SPECIAL NOTE: The design of this course is such that topics in "Managing Research" and "Managing Design" serve as potential topics for team research projects and presentations. Consequently, instructor notes are limited to an extremely brief overview.

MANAGING

ENGINEERING

RESEARCH

AND

DESIGN

DEFINITION OF TERMS

RESEARCH directed toward achievement and/or application of knowledge

DEVELOPMENT use of research results to produce something

DESIGN creating a model of something new

CYCLES AND PHASES

Product Life Cycle

Technology Life Cycle

New Product Development Phases

Systems Engineering Phases

		IDENTIFY NEED	R E S E A R C H	S C R E E N I
	CONCEPTUAL	PRODUCT PLANNING		
		PRODUCT RESEARCH PRODUCT DESIGN		
	TECHNICAL FEASIBILITY			
	DEVELOPMENT			
	VALIDATION	PRODUCTION/		N G
	PRODUCTION	CONSTRUCTION	APPLICATION	
		PRODUCT EVALUATION		N
	PRODUCT SUPPORT	PRODUCT USE/SUPPORT	LAUNCH	
			APPLICATION GROWTH	
			MATURE TECHNOLOGY	
			SUBSTITUTION/ OBSOLESCENCE	
			L	

CONCURRENT or SIMULTANEOUS ENGINEERING (NSPE Phases)

Stage 1

Conceptual

Project Team

*Inventor Research engineer Stage 2

Technical Feasibility

Project Team

*Research engineer Development engineer Marketing/ business Manufactur-

ing engineer

Stage 3

Development

Project Team

*Development eng'r Manufacturing engineer Test engineer Mktg/cost estimator Stage 4

Commercial Validation & Production Preparation

Project Team

*Design engineer Test engineer Manufacturing engineer Development engineer Buyer Q&A eng'r Marketing Stage 5

Full-Scale Production

Project Team

*Manufacturing engineer
Q&A eng'r
Test engineer
Construction
engineer
Process
engineer
Marketing
Sales
Product cost

Product cost analyst Field service Buyer

Suppliers

Stage 6

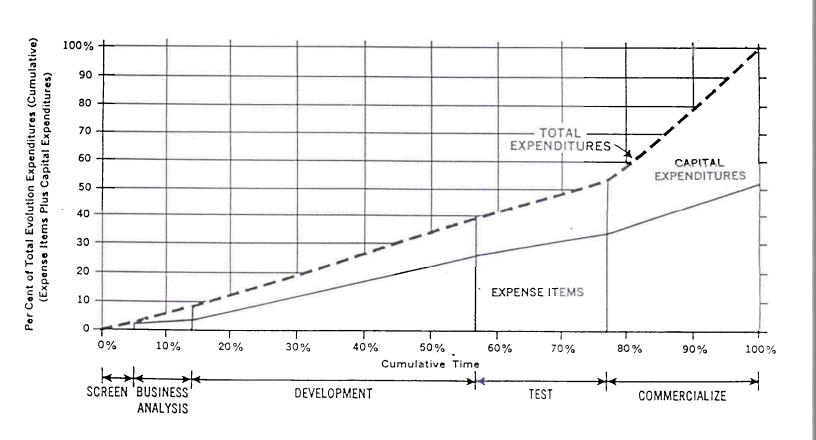
Product Support

Project Team

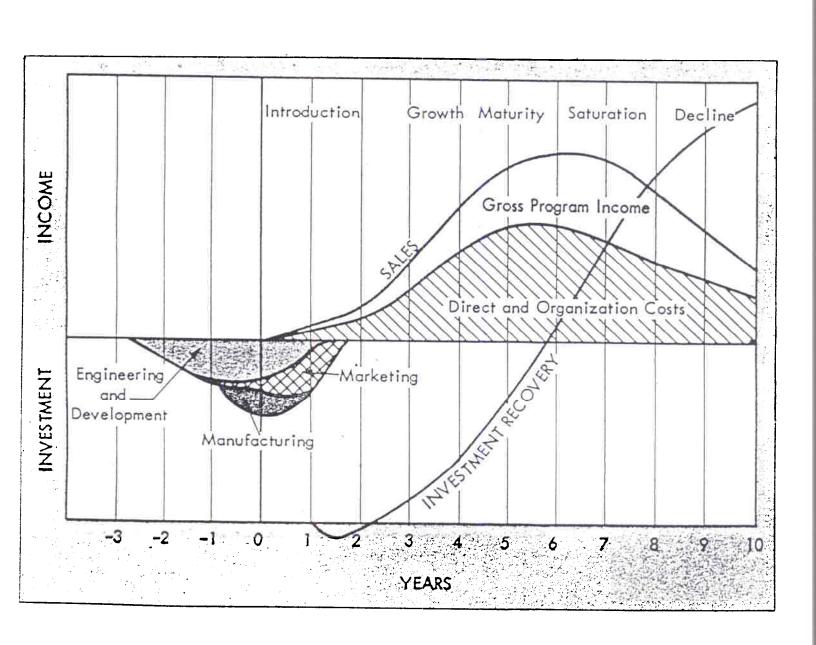
*Marketing Sales Q&A Training Distributors Product improvement Survey Field service

Suppliers

PRODUCT DEVELOPMENT TIME and COST



PRODUCT DEVELOPMENT INVESTMENT RECOVERY



PROTECTION OF IDEAS

Patents
Utility, Design, Plant

Marks
Trade, Service, Certification, Collective

Copyrights

Trade Secrets

"THE ILITIES" PART ONE

RELIABILITY

The probability that a system will demonstrate specified performance for a stated period of time when operated under specified conditions

MAINTAINABILITY

The probability that a failed system will be restored to specified performance within a stated period of time when maintained under specified conditions

AVAILABILITY

The probability that a system, when used under specified conditions, will operate satisfactorily at any point in time when called upon to do so

"THE ILITIES" PART TWO

LIABILITY

Legal responsibility for all aspects of performance, most frequently with respect to safety

ERGONOMICS

Application of biological and engineering data to problems of relating people and machines

PRODUCIBILITY (DFM, DFA)

The extent to which the product can be produced, and produced as economically as possible

VALUE ANALYSIS

Assessment of product components for the purpose of decreasing life cycle costs