

The design process

INTRODUCTION

“ Good design is not simply about aesthetics or making a product easier to use. It is an essential part of the business process, adding value to products and creating new markets.”

Source: Rt Hon Tony Blair MP writing to the Design Council (before the General Election).

INTRODUCTION

- “ Good user interface design is critical to safe and effective equipment operation, installation, and maintenance.
- ” Design-induced errors in the use of medical devices can lead to patient injuries and deaths.”

Source: from 'Do It By Design - An Introduction to Human Factors in Medical Devices', by R. Sawyer of the Food and Drug Administration, January 1997.

INTRODUCTION

“ The management of design is fundamental to the creation of new products, processes and systems. It influences the performance, cost, timing and thus the market appeal, of each new development. It is therefore the key factor in ensuring a company's competitiveness and profitability.”

Source: from 'Managing design for competitive advantage', a joint publication by The Engineering Council and The Design Council.

FUNDAMENTALS

The aim of the Design Methods lectures in this course is to introduce you to a range of useful tools and methods that may be used for the development of new products.

This will be achieved within the context of discussion of the Product Life Cycle (PLC) and the Product Development Cycle (PDC).

DEFINITIONS

Design is the process of converting an idea or market need into the detailed information (manufacturing instructions) from which a product or system can be made.

Production is the process of converting detailed information into physical components and assembling those components into a product or system.

Development is the process of acquiring specific information about the performance of a proposed product or system by constructing and testing prototypes. This information can be used to redesign the product and improve the manufacturing methods before starting full-scale production. The process of development is therefore inseparable from the processes of design and production.

THE PRODUCT LIFECYCLE

Why introduce new products?

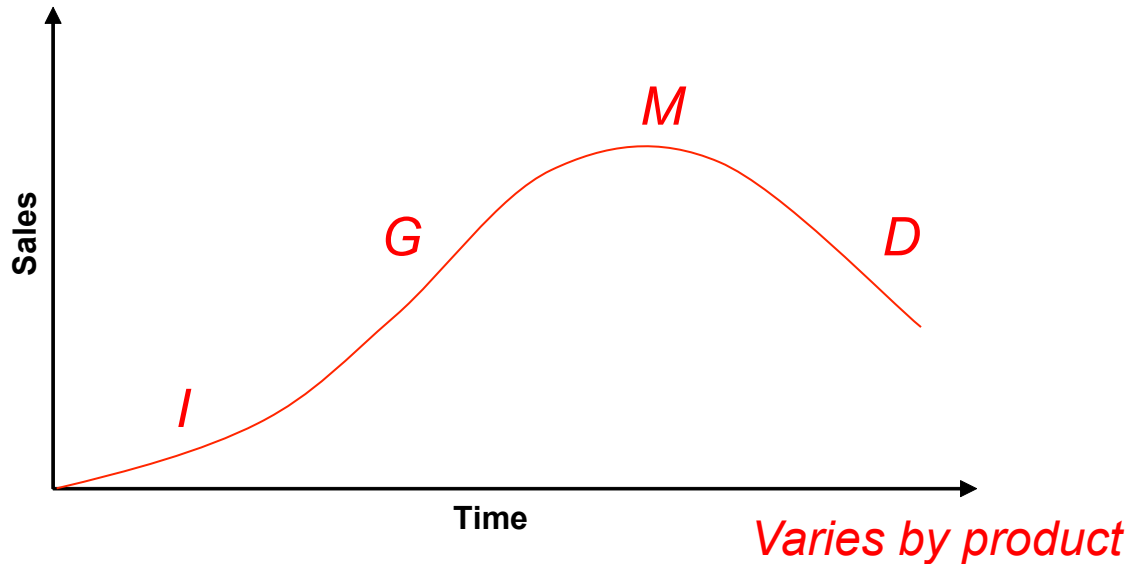
Existing products become obsolete

Factors include:

- *customer demands*
- *competitor products*
- *technological advances*
- *new ideas*
- *increasing regulation*
- *economic climate*

THE PRODUCT LIFECYCLE

A typical product life cycle is shown below. There are also several other well-known forms of product life cycle that may be found in books on marketing.



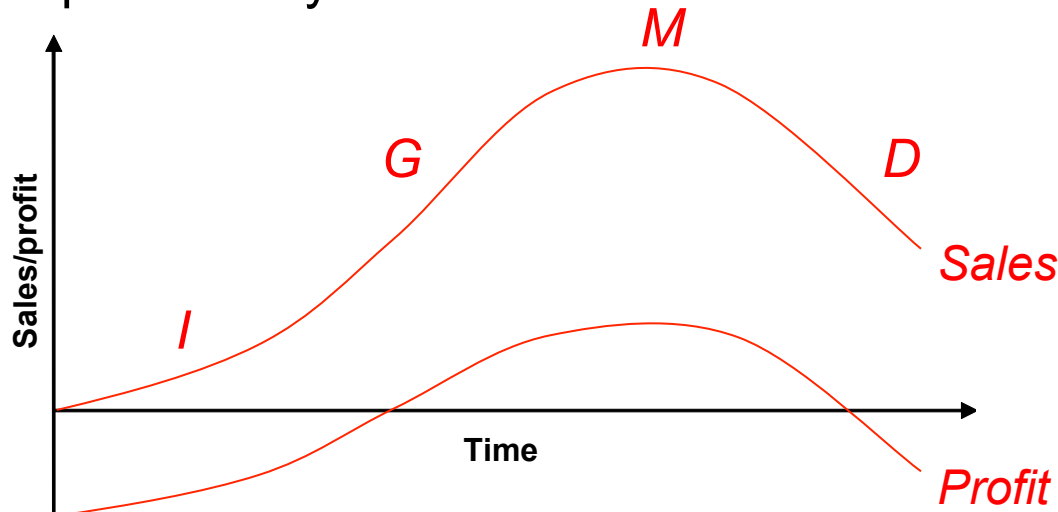
Source: adapted from 'Marketing Management - Analysis, planning, implementation and control', P Kotler, 6th edition, Prentice Hall (BO251).

THE PRODUCT LIFECYCLE

The product life cycle has four key phases:

- introduction (I) - *low volume, design under review*
- growth (G) - *higher volume, design stabilising, some automation*
- maturity (M) - *high volume, design stable, high automation*
- decline (D) - *lower volume, make for spares*

A typical sales/profit life cycle.

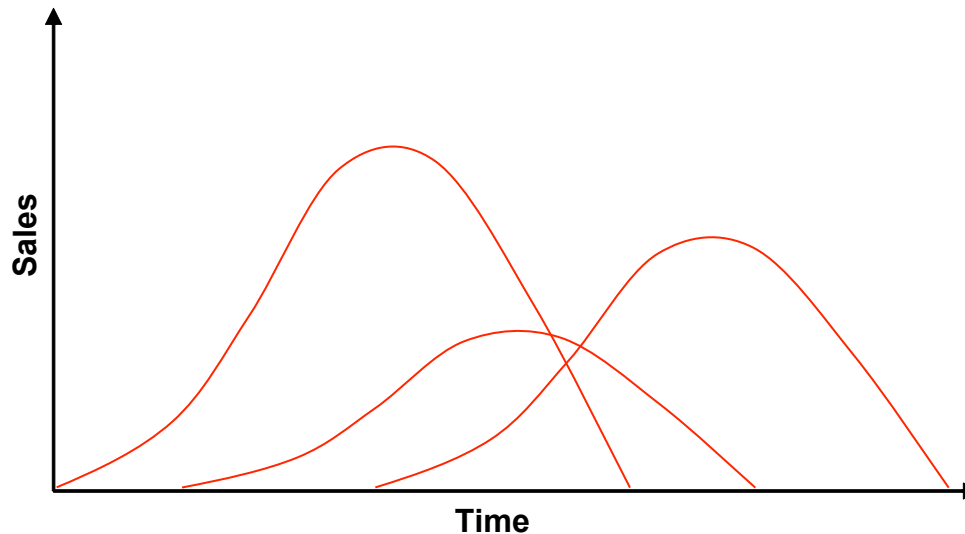


THE PRODUCT LIFECYCLE

The sales/profit life cycle has the same four phases:

- introduction (I) - *negative profit (loss)*
- growth (G) - *increasing profit (declining loss)*
- maturity (M) - *maximum profit (cash flow)*
- decline (D) - *decreasing profit*

If a company is to succeed commercially it will normally have a portfolio of products. Some will be mature, some declining and some growing.



THE PRODUCT LIFECYCLE

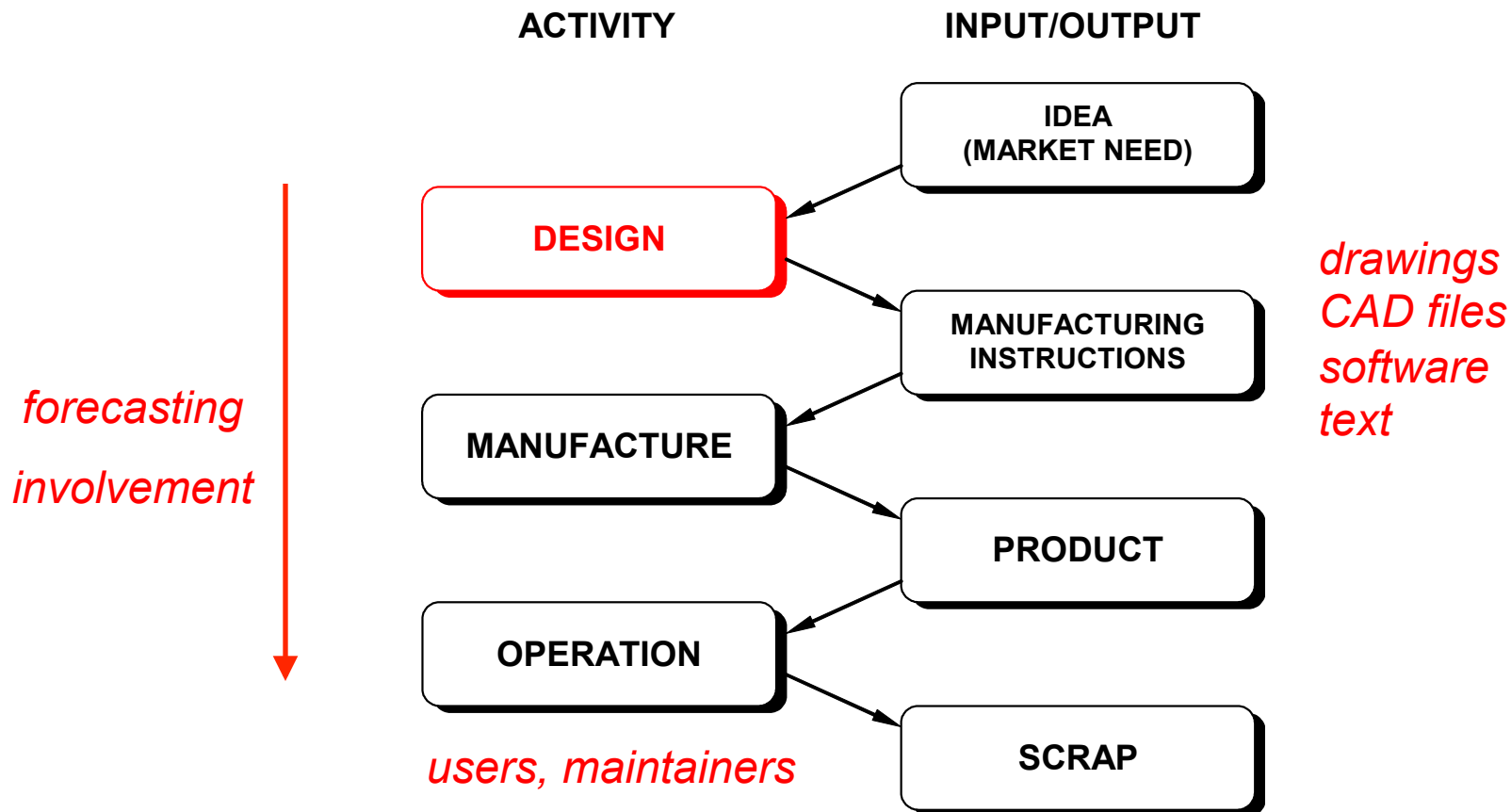
Management of the product portfolio is critical to the success of the company.

Product life cycles show that:

- *products have a limited life*
- *product sales pass through distinct stages, each posing different challenges to the seller*
- *product profits rise and fall at different stages of the product life cycle*
- *timely launch of the 'right' new product is crucial*

THE PRODUCT DEVELOPMENT CYCLE

A simplified product creation sequence is shown below.



THE PRODUCT DEVELOPMENT CYCLE

The key question is: how can we create better products?

not optimal

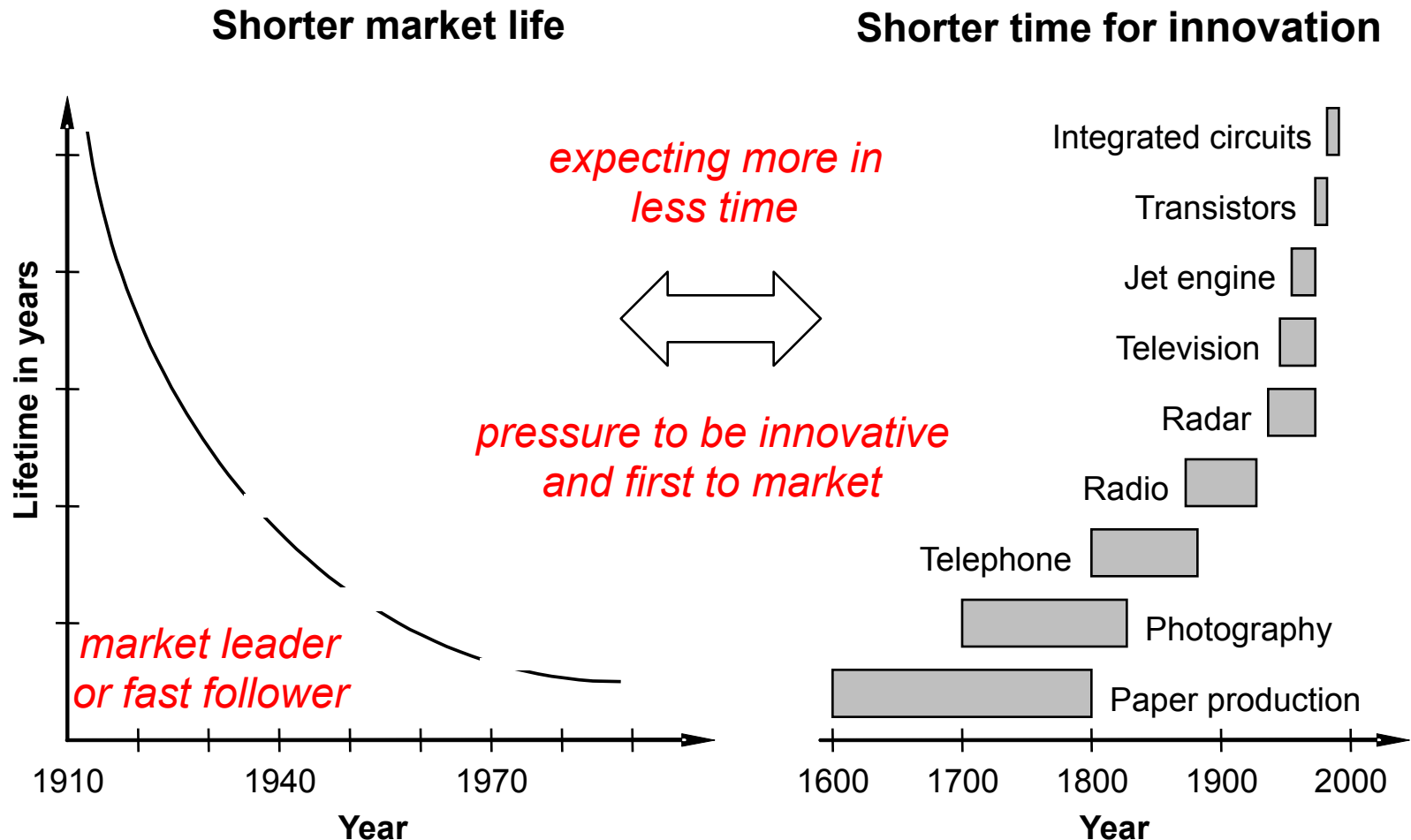
Only 50% of new products succeed.

Successful product development is dependent upon the:

- product - *complexity*
- design team - *multi-disciplinary*
- design process - *intuitive / systematic*
- design resource - *availability*
- design context - *viewpoint – components/system/product/service*

THE PRODUCT DEVELOPMENT CYCLE

External pressures on product development are ever increasing.



GENERAL APPROACHES

Design may be intuitive:

- freedom - *no constraints*
- creative - *brainstorming*
- fun → *risky*

or systematic: → *framework* → *reduces risk*

- discipline - *methodical*
- structured - *functions*
- boring → *fun*

or a balanced mutually supportive *mix* of the two.

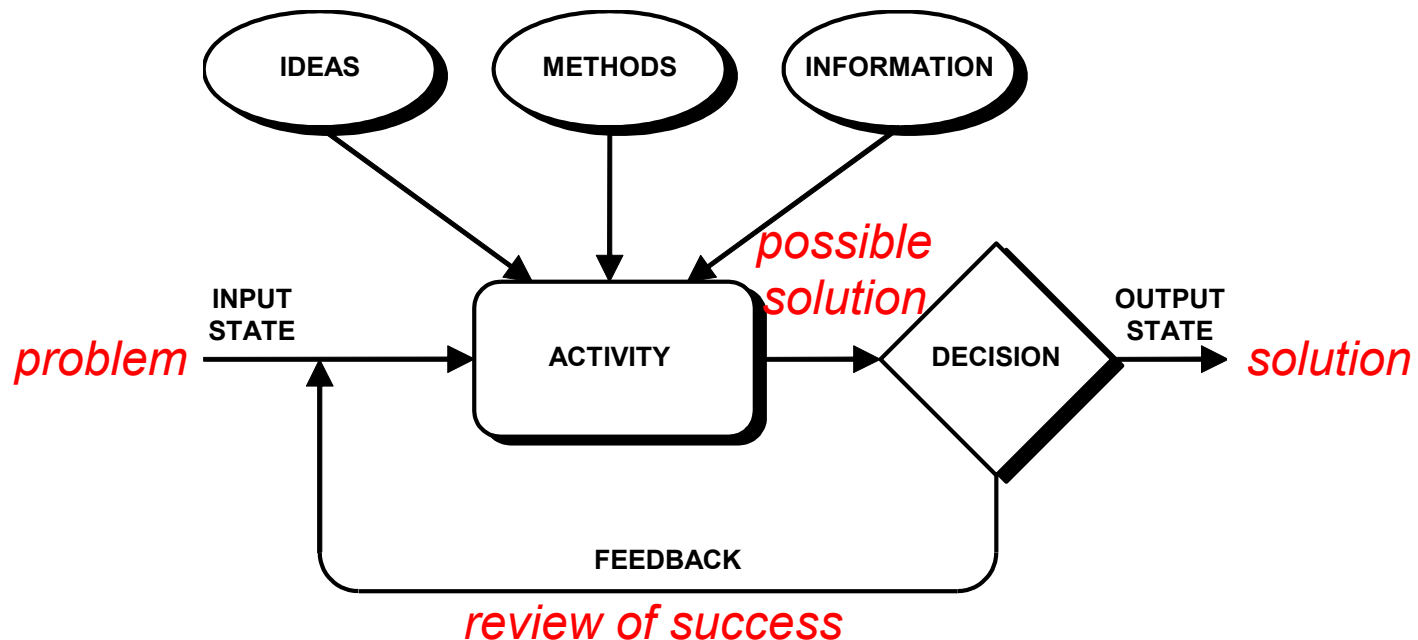
PROBLEM SOLVING

Solving problems involves the following activities:

- Identifying the problem - *defining the problem, establishing the criteria for success*
- Solving the problem - *generating options, evaluating options, selecting the best*
- Implementing the solution - *build it*
- Reviewing the outcome - *building up experience*

PROBLEM SOLVING

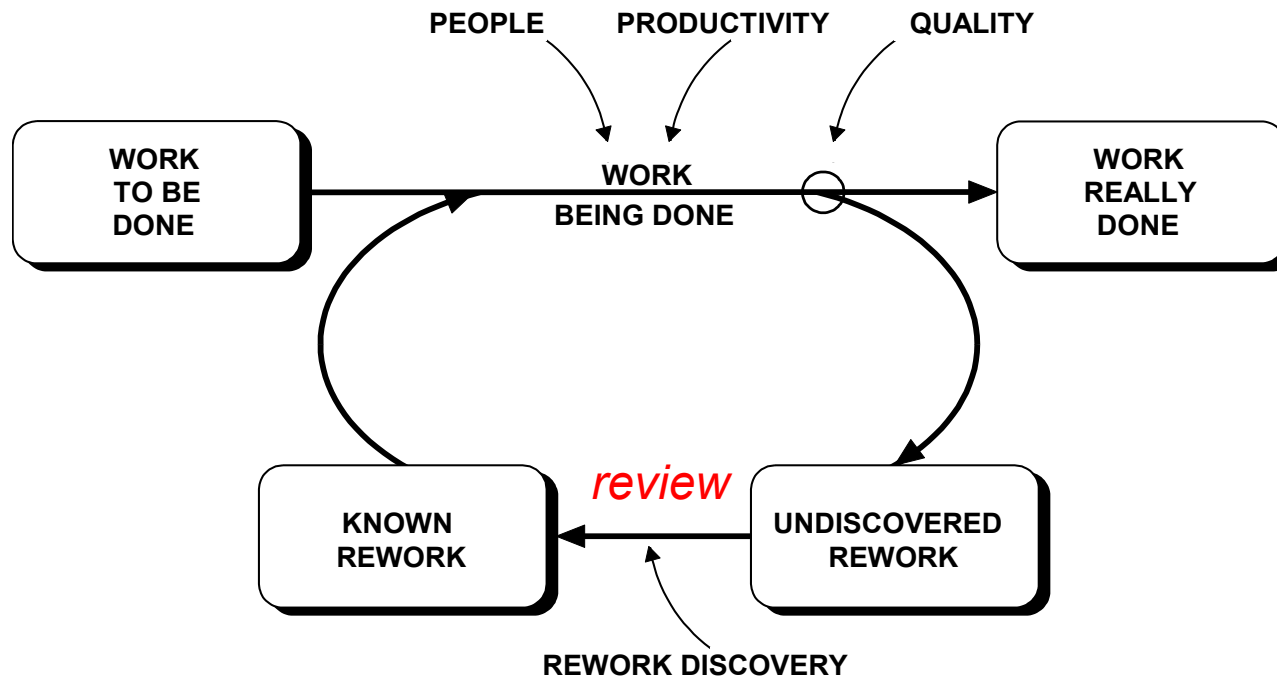
Problem solving can be thought of as a form of elementary information processing.



The number of iterations depends upon the quality of ideas, methods, information and the processing activity. Inevitably, more than one iteration is required, which may lead to increased timescales and costs. The decisions and decision criteria are also critical.

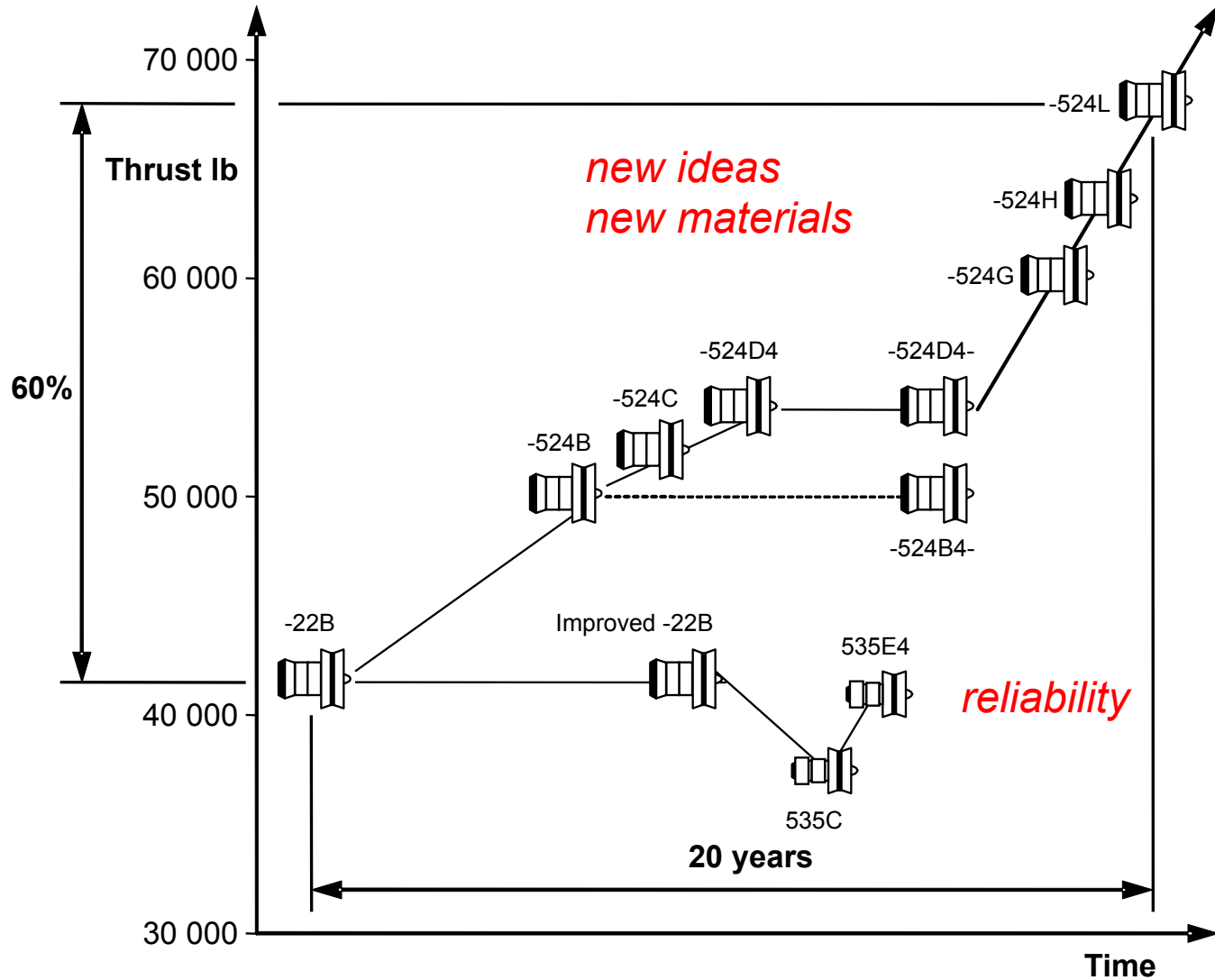
PROBLEM SOLVING

The effect of design iteration may be explained at the project level by the rework cycle.



Source: 'The Rework Cycle', K G Cooper, Director, Management Simulation Group, March 1993, PA Consulting Group.

PROBLEM SOLVING



DESIGN MANAGEMENT

Design management involves the following activities:

- *Setting the objectives*
- *Planning*
- *Communicating the plans*
- *Monitoring and controlling the execution of the plans*
- *Reviewing the outcome (evaluating in BS 7000)*

Reference: BS 7000 - Guide to managing product design.

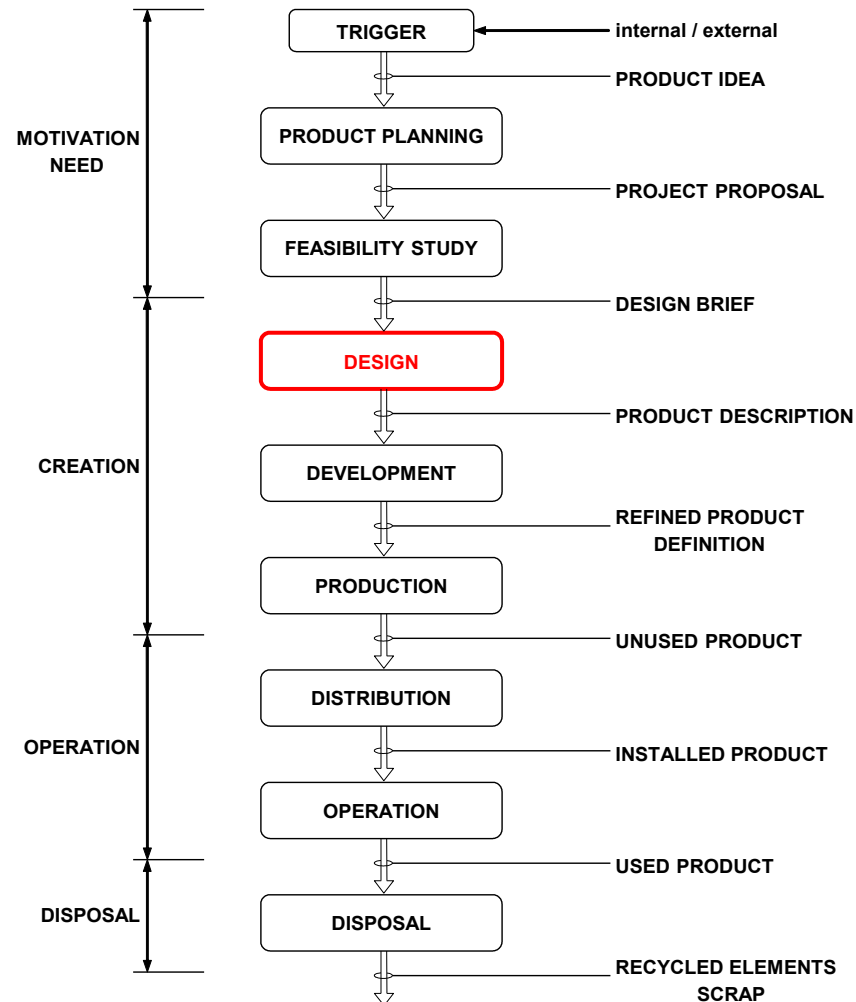
The three main sections in BS 7000 are:

- *Managing product design at corporate level*
- *Managing product design at project level*
- *Managing the design activity*

It is essential to ensure that the objectives and plans are compatible at all three levels.

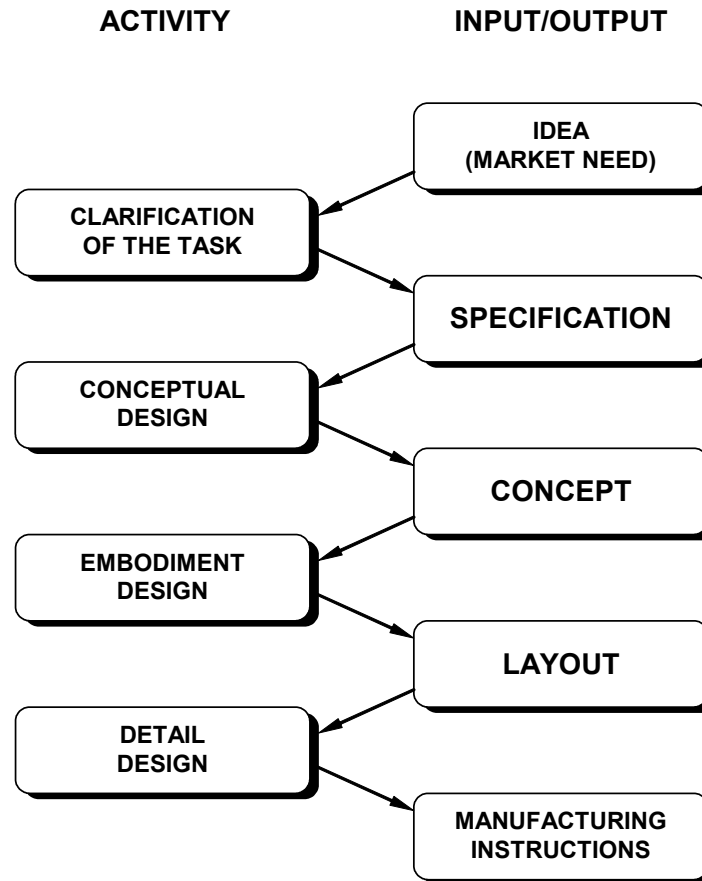
DESIGN MANAGEMENT

An idealised product evolution model is given in BS 7000.



DESIGN PROCESS

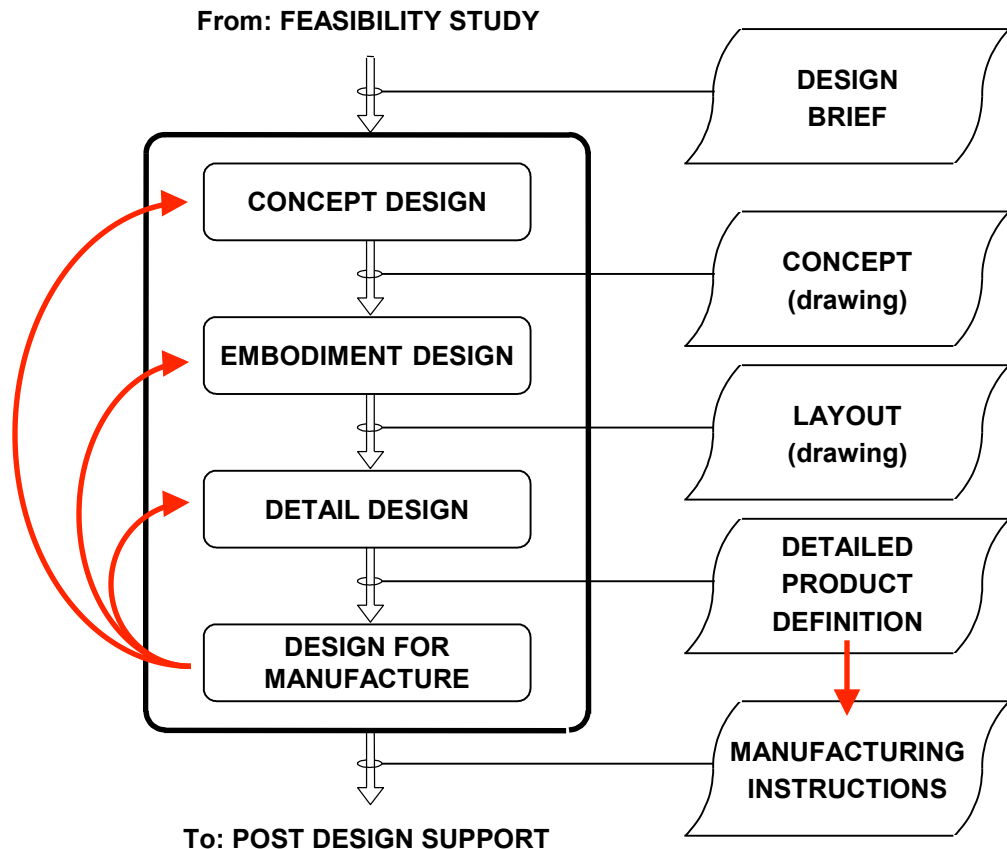
The design process may be broken down into several stages. There are then many methods, both creative and systematic, which can help with execution of each stage.



DESIGN PROCESS

BS 7000 contains a similar design process model.

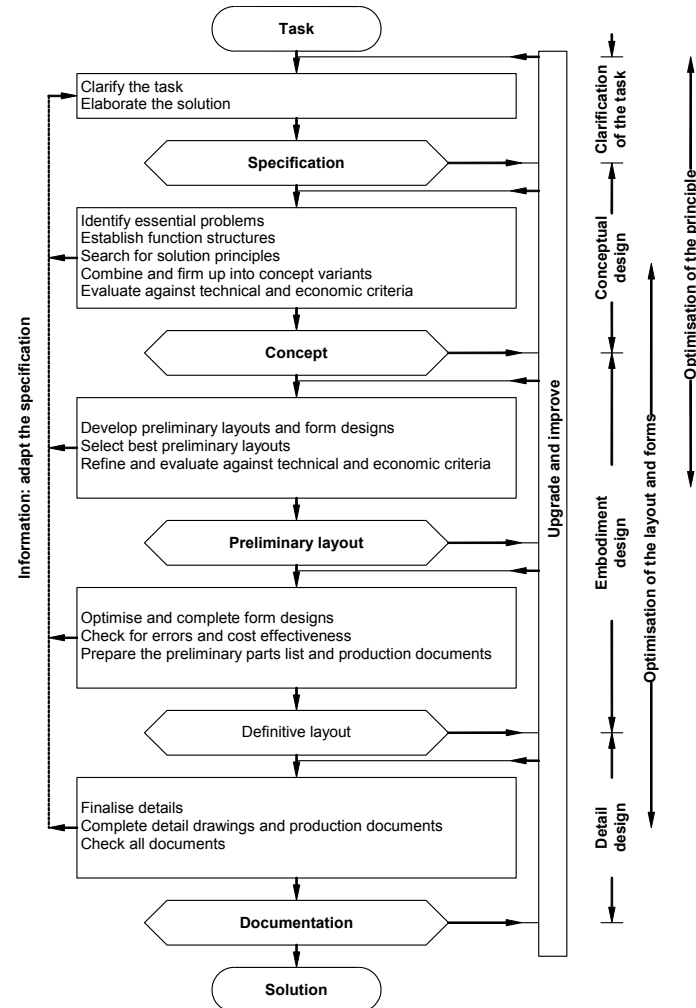
task has been clarified



*intended for
mechanical systems*

DESIGN PROCESS

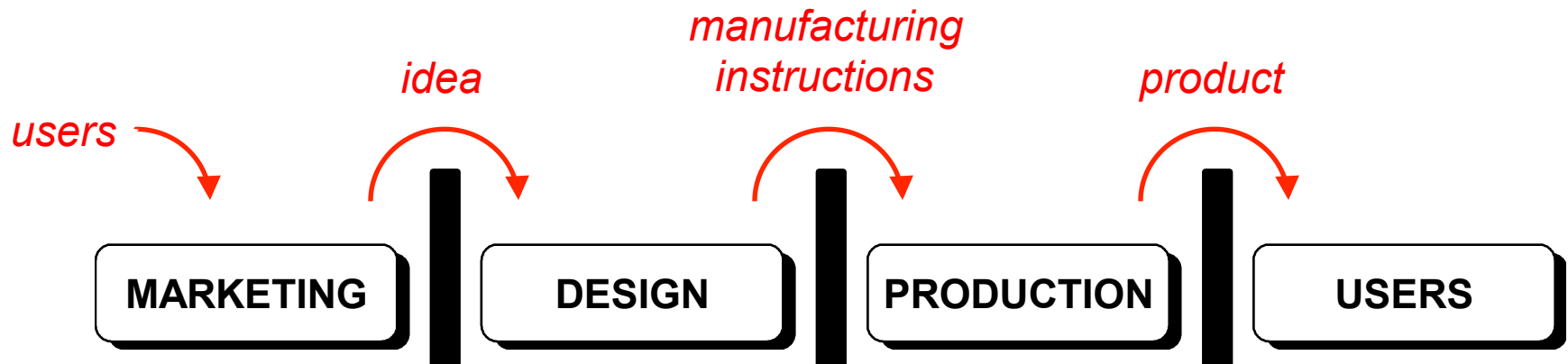
Pahl and Beitz also contains a design process model.



SUMMARY

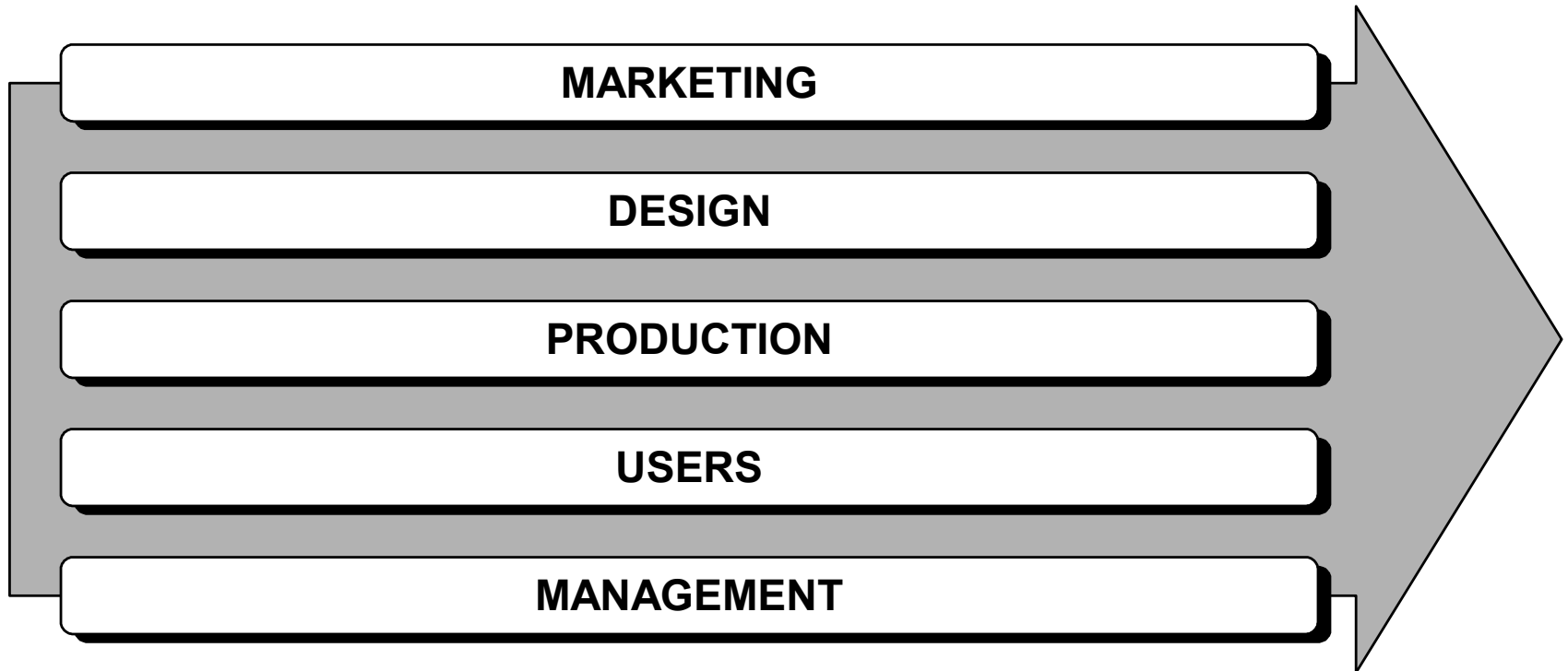
Good product development is a team game, involving marketing, design, production and management personnel. *and the users/customers*

The traditional 'over the fence' or sequential engineering approach still exists in many companies and cost millions of pounds per year as a result of failed products due to poor communication between company departments.



SUMMARY

The systematic approach encourages 'integrated' or concurrent engineering where all the key parts of a company are represented throughout the product development cycle.



involvement