are the most important factors with a weighting of 8, and low cost shipping is the least important. Alternative C resolves cleanability the best, and A is the least preferred for layout.

Examination of the table shows which factors can best be improved for maximum effectiveness. For example there is little to be gained by concentrating in low cost shipping in alternative C when improved aesthetics would have more impact. The evaluation shows A and B as being about equal, with C as the preferred solution.

## Product Development Test

The following questions include the basic areas in design, marketing and engineering. A far more comprehensive analysis is necessary for detailed examination, but this check list is a good starting point. If most of the answers to the odd numbered questions are **yes**, and even numbered are **no**, a Product Development Plan is necessary for improved sales and profit.

1. Your company is ready to move into national or international markets but your product isn't?	<b>yes</b>	<b>no</b>
2. Could you define in two words the basic need your product fills?	<b>yes</b>	<b>no</b>
3. Do you have occasions where your goods are rejected by the customer because they fail to meet his standards?	<b>yes</b>	<b>no</b>
4. Do you know where your product is now, where you want it to go, and how to get it there?	<b>yes</b>	<b>no</b>
5. Can you identify the different costs involved in manufacturing your product?	<b>yes</b>	<b>no</b>
6. Does your product represent a package of user-satisfying benefits?	<b>yes</b>	<b>no</b>

7. Can you name at least 3 competitors whose products have the same components as yours?	<b>yes</b>	<b>no</b>
8. Have you done any market research to find out about your customers and competition?	<b>yes</b>	<b>no</b>
9. Do you have to work overtime and switch jobs to meet customers' schedules?	<b>yes</b>	<b>no</b>
10. Is the relationship between your product's function and its shape obvious?	<b>yes</b>	<b>no</b>
11. Do you wish your workers were motivated to increase productivity?	<b>yes</b>	<b>no</b>
12. Do you have clearly defined and effective distribution channels, with the necessary support communications?	<b>yes</b>	<b>no</b>
13. Are you selling what you can make, or making what you can sell?	<b>yes</b>	<b>no</b>
14. Do you think your products look like they're worth what they cost the customer?	<b>yes</b>	<b>no</b>
15. Should you allocate time and money to product development, or are you too involved in daily detail?	<b>yes</b>	<b>no</b>
16. Do you know your profit margins, and are they adequate to support your continued growth?	<b>yes</b>	<b>no</b>



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