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This document presents in schematic form a systems approach for the development of an executive information system. Although it does not use the traditional sentence and paragraph form, its diagrams, written in a sequence similar to computer programs, cover such topics as history of information systems, requirements analysis, how to begin building the system, organizational context, system goals, output tracing, data collection, system design and planning, and operational use and improvement. Some discussion of the usefulness of electronic data processing and hardware acquisition is provided. (TT)

FARRE

ED029376

OPERATION PEP/EXECUTIVE INFORMATION SYSTEMS

M68-11

A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT OF
AN EXECUTIVE INFORMATION SYSTEM

by

J. A. Evans

June 1968

This paper has been especially prepared for distribution to the California Educational Administrators participating in the "Executive Information Systems" Unit of Instruction as part of the instructional program of OPERATION PEP (Prepare Educational Planners).

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EA 002 162

EXECUTIVE INFORMATION SYSTEMS	A PAGE OF HISTORY
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1955

**D.P. SERVICES
APPROACH**



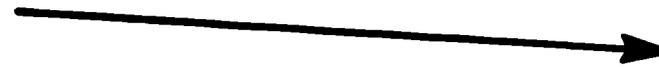
**MILITARY
SYSTEM
APPROACH**

**INTER-SYSTEM
INTEGRATION
APPROACH**



**"COSMO"
APPROACH**

**PRAGMATIC
APPROACH**



?



**A FRAMEWORK FOR
THE EVOLUTIONARY
DEVELOPMENT OF
EXECUTIVE INFORMATION
SYSTEMS**

**EXECUTIVE
INFORMATION SYSTEMS**

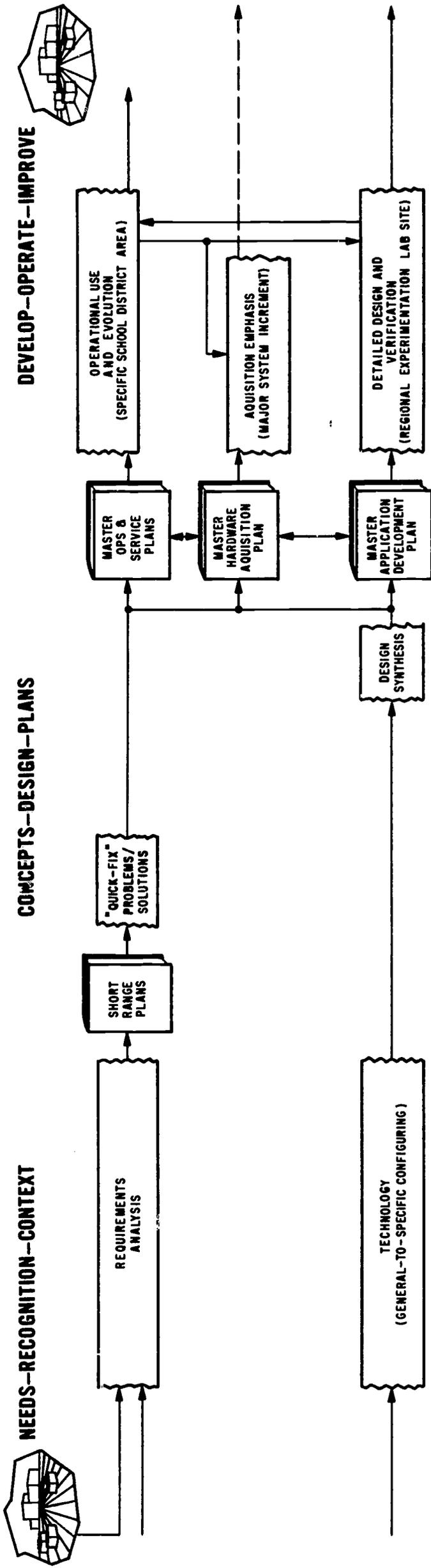
**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

CONTENTS

- **GENERAL FRAMEWORK**
- **BASIC TYPES OF EFFORT**
 - 1. REQUIREMENTS ANALYSIS**
 - 2. SYSTEM DESIGN & PLANNING**
 - 3. DEVELOPMENT, TEST & EVALUATION**
 - 4. HARDWARE ACQUISITION**
 - 5. OPERATIONAL USE & IMPROVEMENT**



EIS ANALYSIS AND DESIGN PROCESS



**EXECUTIVE
INFORMATION SYSTEMS**

**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

REQUIREMENTS ANALYSIS

- **CONSTRAINTS AND FOCUS
STEPS 1,2**
- **OPERATIONAL ENVIRONMENT & MISSION
STEPS 3,4**
- **FUNCTIONAL ANALYSIS
STEPS 5,6,7**
- **SPECIFICATION PRODUCTS**

**EXECUTIVE
INFORMATION SYSTEMS**

**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

REQUIREMENTS ANALYSIS - STEP 1

KNOW THE CONSTRAINTS

- **LOCUS OF INITIATIVE**
- **MANAGEMENT VIEW OF PROBLEMS**
- **TIME AND LEVEL OF EFFORT**
- **TYPE AND EXTENT OF COOPERATION**
- **EXISTING SYSTEMS**
- **LONG-RANGE /SHORT RANGE BIAS**



**EXECUTIVE
INFORMATION SYSTEMS**

**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

HOW TO BEGIN



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INFORMATION SYSTEMS**

**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

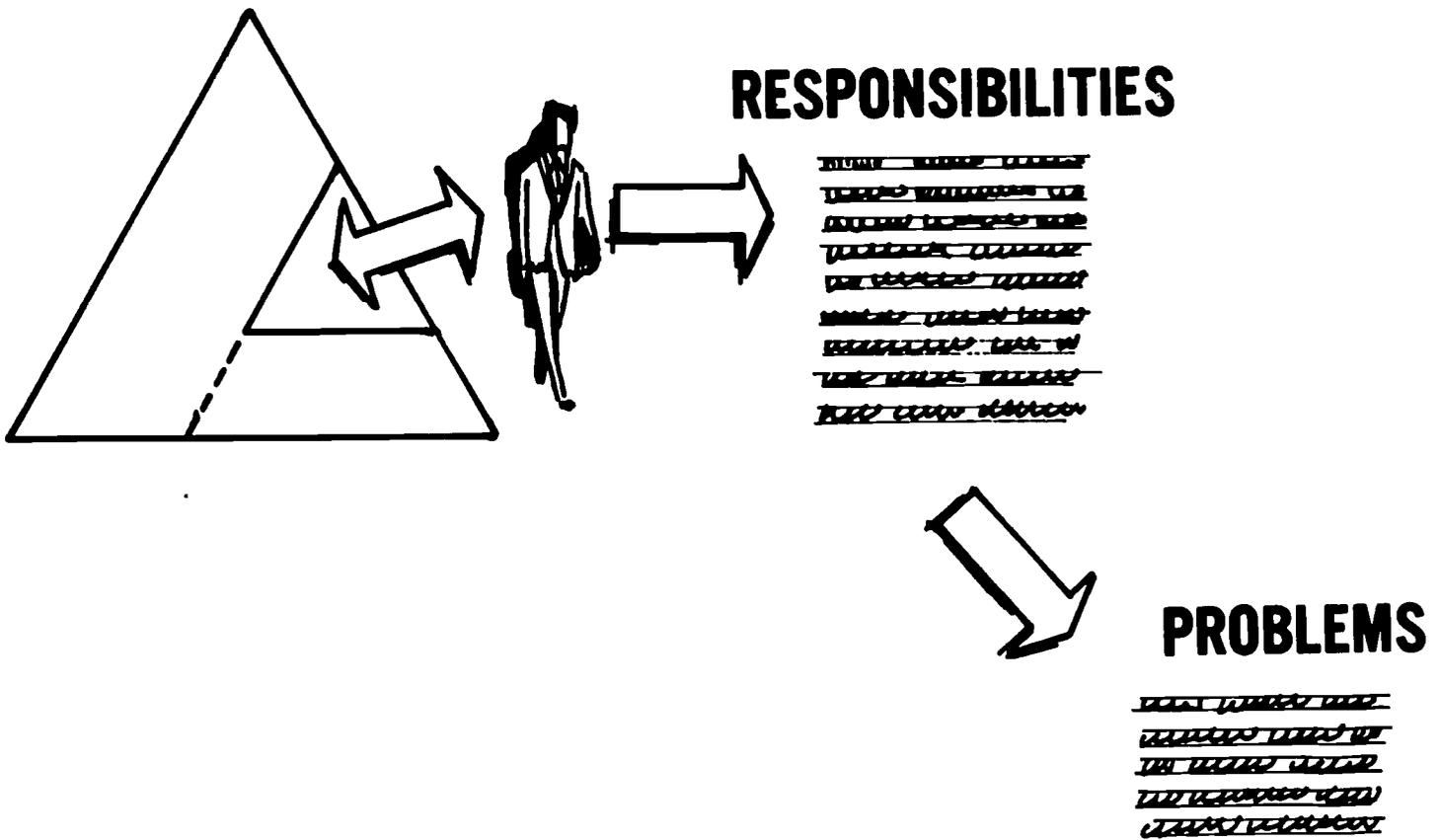
REQUIREMENTS ANALYSIS - STEP 2

SET ORGANIZATIONAL LEVEL FOCUS

- **SELECT LEVEL**
- **IDENTIFY KEY ELEMENTS**
- **ASCERTAIN KEY ACTIVITIES**

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT
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WHERE TO START



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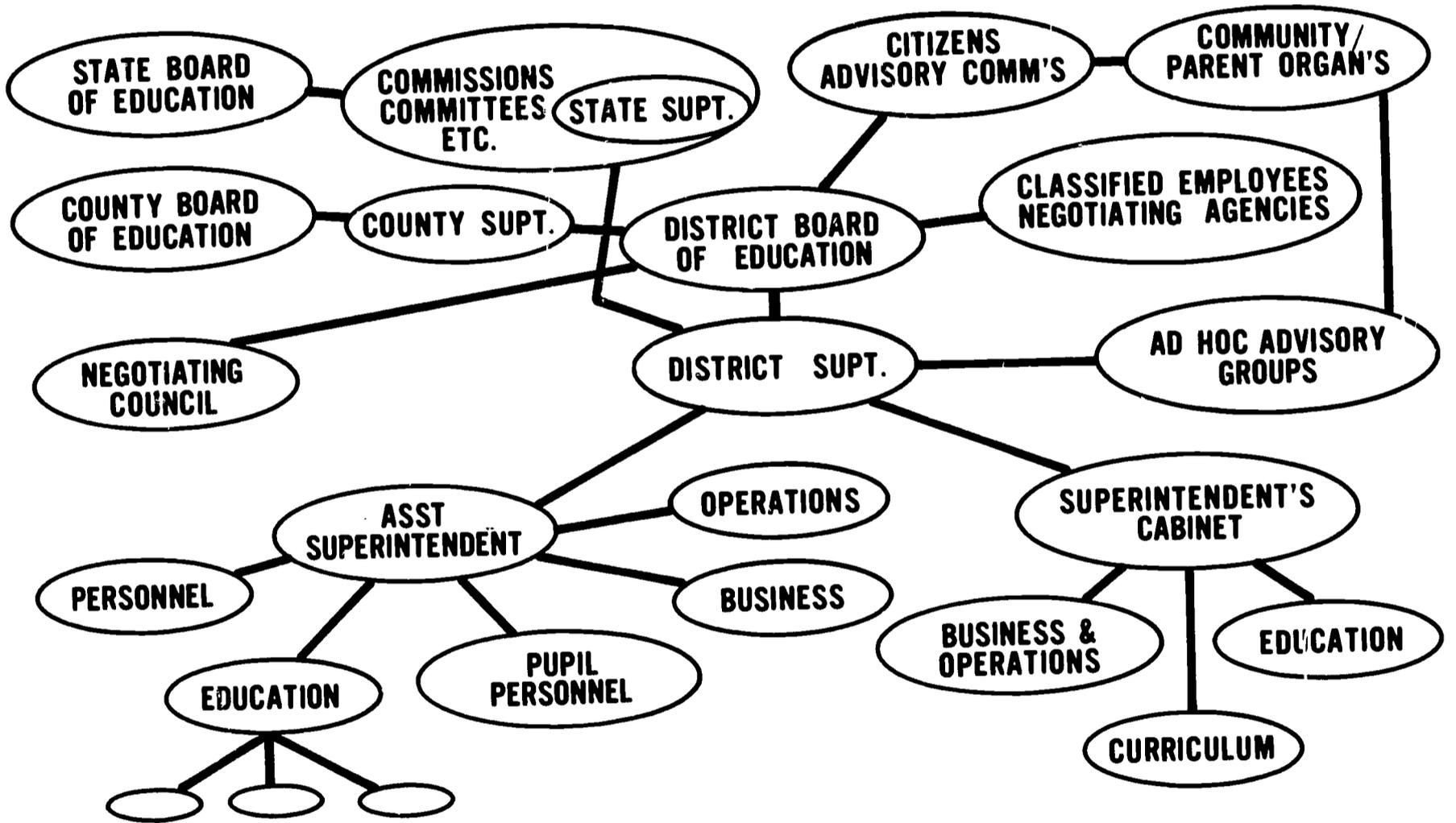
REQUIREMENTS ANALYSIS - STEP 3

LEARN THE OPERATIONAL ENVIRONMENT

- **ORGANIZATIONAL CONTEXT**
- **TASK-RESPONSIBILITY ALIGNMENTS**
- **MAJOR PROCESSES & DECISIONS**
- **EXTERNAL CONTEXT**
- **CORRELATE : CONTEXT-ELEMENTS-
ACTIVITIES**

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT
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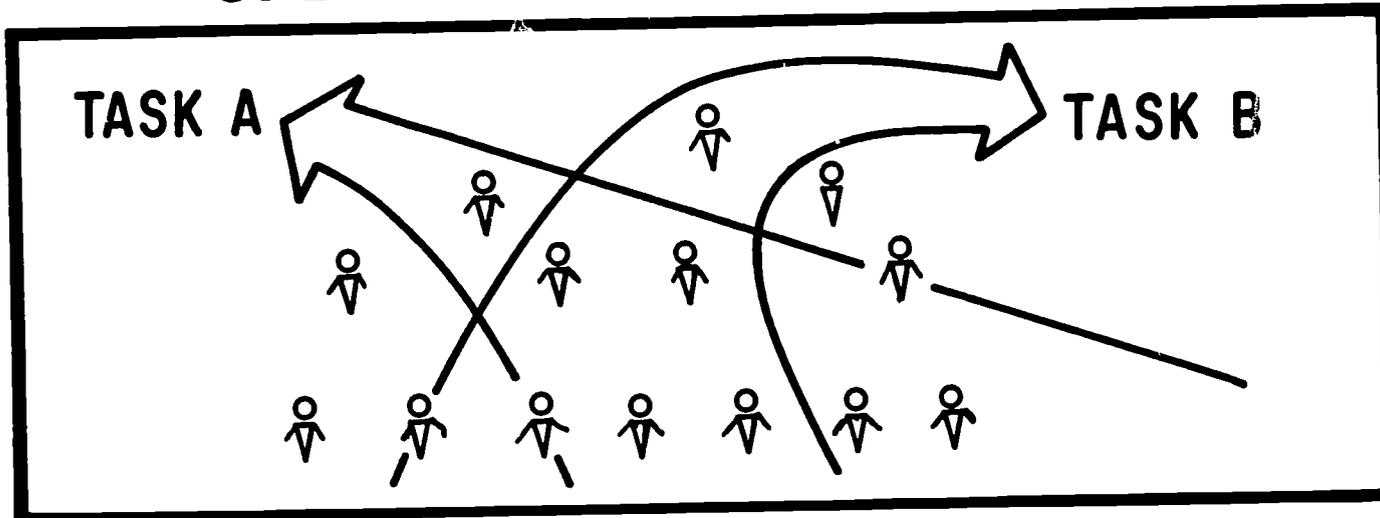
ORGANIZATIONAL CONTEXT



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EVOLUTIONARY DEVELOPMENT**

OPERATIONAL ENVIRONMENT



RESPONSIBILITY- ORGANIZATION MATRICES				
TASK	ORG			
	1	2	3	4
	O K	D K	A D	A A

PROCESS FLOW CRARTS				
PROCESS	ORG			
	1	2	3	4



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**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

SUPERINTENDENT

CABINET

**PLANNING
CONTROL
EVALUATION**

PERSONNEL

**RECRUITMENT
TESTING
EVALUATION
ASSIGNMENT
EDUCATION
ORIENTATION**

INSTRUCTIONAL

**I.M.
PUPIL-PERS.
CURRICULUM
LIBRARY
PROGRAMS**

**BUSINESS
(OPERATIONS)**

**MAINT.
CONSTR.
TRANSP.
CAFETERIA
INVENTORIES**

**BUSINESS
(FINANCIAL)**

**ACCNT'G.
PAYROLL
PURCH.
PAYABLES**

**EXECUTIVE
INFORMATION SYSTEMS**

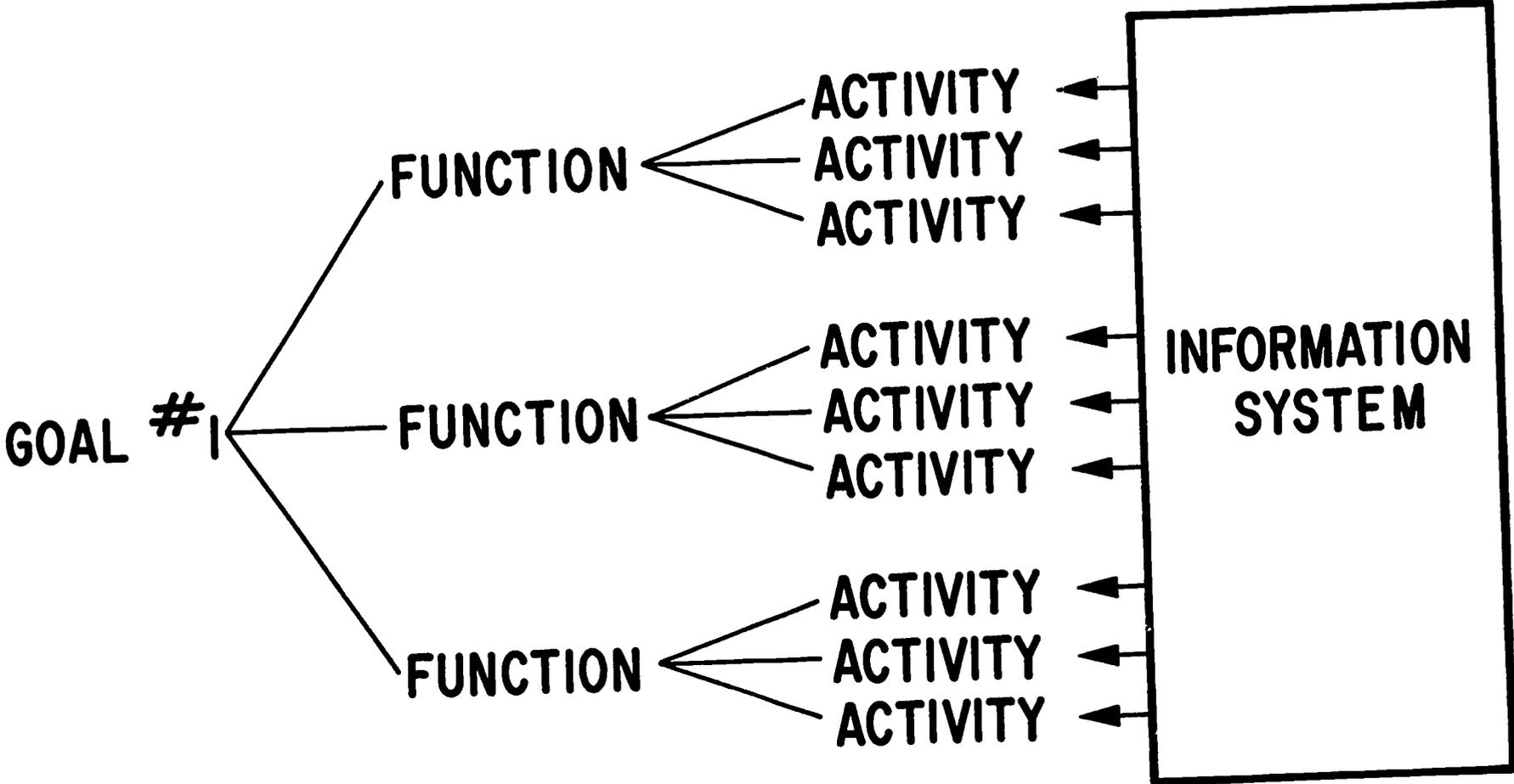
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REQUIREMENTS ANALYSIS - STEP 4

PERFORM "MISSION" ANALYSIS

- **"ULTIMATE" GOALS**
- **DEFINABLE OBJECTIVES**
- **INTERRELATIONSHIPS AMONG OBJECTIVES
PRIORITIES
HIERARCHIES**
- **CORRELATE: OBJECTIVES-ORGANIZATION-
ACTIVITIES**

GOALS-FUNCTIONS-ACTIVITIES



SYSTEM ANALYST'S DILEMMA

REAL-WORLD GOALS
MULTIPLE COMPLEX UNDEFINED CONTROVERSIAL

GOALS FOR DESIGN GUIDANCE
SIMPLE CLEARLY RELATED PRECISELY DEFINED NON-CONTROVERSIAL

?



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REQUIREMENTS ANALYSIS - STEP 5

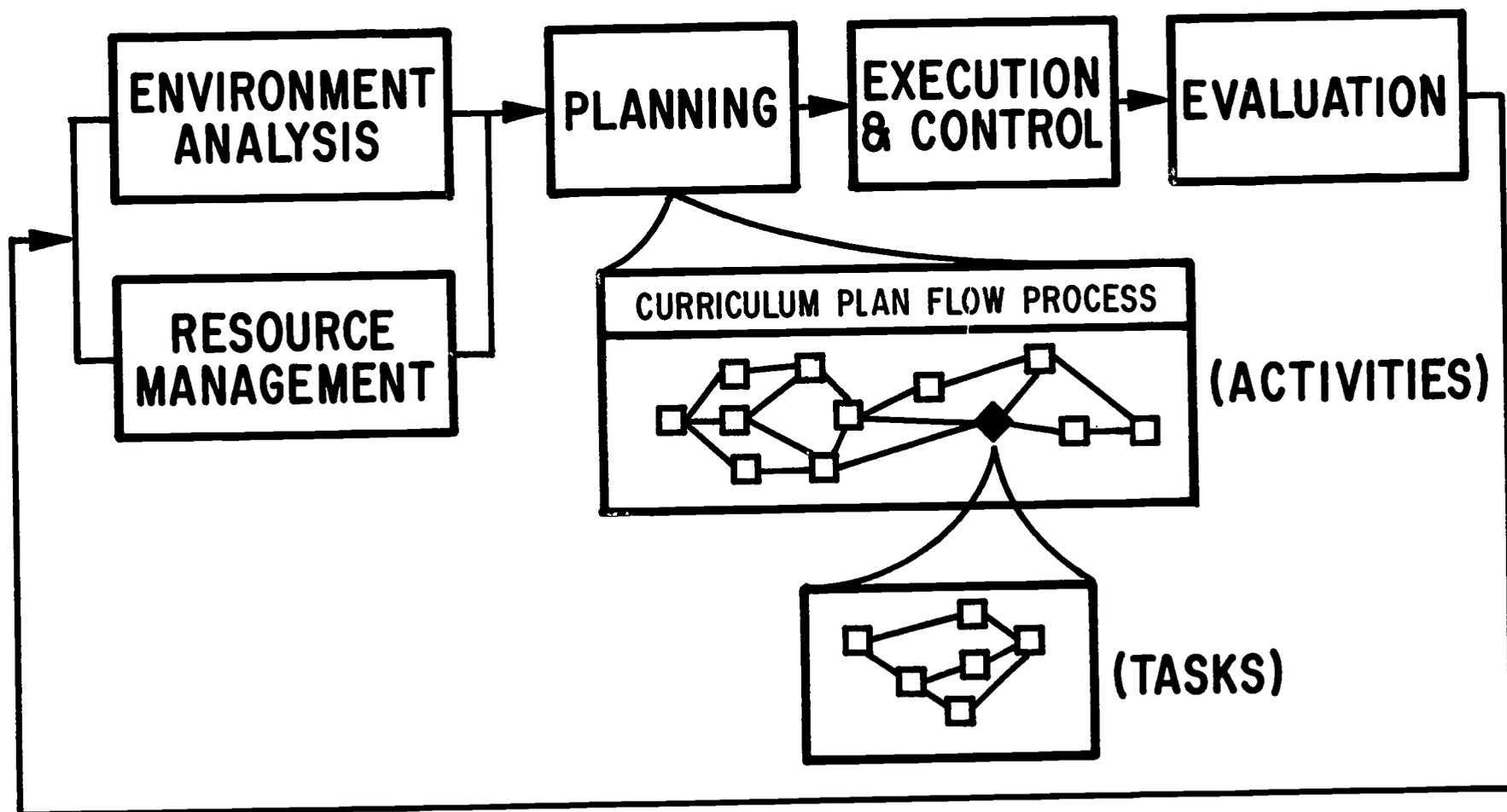
PERFORM "FUNCTIONAL" ANALYSIS

- **PROBE THE OPERATIONAL SYSTEM**
- **TRACE THE DEVELOPMENT OF MAJOR OUTPUTS**
- **INTERVIEW KEY AND COLLATERAL PERSONNEL**
- **DEVELOP PATTERN OF MAJOR DECISIONS / ACTIONS**
- **CORRELATE: OBJECTIVES, FUNCTIONS, ORGANIZATION,
ACTIVITIES**



EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT
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EXAMPLE: MAJOR OUTPUT TRACING - A PLAN



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REQUIREMENTS ANALYSIS - STEP 6

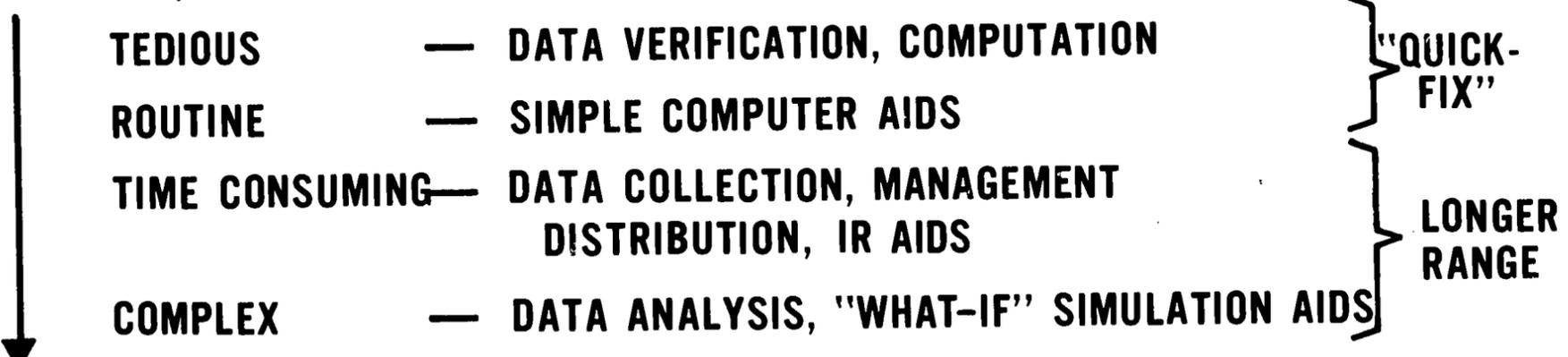
PROBLEM / SOLUTION HANDLING

- **OPERATIONAL SYSTEM "PROBLEMS"**
- **INFORMATION SYSTEM "PROBLEMS"**
- **SYMPTOMS OF SICK SYSTEMS**
- **UNRAVELLING "PROBLEM - SOLUTION" SNARLS**

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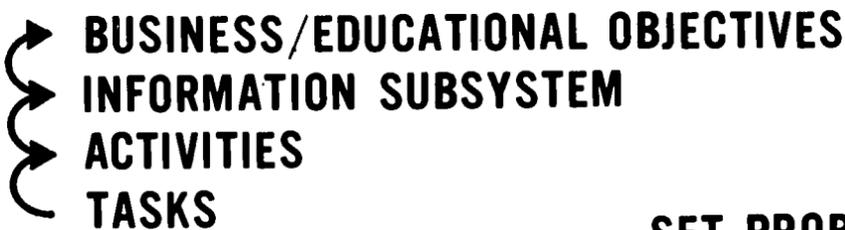
PROBLEMS

TASKS/ACTIVITIES



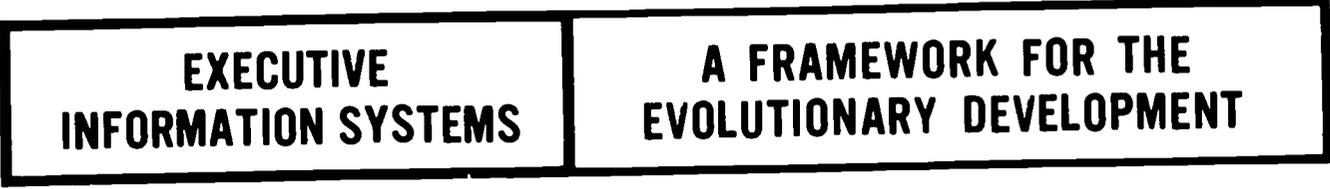
IMPACT ON OPERATIONAL SYSTEM

HOW RELATED?



SET PROBLEM PRIORITIES





TRANSLATION OF MAJOR PROBLEMS —————> **APPLICATIONS**
CAN OBJECTIVES BE ACHIEVED? • **SHORT RANGE PLANS AND CONCEPTS**

- EASIER?
- FASTER?
- AT LESS COST?
- WITH FEWER DIFFERENT PEOPLE?

BY CHANGES IN

- ORGANIZATION
- RESPONSIBILITIES
- PROCEDURES
- LAYOUT

“QUICK-FIX”/SHORT RANGE PLAN



CAN EDP HELP?

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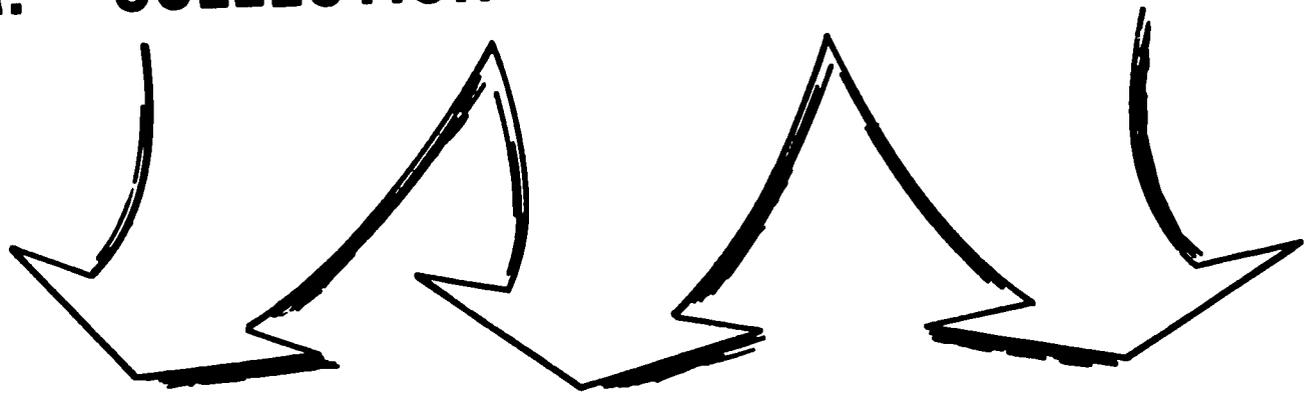
REQUIREMENTS ANALYSIS - STEP 7

REITERATION WITH PROBLEM/SOLUTION FOCUS

- **COLLECTION OF MORE DETAILED DATA**
 - **RELEVANT TO SELECTED PROBLEMS/SOLUTIONS**
- **SPECIFIC PROBLEM RANKING**
 - **STRESS IMPORTANT AREAS**
- **TOWARD EVOLUTIONARY IMPROVEMENTS**

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT
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DATA: COLLECTION FLOW ANALYSIS



SIMPLE



TO

SOPHISTICATED

**REVIEW OF HIST.
DATA, TRENDS,
REPORTS
QUESTIONNAIRES
OBSERVATION
SAMPLING**

**I/O MATRICES
FLOWCHARTING
DECISION TABLES**

**DATA REDUCTION
& SUMMARIES
STATISTICAL
TECHNIQUES
MODELLING &
SIMULATION**

0

**EXECUTIVE
INFORMATION SYSTEMS**

**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

RANKING OF PROBLEM AREAS/APPLICATIONS/ CONCEPTS

- IMPORTANCE IN RELATION TO ORGANIZATION/MISSION
- URGENCY IN RESPECT TO DISTRICT NEEDS
- AMENABILITY TO AUTOMATION AIDS
- EASE OF INTRODUCTION
 - POLITICAL, ECONOMIC & SKILL-CONSTRAINTS
 - TECHNOLOGICAL "SHOPPING LIST"
- "BUILDING BLOCKS" FOR FLEXIBLE GROWTH
- RELATIONSHIP TO STATE/OTHER SYSTEMS

OPS. ENVIRONMENT

FUNCTIONAL ANALYSIS

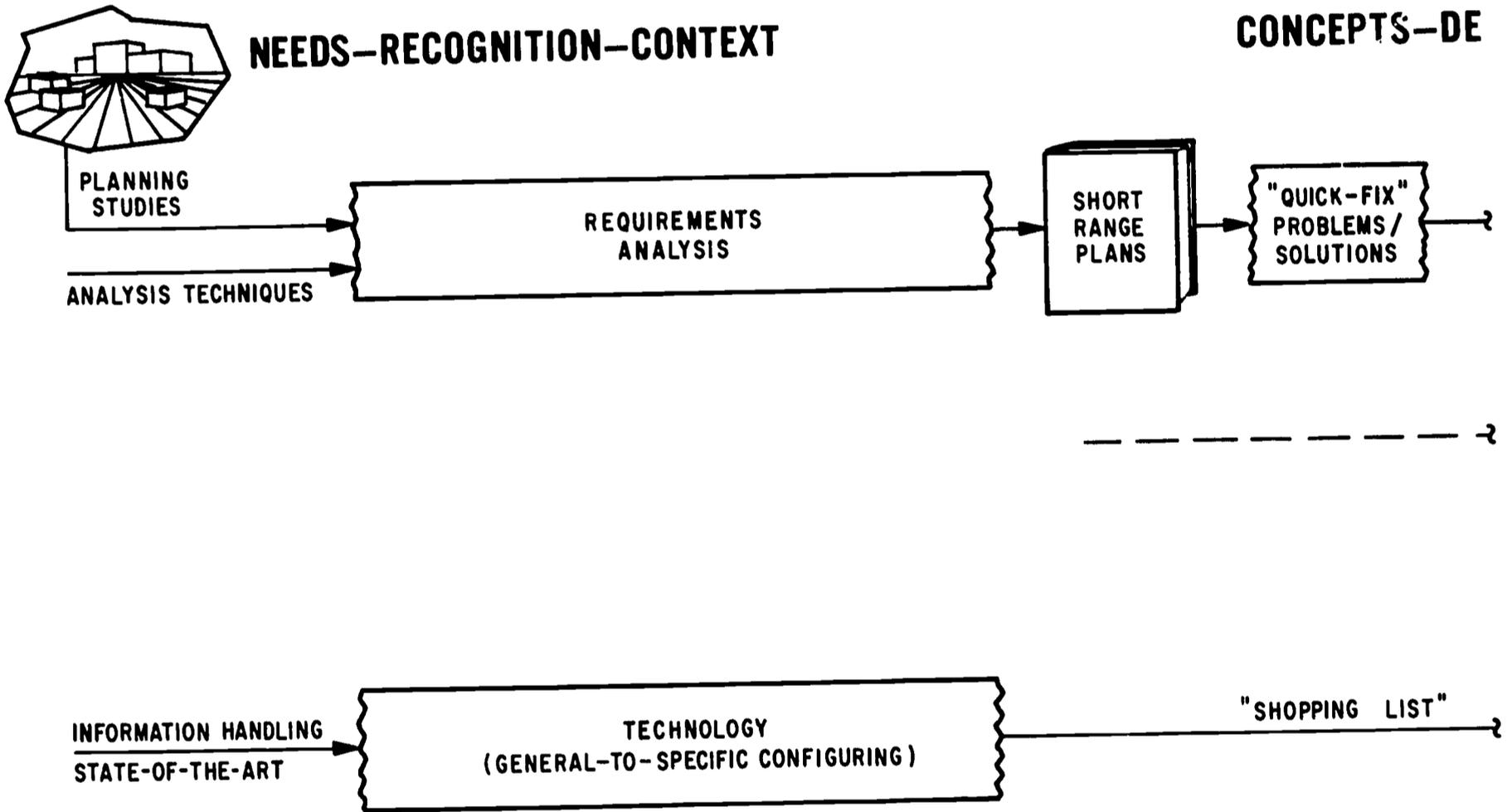
TO "QUICK-FIXES"

TO SYSTEM DESIGN

REQUIREMENTS ANALYSIS-SUMMARY

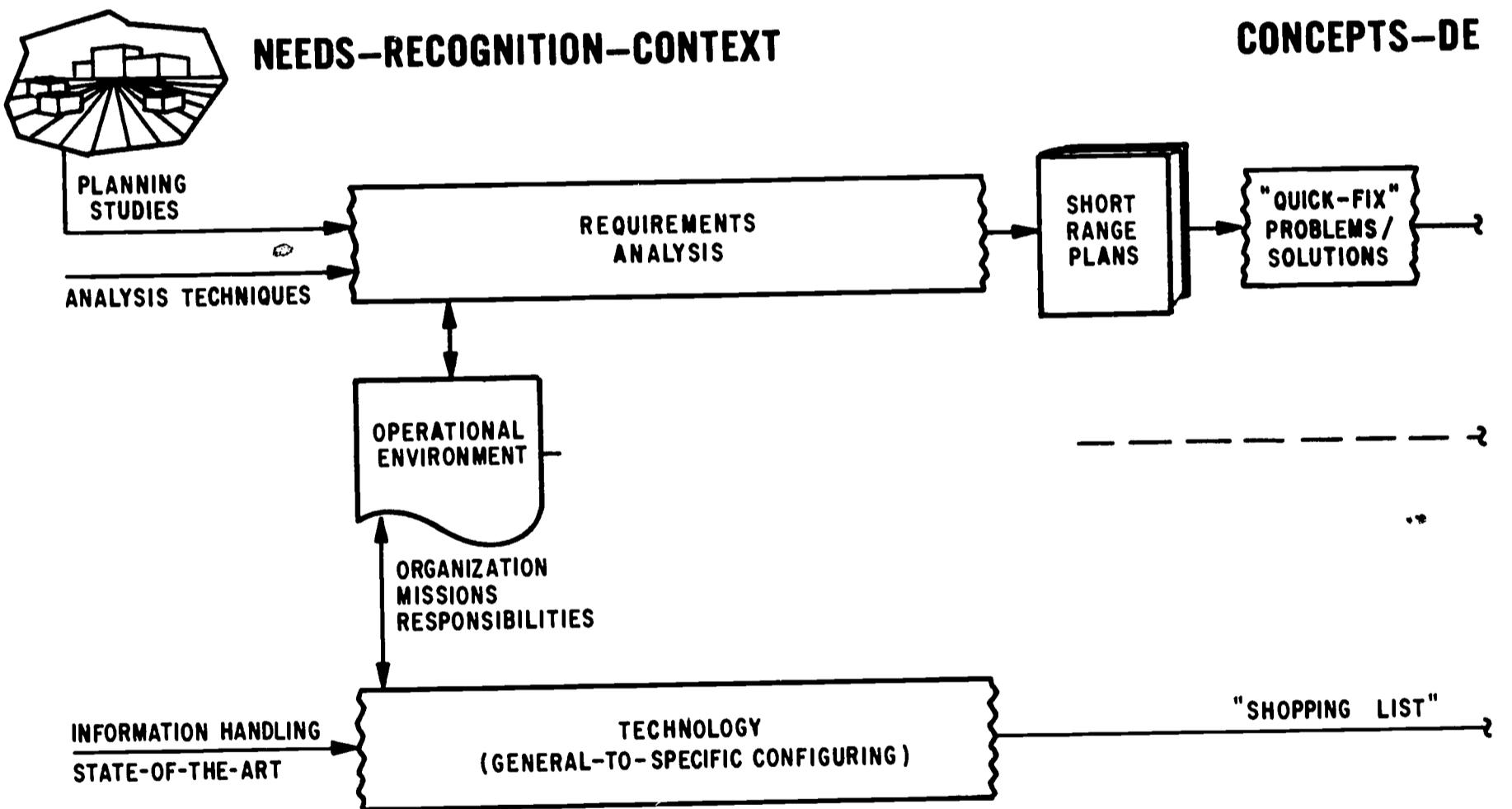
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EIS ANALYSIS AND DESIGN PROCESS



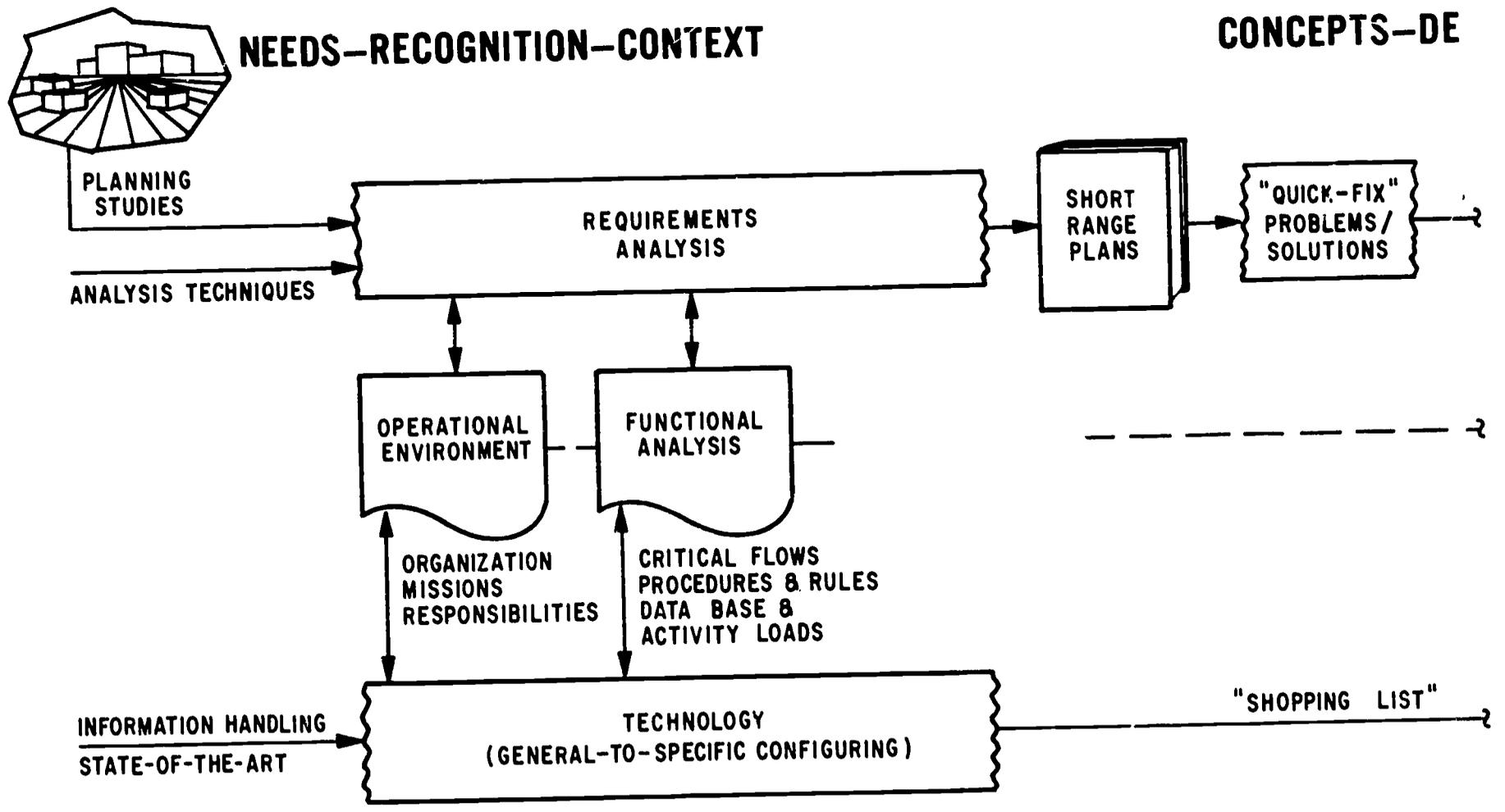
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EIS ANALYSIS AND DESIGN PROCESS



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EIS ANALYSIS AND DESIGN PROCESS



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EIS ANALYSIS AND DESIGN PROCESS



NEEDS-RECOGNITION-CONTEXT

CONCEPTS-DE

PLANNING
STUDIES

ANALYSIS TECHNIQUES

REQUIREMENTS
ANALYSIS

SHORT
RANGE
PLANS

"QUICK-FIX"
PROBLEMS/
SOLUTIONS

OPERATIONAL
ENVIRONMENT

FUNCTIONAL
ANALYSIS

SPECIFICATIONS
PROBLEMS /
APPLICATIONS
CONCEPTS

ORGANIZATION
MISSIONS
RESPONSIBILITIES

CRITICAL FLOWS
PROCEDURES & RULES
DATA BASE &
ACTIVITY LOADS

INFORMATION HANDLING
STATE-OF-THE-ART

TECHNOLOGY
(GENERAL-TO-SPECIFIC CONFIGURING)

"SHOPPING LIST"

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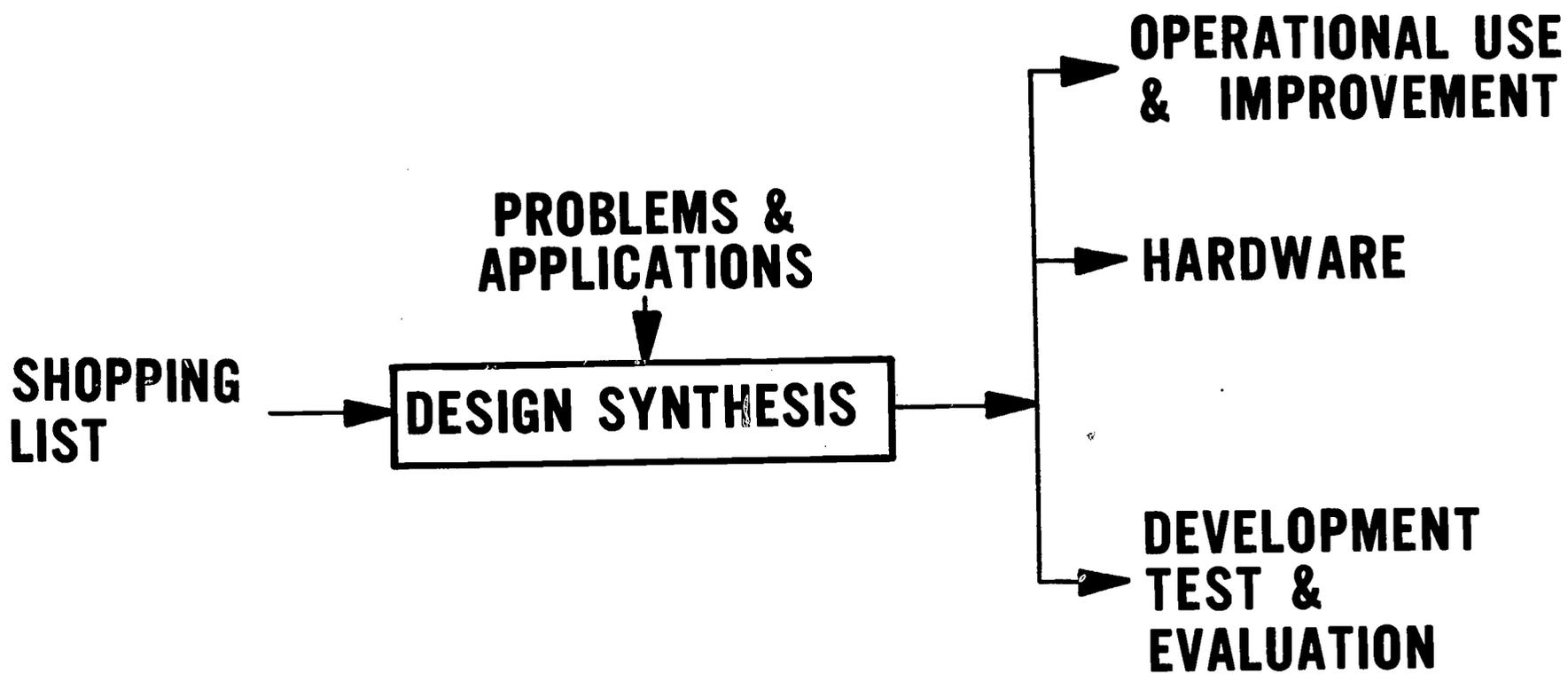
BASIC TYPES OF EFFORT

- 1. REQUIREMENTS ANALYSIS** ✓ ✓
- 2. SYSTEM DESIGN & PLANNING** ✓
- 3. DEVELOPMENT, TEST & EVALUATION**
- 4. HARDWARE ACQUISITION**
- 5. OPERATIONAL USE & IMPROVEMENT**



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SYSTEM DESIGN & PLANNING - STAGE 1

**INCREASING NO. OF TECHNOLOGY OPTIONS
(GROWING "SHOPPING LIST")**

- **HARDWARE**
- **SOFTWARE**
- **DATA MANAGEMENT**
- **OPERATIONAL MODES**
- **CENTRALIZATION/DECENTRALIZATION**

**INFINITE NO.
OF SYSTEM
CONFIGURATIONS**

O

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SYSTEM DESIGN & PLANNING - STAGE 1
IMPLICATIONS OF INCREASING OPTIONS

- **SYSTEM DESIGN FLEXIBILITY**
- **ALLOWS DESIGN TO BE LESS
"JOB-SENSITIVE"**
- **CONTROLLING FACTORS**
 - LESS: TECHNOLOGY
 - MORE: OPERATIONAL FEASIBILITY

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SYSTEM DESIGN & PLANNING - STAGE 1

IMPLICATIONS OF INCREASING OPTIONS

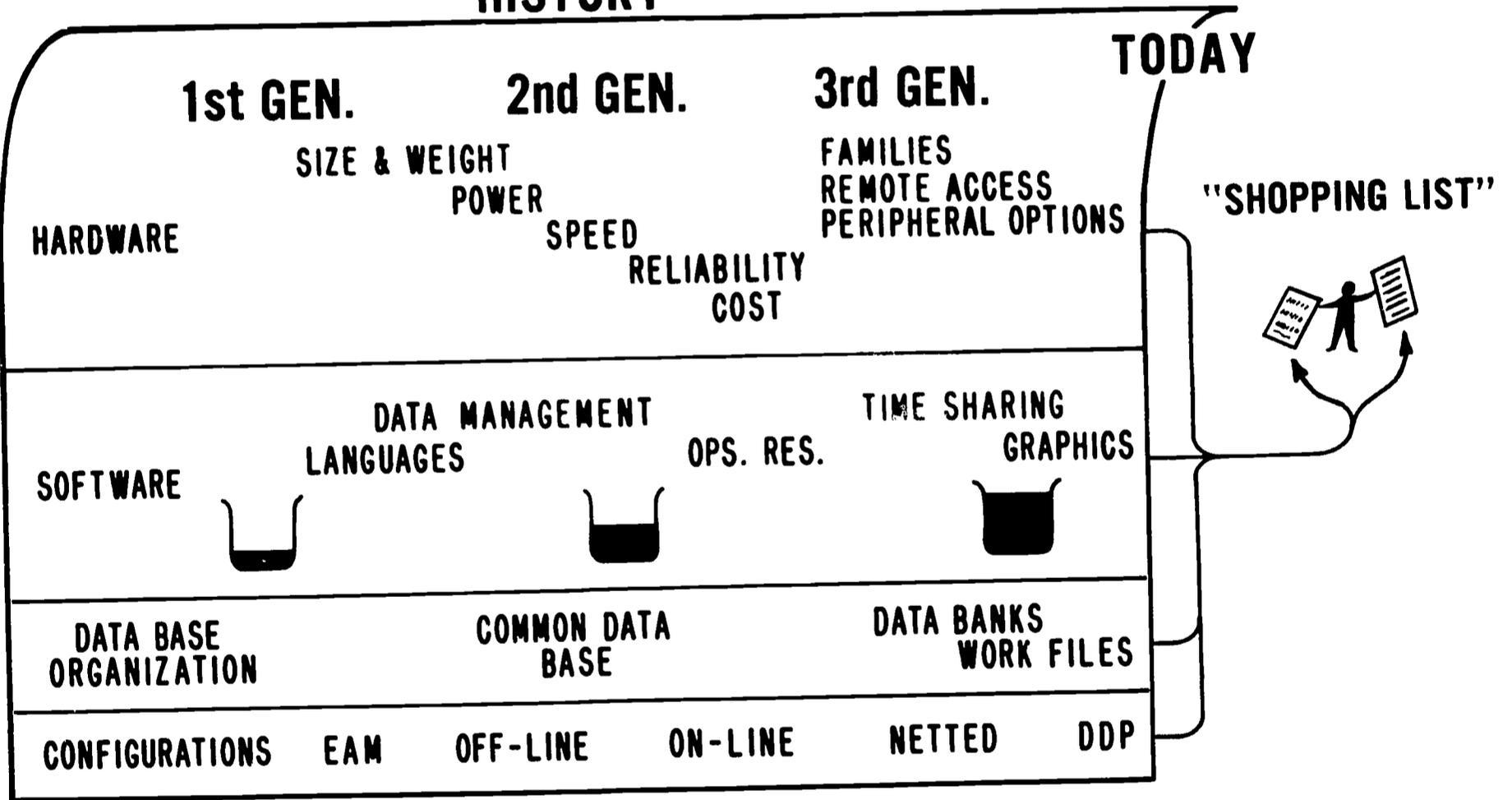
- **THEY APPLY TO EVERYONE ELSE TOO**
STATE
REGIONAL
SERVICE BUREAUS
- **ECONOMIC FACTORS CHANGING RAPIDLY**
- **FEDERAL ROLE UNCERTAIN**

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EIS OPTIONS

HISTORY



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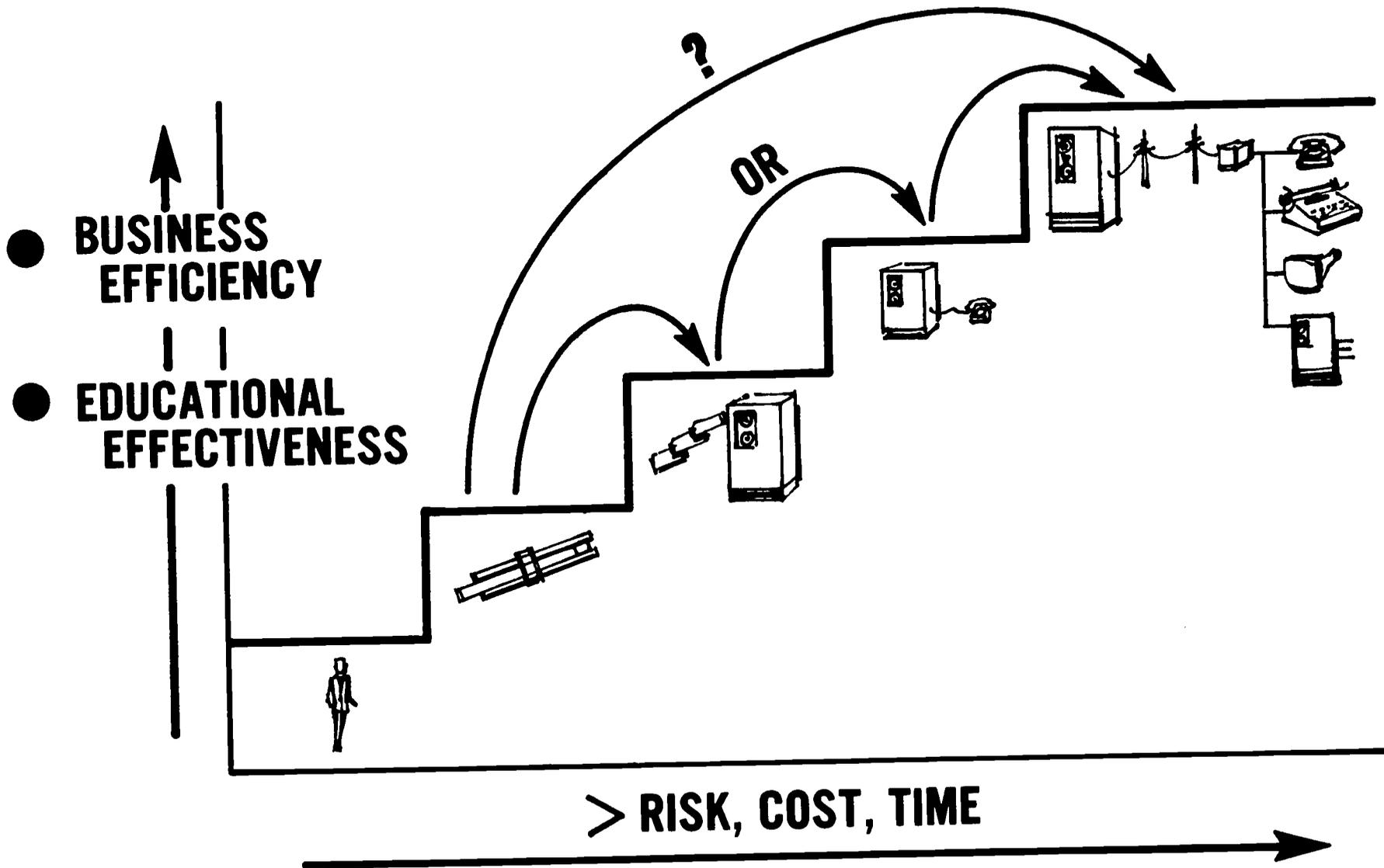
SYSTEM DESIGN & PLANNING - STAGE 2

SYSTEM DESIGN / PLAN STRATEGY

- **INFORMATION SYSTEM PROBLEMS & GOALS**
- **NEAR-TERM VS. LONG-RANGE**
- **FUNDS & SKILLS AVAILABLE**
- **LOCUS OF INITIATIVE**
- **IMPACTS OF BIAS**

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STRATEGY



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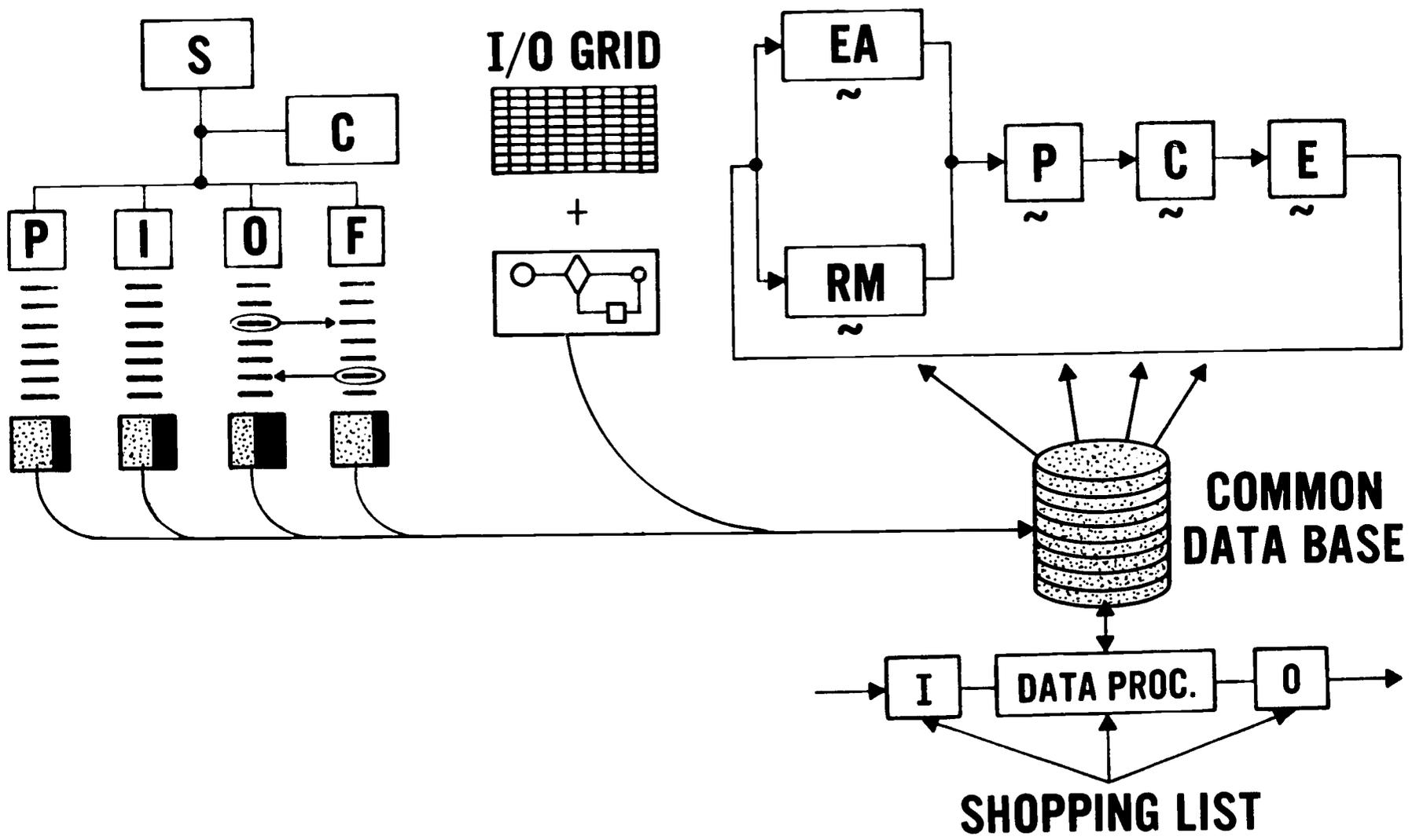
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SYSTEM DESIGN & PLANNING - STAGE 3

DESIGN SYNTHESIS

- **SPECIFICATIONS FROM REQUIREMENTS ANALYSIS**
- **TECHNOLOGY OPTIONS**
- **STRATEGIC CONSIDERATIONS**
- **EVALUATION OF ALTERNATIVES**

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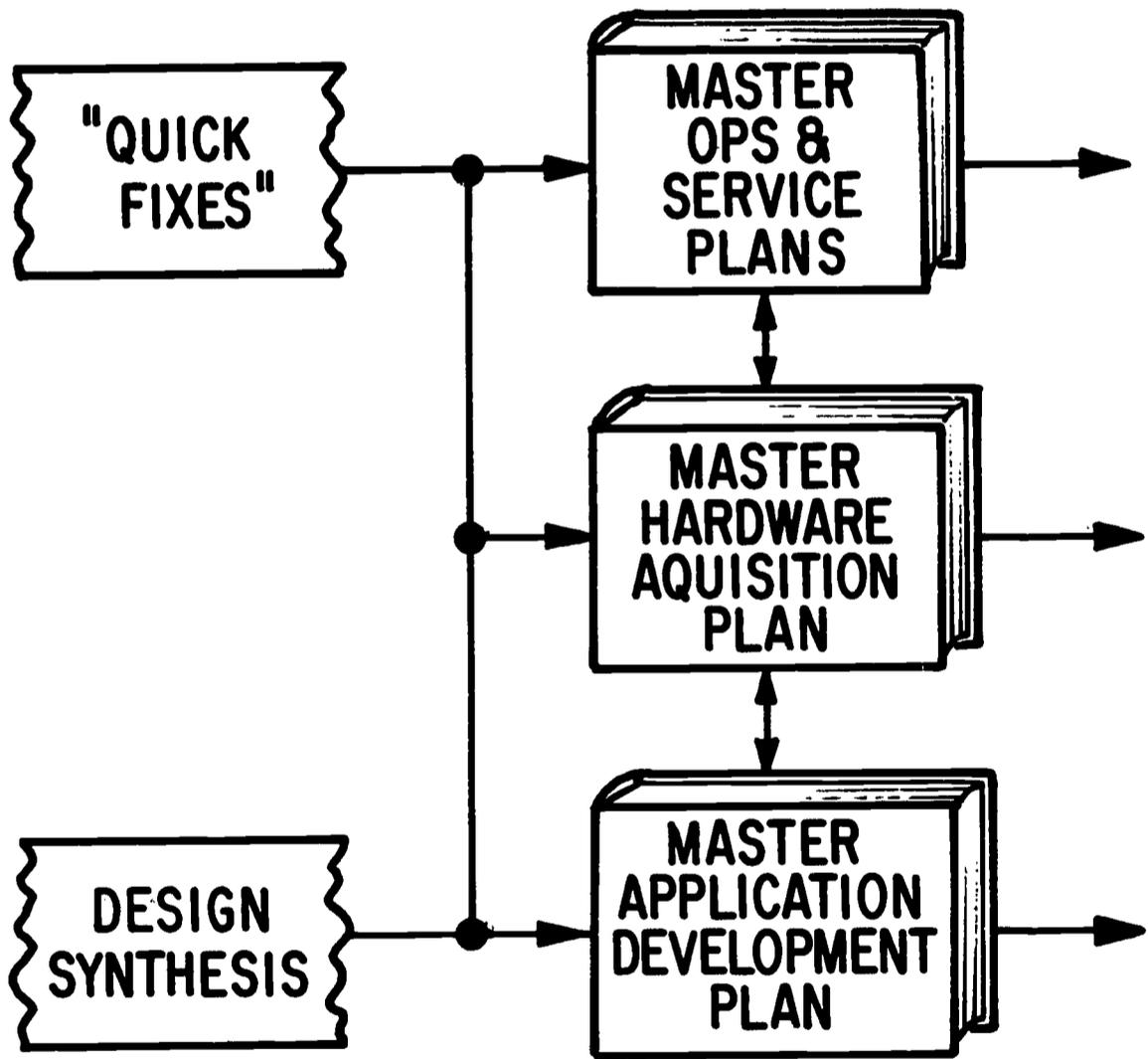
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SYSTEM DESIGN & PLANNING - STAGE 4

DESIGN / PLANNING COORDINATION

- **DESIGN SYNTHESIS**
- **COORDINATE PLANS –**
 - APPLICATIONS DEVELOPMENT**
 - HARDWARE ACQUISITION**
 - OPERATIONAL USE & IMPROVEMENT**

EXECUTIVE INFORMATION SYSTEMS	A FRAMEWORK FOR THE EVOLUTIONARY DEVELOPMENT
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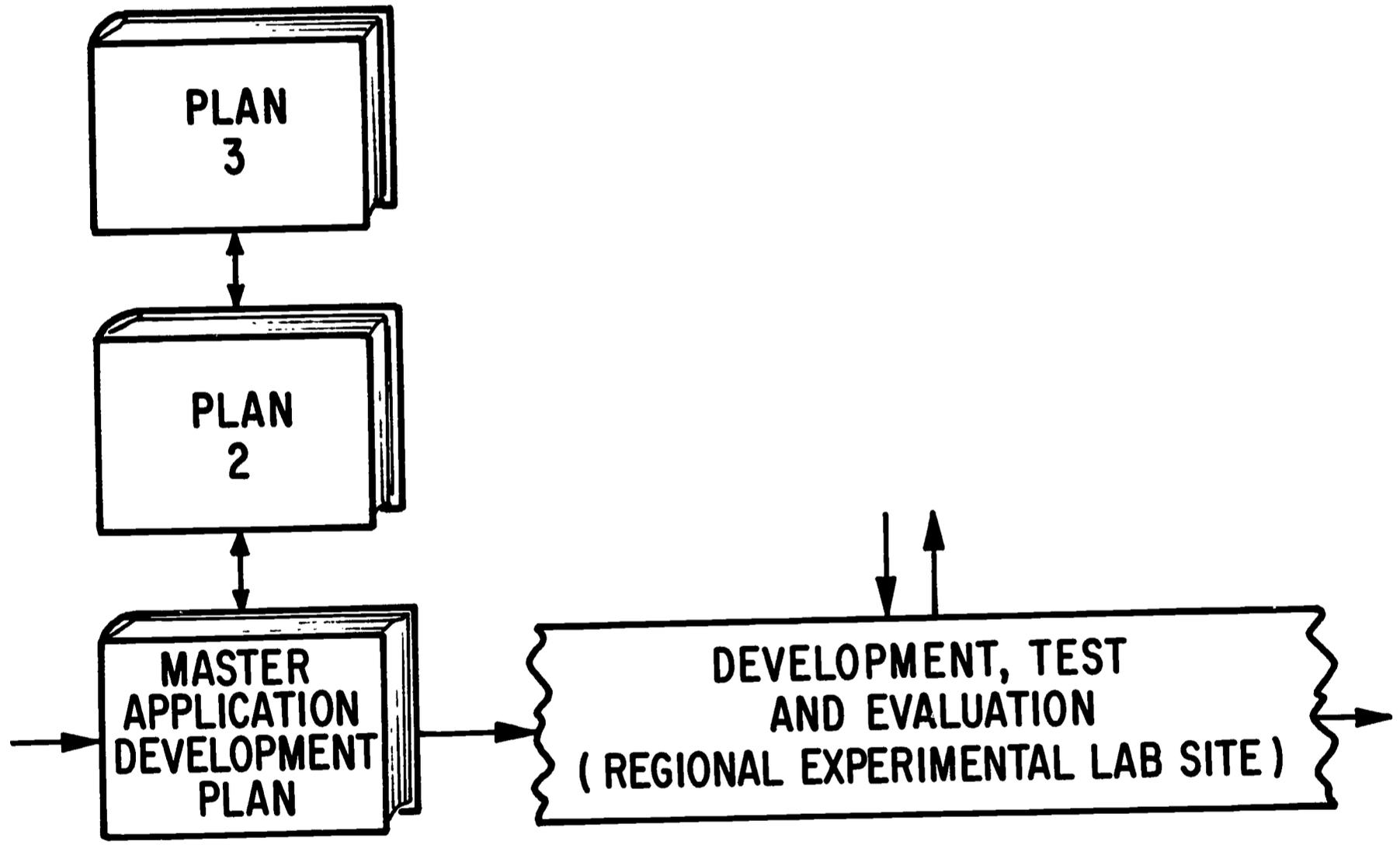
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EVOLUTIONARY DEVELOPMENT**

3. APPLICATIONS DEVELOPMENT

- **PACKAGE SIZE**
- **REGION LABS - STATE - DISTRICT - SCHOOLS**
- **(PROBLEM AREAS)**



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4. HARDWARE ACQUISITION

- **MAJOR STAGES**
- **TIME FACTORS**
- **PEOPLE FACTORS**

**EXECUTIVE
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**A FRAMEWORK FOR THE
EVOLUTIONARY DEVELOPMENT**

MAJOR PLANNING MILESTONES

REQUIREMENT ANALYSIS & DESIGN
3 - 24 MONTHS

PROCUREMENT ACTION
8 - 12 MONTHS

EQUIPMENT DELIVERY
1 - 12 MONTHS

COMPUTER PROGRAMMING
6 - 12 MONTHS

SITE PREPARATION
2 - 18 MONTHS

PERSONNEL TRAINING
3 - 12 MONTHS

INSTALLATION-CONVERSION
3 - 12 MONTHS

**CONTINUING
NEED
ASSESSMENT**

FACTORS AFFECTING

- DEGREE OF CONCURRENCY
- TIME/COST ESTIMATES
 - SCOPE
 - DEGREE OF COORDINATION
 - STABILITY OF REQUIREMENTS
 - QUALITY OF DOCUMENTATION
 - RESOURCES COMMITTED
 - ACTUAL TIME AVAILABLE

**PACE OF
EVOLUTION**

**EXECUTIVE
INFORMATION SYSTEMS**

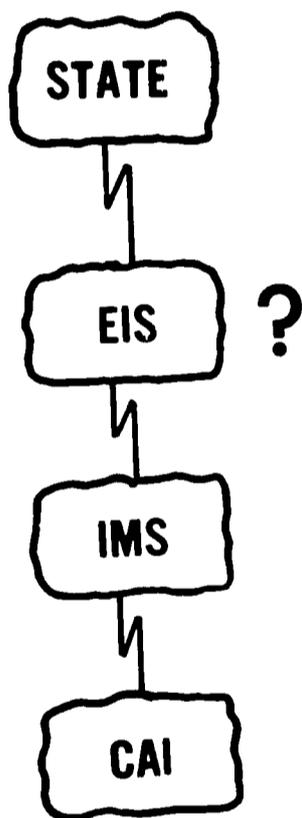
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5. OPERATIONAL USE & IMPROVEMENT

- **PHASE-IN OF PLANNED IMPROVEMENTS**
- **PREPARING FOR FUTURE CHANGE & RENEWAL**

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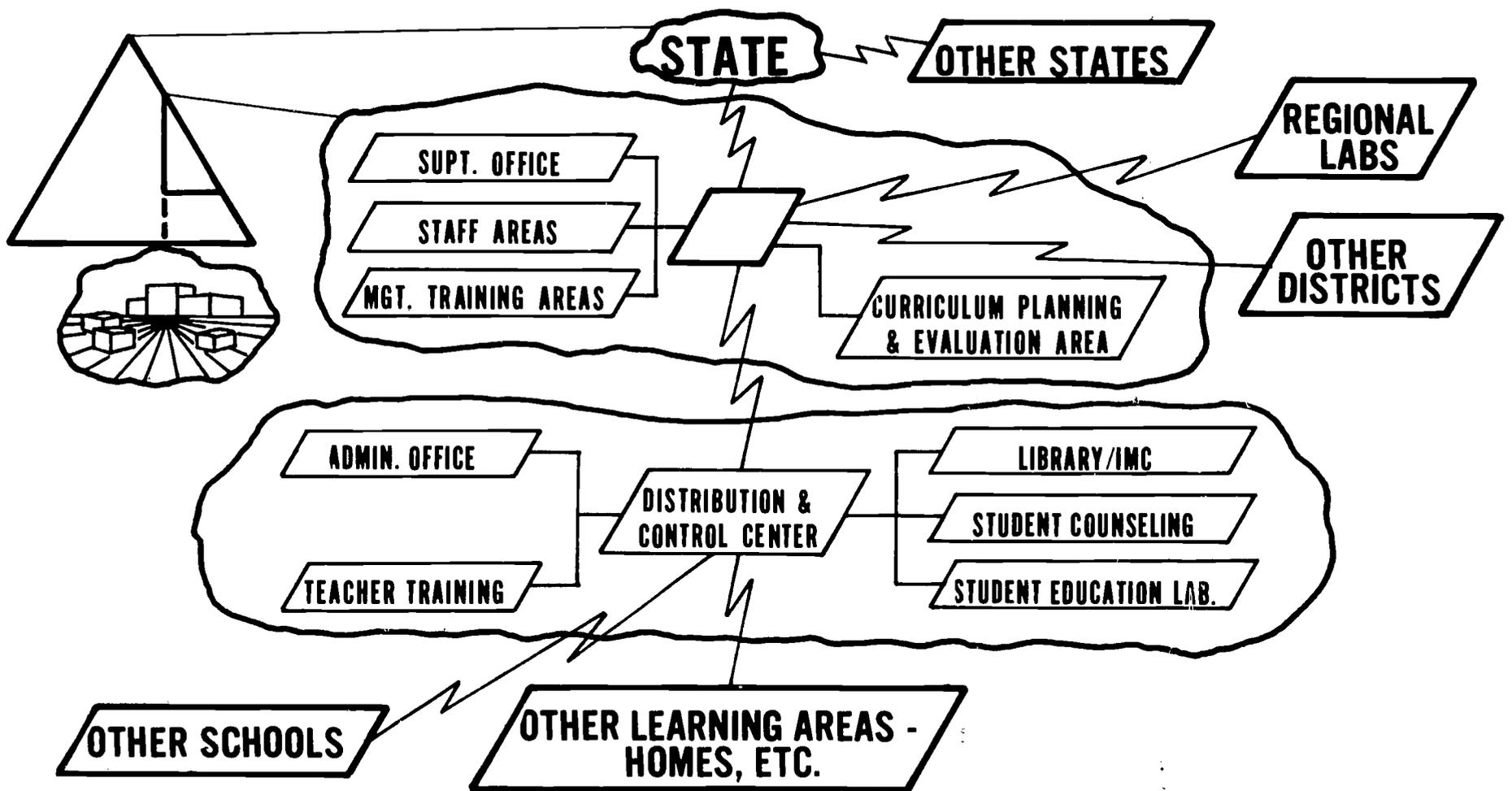


"... DOUBTFUL THAT LARGE NUMBER OF SMALL, UNAFFILIATED OPERATORS CAN SURVIVE ... CRITICALLY IMPORTANT TO EXPLORE POSSIBLE ARRANGEMENTS BY WHICH SMALL ORGANIZATION CAN ENJOY SOME BENEFITS OF LARGE-SCALE ORGANIZATION WITHOUT ANY SUBSTANTIAL LOSS OF AUTONOMY"

**J.W. GARDNER
SELF-RENEWAL, 1964**

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TOWARD EDUCATIONAL EFFECTIVENESS - FUTURE SYSTEM?

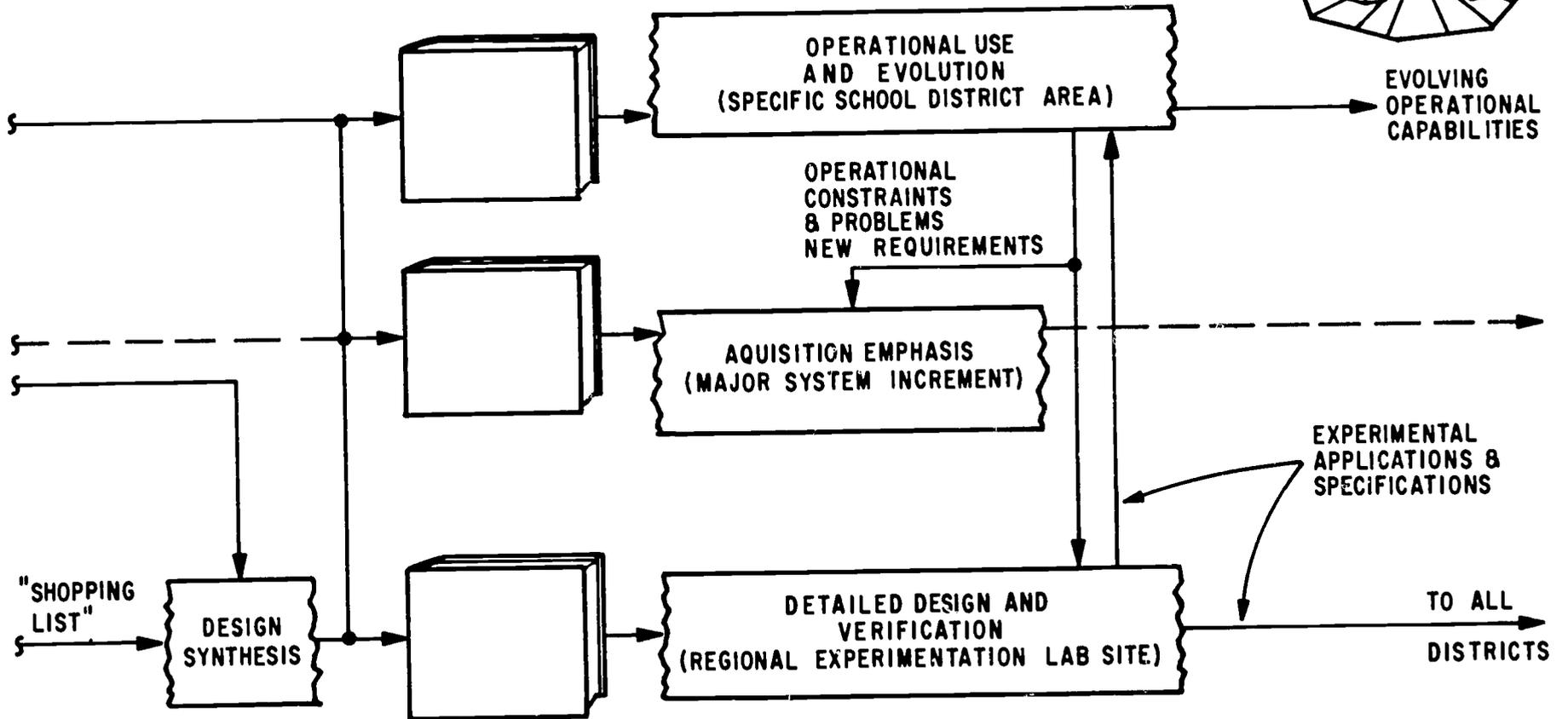
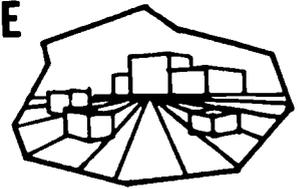


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EIS ANALYSIS AND DESIGN PROCESS

SIGN-PLANS

DEVELOP-OPERATE-IMPROVE

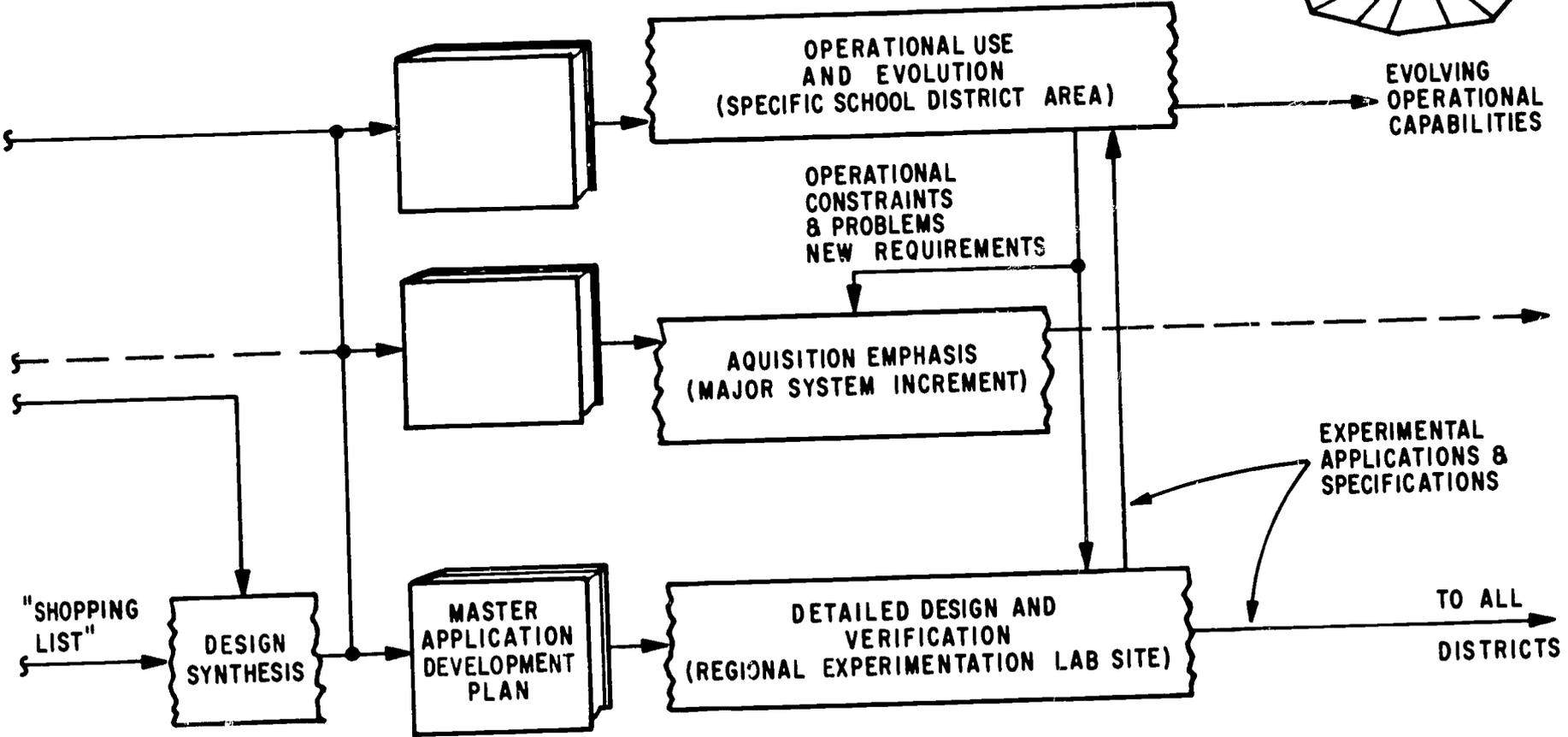
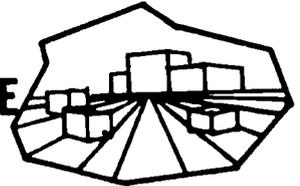


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EIS ANALYSIS AND DESIGN PROCESS

SIGN-PLANS

DEVELOP-OPERATE-IMPROVE

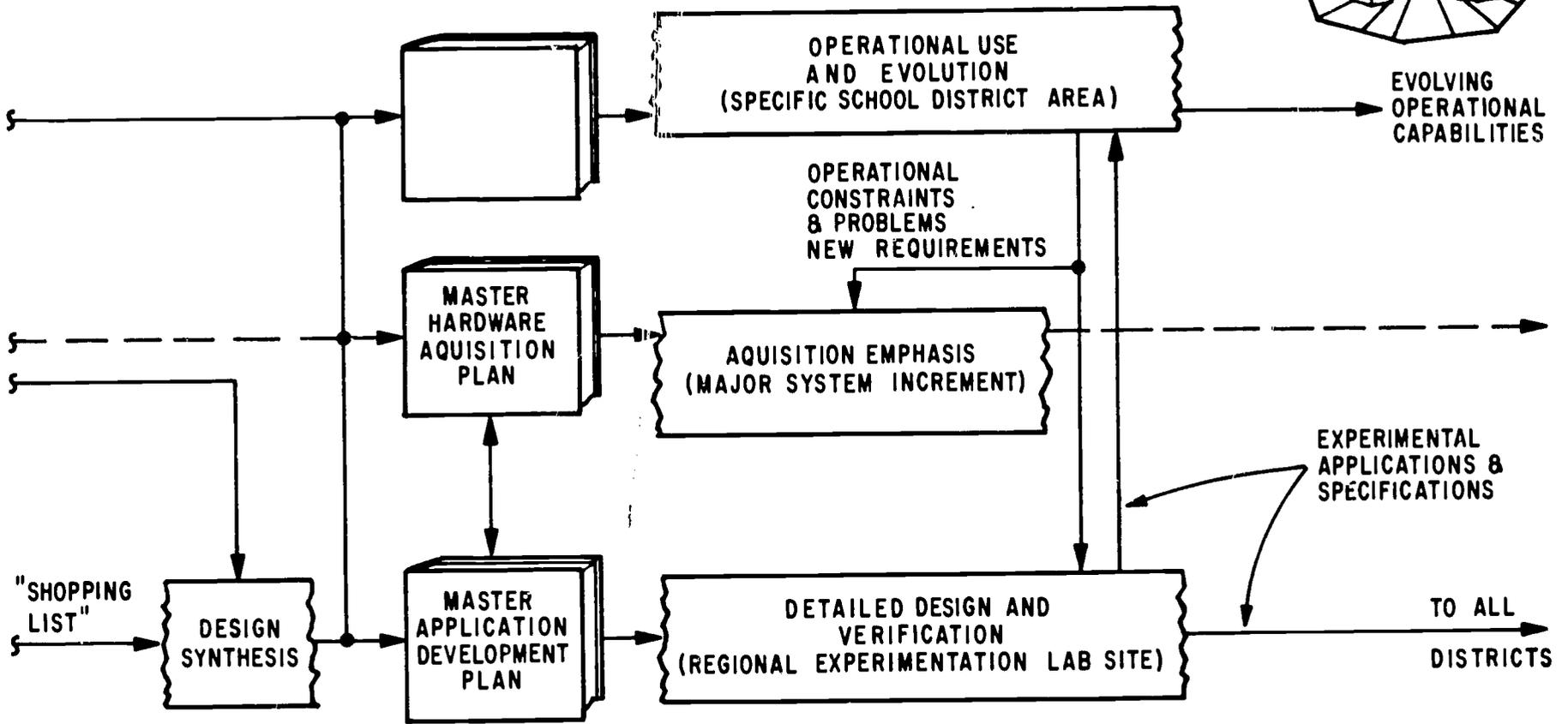
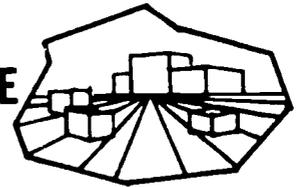


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EIS ANALYSIS AND DESIGN PROCESS

SIGN-PLANS

DEVELOP-OPERATE-IMPROVE

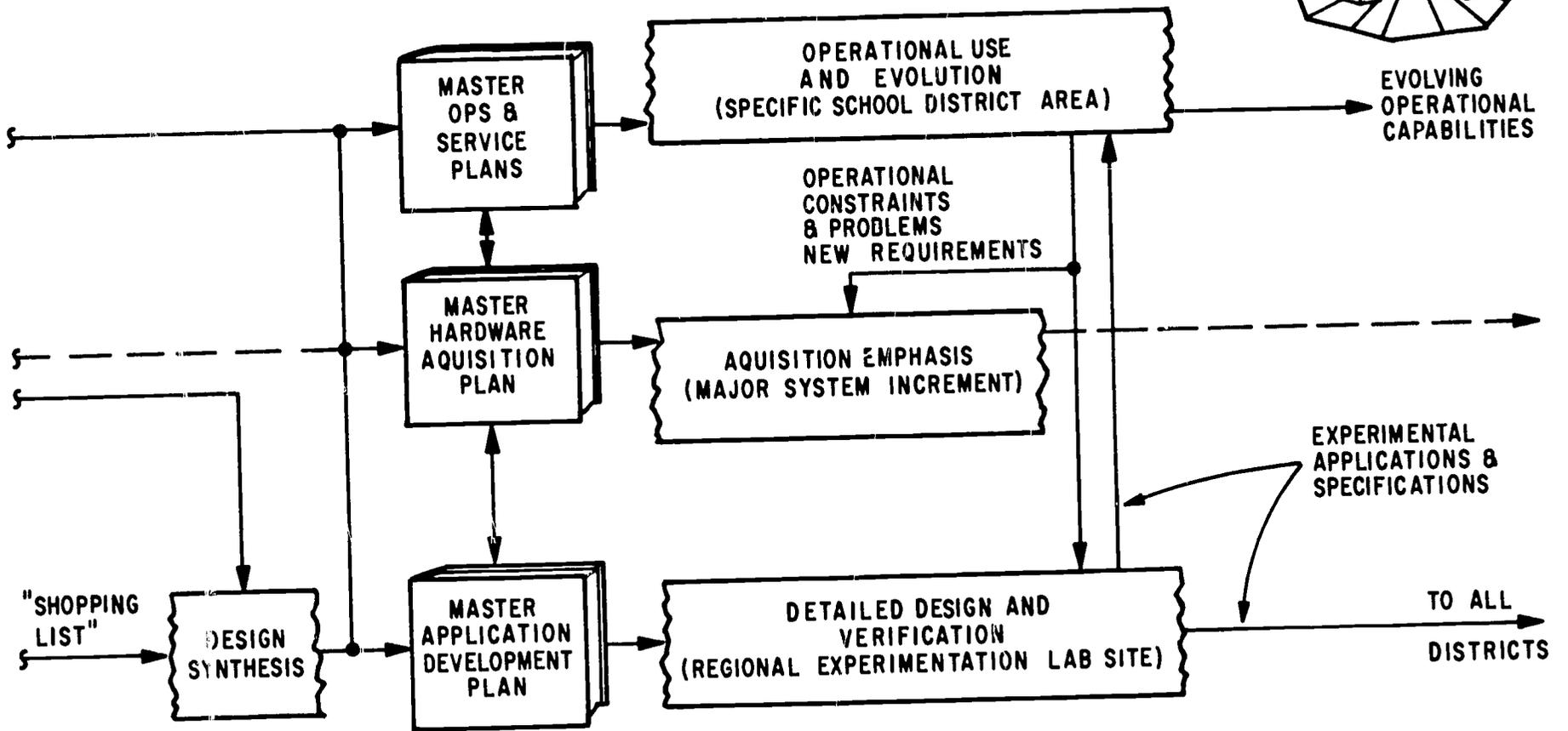
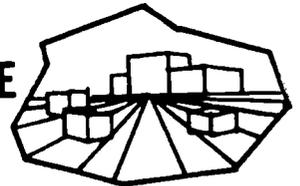


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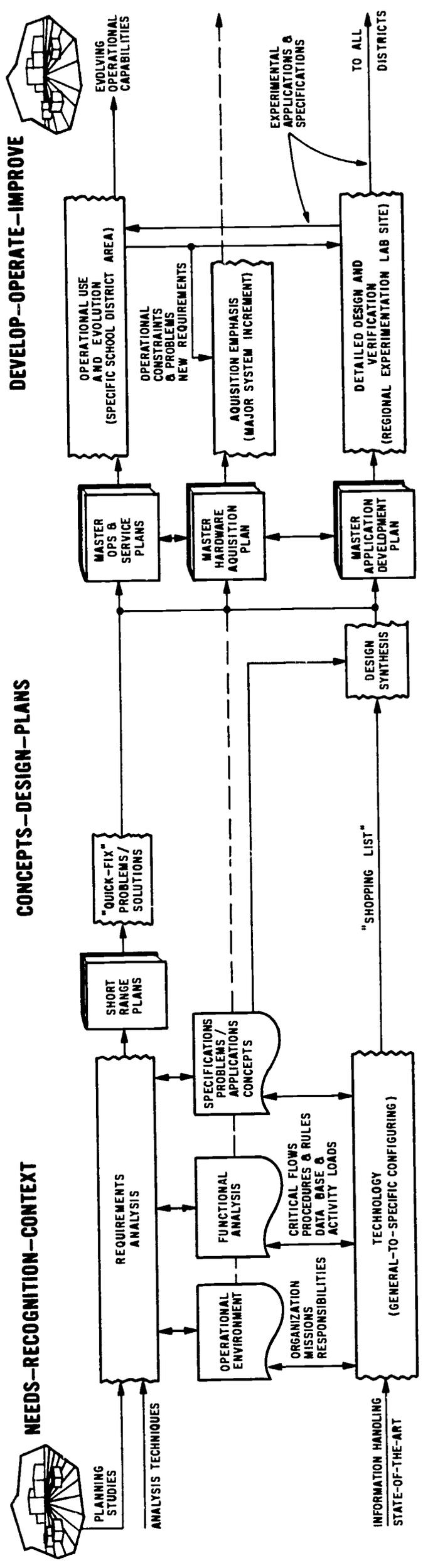
EIS ANALYSIS AND DESIGN PROCESS

SIGN-PLANS

DEVELOP--OPERATE--IMPROVE



EIS ANALYSIS AND DESIGN PROCESS



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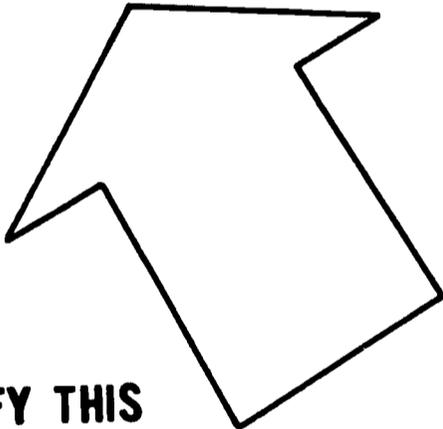
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**"WE HAVE MORE INFORMATION & LESS
UNDERSTANDING THAN AT ANY TIME
IN OUR HISTORY"**

ROBERT HUTCHINS



INTENSIFY THIS



EIS

**TIME TO THINK ABOUT WHOLE MAN:
"THE HUMAN RACE LIVES - -
BY ART AND REASONINGS"**

ARISTOTLE



ENCOURAGE THIS

