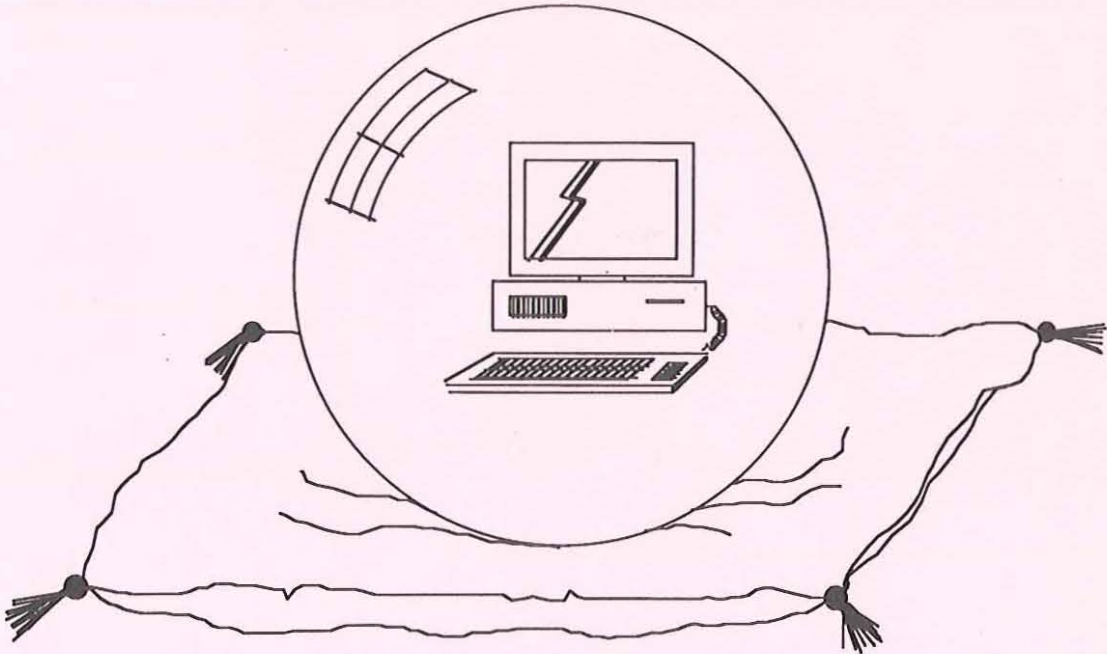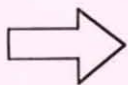# CASE89 STOCKHOLM
ON THE FUTURE OF CASE TOOLS

F. VAN ASSCHE
JAMES MARTIN ASSOCIATES

CONTENTS

→ ● THE HISTORY OF CASE TOOLS

● CASE TOOLS STATE OF THE ART

● THE EVOLUTION OF APPLICATIONS

● THE EVOLUTION OF APPLICATION DEVELOPMENT

● EVOLUTION OF CASE TOOLS

● EVOLUTION OF CASE TOOL DEVELOPMENT

● THE IMPACT OF THESE INNOVATIONS ON PRODUCTIVITY
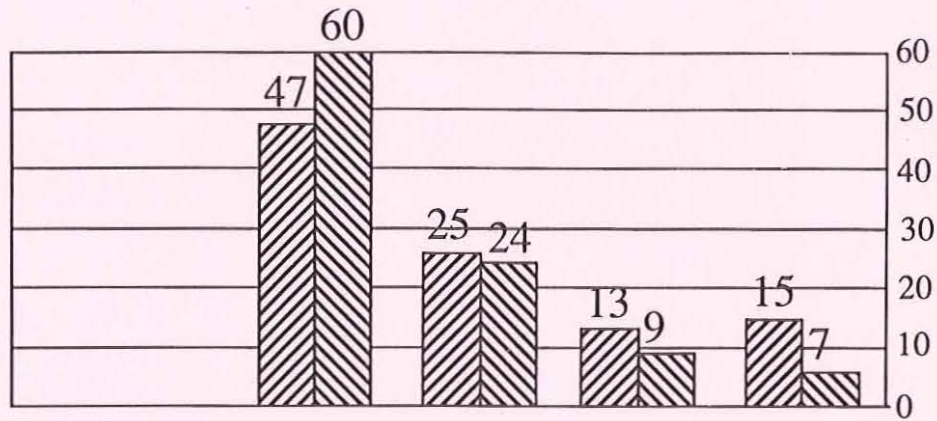& QUALITY

THE SOFTWARE BACKLOG STORY

INVISIBLE BACKLOG

VISIBLE BACKLOG

SOFTWARE PRODUCTION
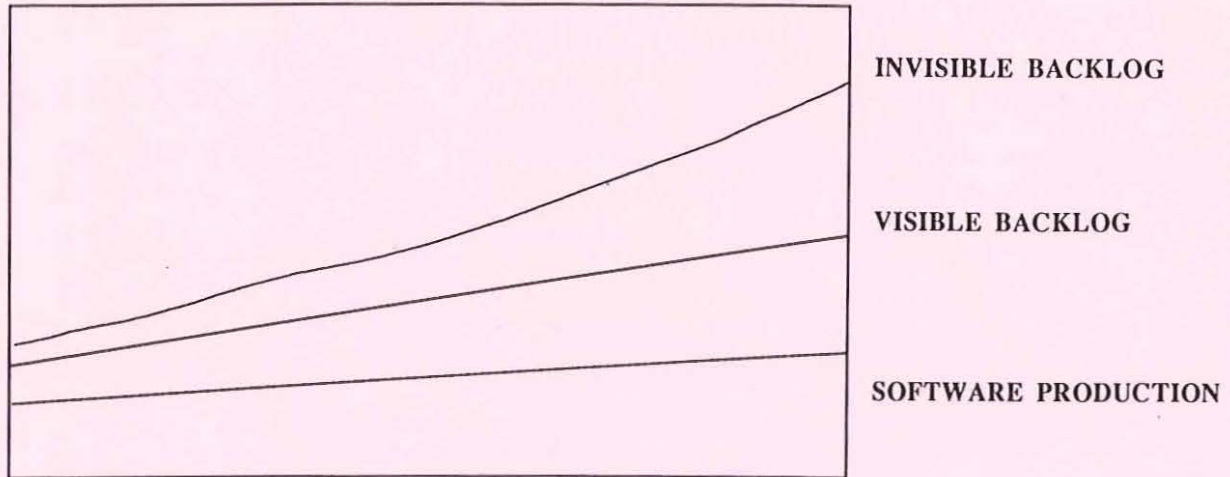
THE RESULT OF USING

4TH GL
CODE GENERATORS

HAS BEEN THAT SYSTEM BUILDERS STILL
DEVELOPED UNRELIABLE INFORMATION
SYSTEMS BUT NOW MUCH FASTER
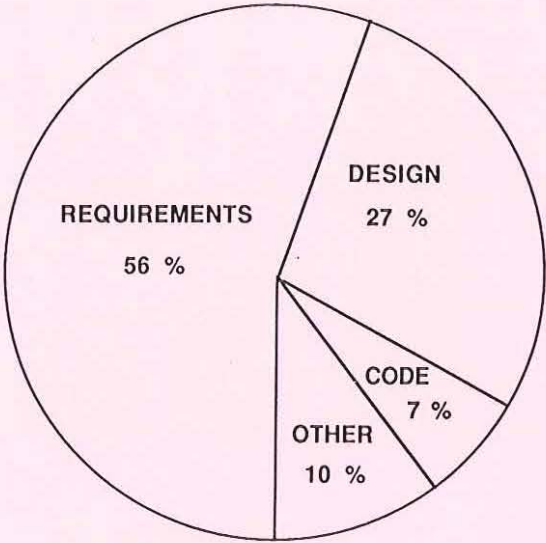
INCREASED PRODUCTIVITY

☑ 84
☒ 87

HOWEVER,
MAINTENANCE IS NOT REDUCED
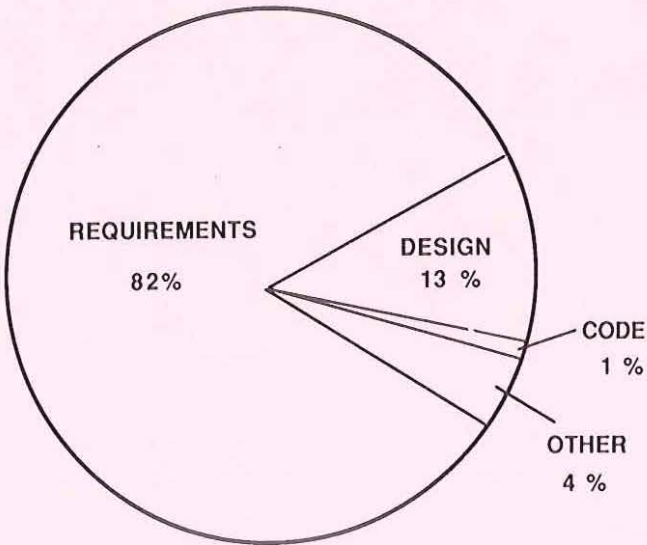
1979 REPORT BY
U.S. ACCOUNTING DEPARTMENT

STUDY OF 9 FEDERAL SOFTWARE PROJECTS
Total Amount 6.8 Million US$

47 %	3.3 M	Delivered but never used
29 %	2.0 M	Paid but never delivered
19 %	1.3 M	Abandoned or reworked
3 %	0.2 M	Used after change
2 %	0.1 M	Used as delivered

DISTRIBUTION OF BUGS

DESIGN
27 %

REQUIREMENTS
56 %

CODE
7 %

OTHER
10 %

DISTRIBUTION OF EFFORT TO FIX BUGS

REQUIREMENTS
82%

DESIGN
13 %

CODE
1 %

OTHER
4 %

EVOLUTION OF
TIME SPENT BY DEVELOPERS
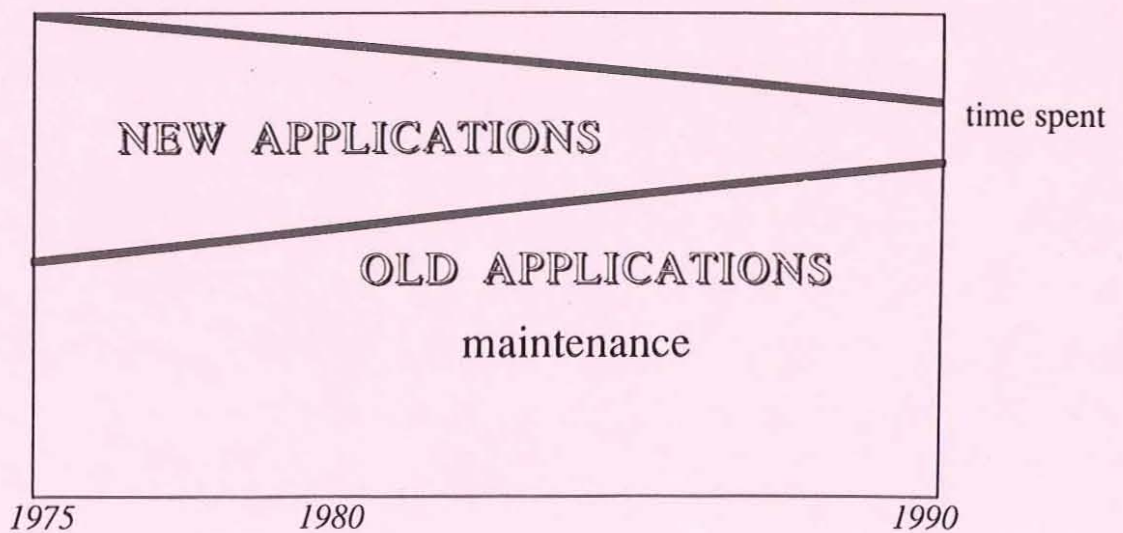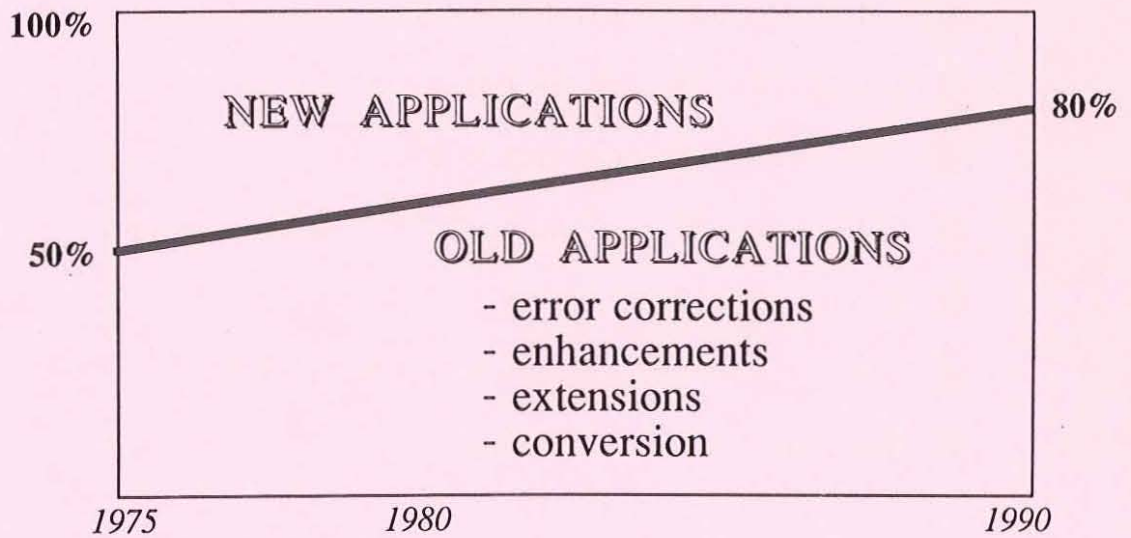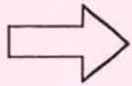
100%

NEW APPLICATIONS

80%

50%

OLD APPLICATIONS

- error corrections
- enhancements
- extensions
- conversion

1975   *1980*   *1990*

NEW APPLICATIONS

time spent

OLD APPLICATIONS

maintenance

1975   *1980*   *1990*

CONTENTS

CASE TOOLS : State of the Art

● TERMINOLOGY

● AREAS TO BE COVERED BY CASE TOOLS

● THE NEED FOR INTEGRATION

● A TYPICAL I-CASE ARCHITECTURE

● HIGH-LEVEL DESIGN SPECIFICATIONS

● ADMINISTRATION

● EFFECTIVENESS OF CASE TOOLS

● REDUCTION OF COSTS

TERMINOLOGY
CONCERNING CASE TOOLS

- SOFTWARE ENGINEERING vs INFORMATION SYSTEM ENGINEERING

- WORK BENCH: PROGRAMMER WB, ANALYST WB, DESIGNER WB

- UPPER CASE & LOWER CASE`
  FRONT END CASE & BACK END CASE

- INTEGRATED PROJECT SUPPORT ENVIRONMENT (IPSE)

- I-CASE

- CASE-SHELL

AREAS TO BE
COVERED BY CASE-TOOLS

	INFORMATION STRATEGY PLANNING	BUSINESS AREA ANALYSIS	BUSINESS SYSTEM DESIGN	TECHNICAL DESIGN & CONSTRUCTION	TRANSITION	PRODUCTION
INFORMATION SYSTEM DEVELOPMENT						
CONFIGURATION MANAGEMENT						
PROJECT MANAGEMENT						

IMPROVING SYSTEMS DEVELOPMENT

PLAN

CONSTRUCT

MANAGE

ANALYSE

DESIGN
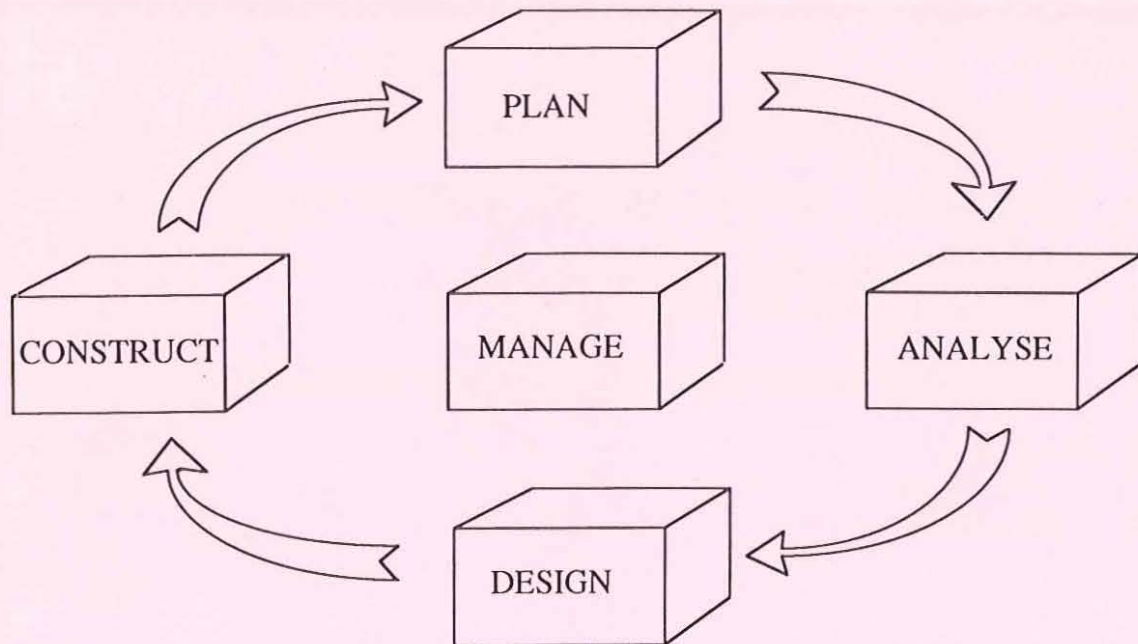
I-CASE : NEED FOR INTEGRATION

● **WHAT**
  - of data models, process models, mmi
  - of all stages
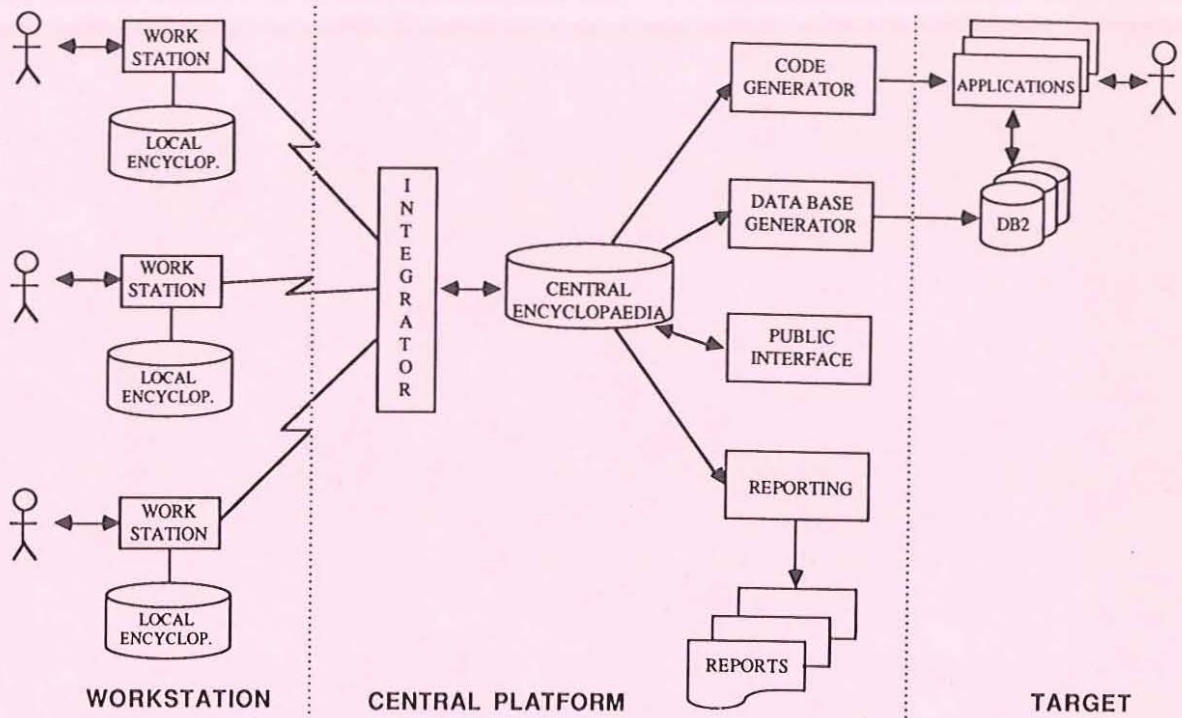 - of development, administration, project management

● **WHY**
  - quality : error prevention; more powerful analysis;
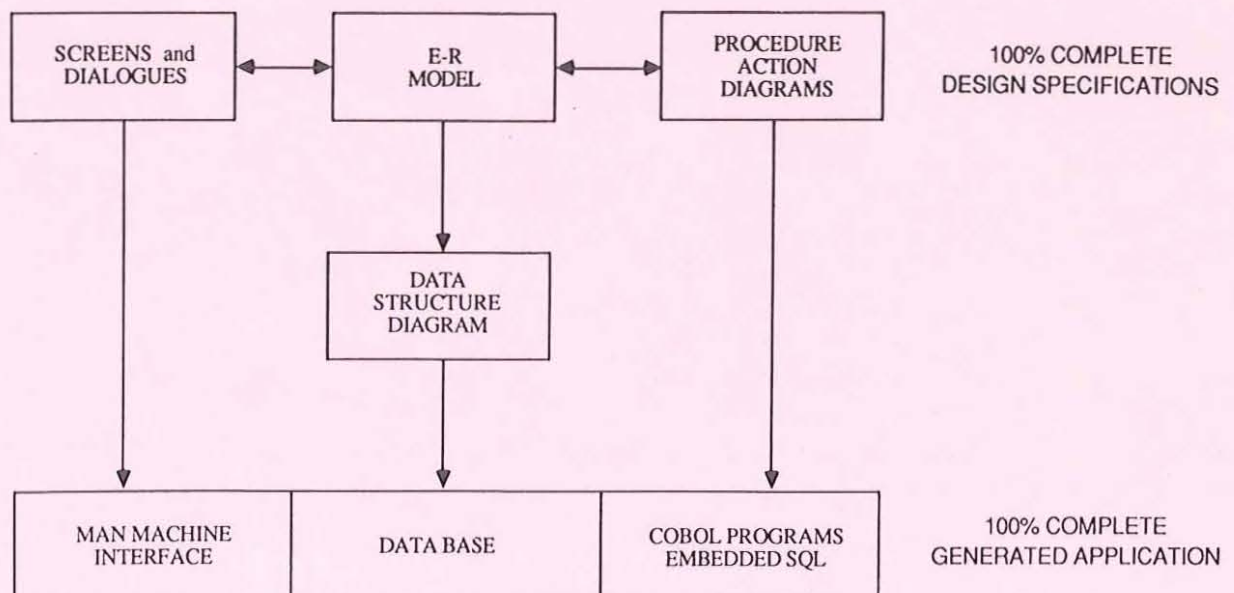 - productivity : more powerful generation; administration

● **HOW**

  central encyclopaedia

A TYPICAL I-CASE ARCHITECTURE

WORKSTATION   CENTRAL PLATFORM   TARGET

HIGH LEVEL DESIGN SPECIFICATIONS

SCREENS and DIALOGUES ↔ E-R MODEL ↔ PROCEDURE ACTION DIAGRAMS

100% COMPLETE DESIGN SPECIFICATIONS

DATA STRUCTURE DIAGRAM

MAN MACHINE INTERFACE | DATA BASE | COBOL PROGRAMS EMBEDDED SQL

100% COMPLETE GENERATED APPLICATION

HIGH LEVEL SPECIFICATIONS

READ customer
   WHICH makes ANY OCCURENCE OF booking
      WITH received_date EQUAL TO CURRENT_DATE
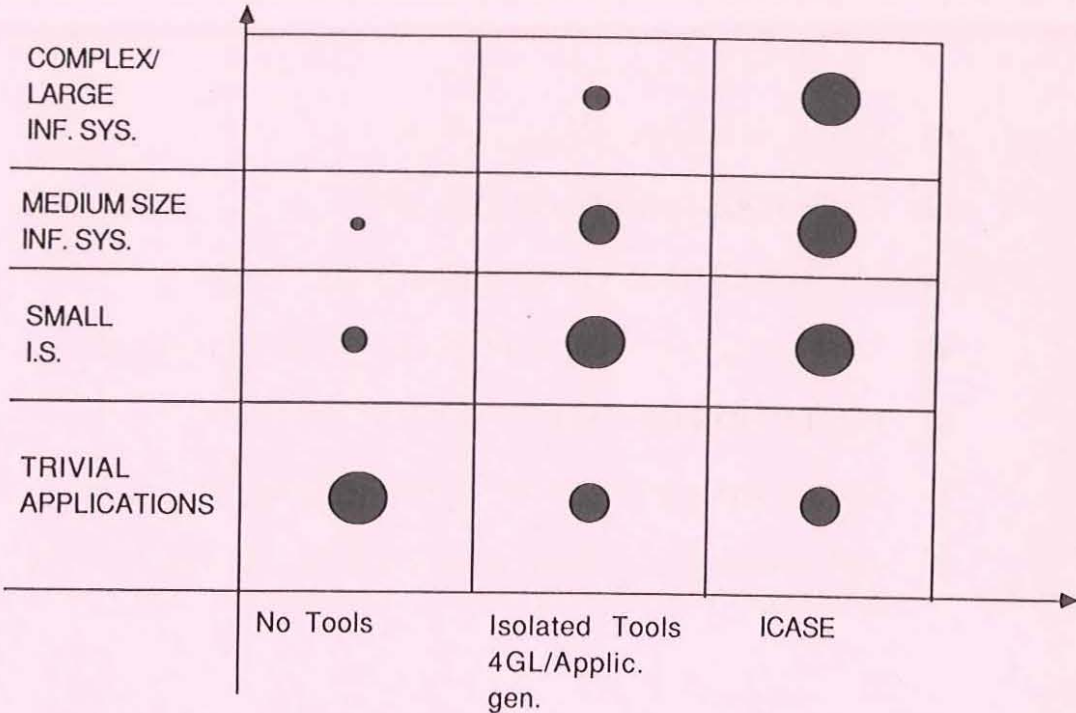

  .
  .
  .

SET out booking fee_amount TO course daily_price * course
     days_duration * (100 - in customer
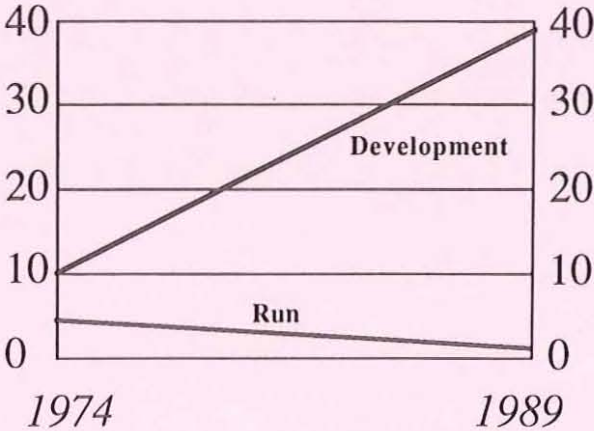   discount_percentage) / 100

ADMINISTRATION

- ADHERENCE TO STANDARDS
- MODEL MANAGEMENT, MANAGING MULTIPLE MODELS
- CONTROLLING USER ACCESS
- VERSION CONTROL, VERSION DIFFERENCE REPORTING
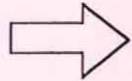- SUBSETTING & MERGING
- SELECTIVE GENERATION

EFFECTIVENESS OF TOOLS

	No Tools	Isolated Tools 4GL/Applic. gen.	ICASE
COMPLEX/ LARGE INF. SYS.		●	⬤
MEDIUM SIZE INF. SYS.	·	⬤	⬤
SMALL I.S.	●	⬤	⬤
TRIVIAL APPLICATIONS	⬤	⬤	●

EVOLUTION OF DEVELOPMENT AND RUN COSTS

Development

Run

1974   1989

CONTENTS

- THE HISTORY OF CASE TOOLS

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⇨ - THE EVOLUTION OF APPLICATIONS

- THE EVOLUTION OF APPLICATION DEVELOPMENT

- EVOLUTION OF CASE TOOLS

- EVOLUTION OF CASE TOOL DEVELOPMENT

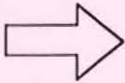- THE IMPACT OF THESE INNOVATIONS ON PRODUCTIVITY & QUALITY

EVOLUTION IN THE DOMAIN COVERED BY CASE TOOLS

- MANAGEMENT INFORMATION SYSTEMS

- LOW LEVEL SOFTWARE (OPERATING SYSTEMS, COMPILERS, DBMS, ...)

- REAL TIME SYSTEMS

- DECISION SUPPORT SYSTEMS

- ENTERPRISE MODELLING

- DISTRIBUTED SYSTEMS

EVOLUTION IN HCI SUPPORT

- GRAPHICS

- WINDOWS
  ICONS
  MOUSE
  POINTER DEVICES

- OTHER INTERFACES
  E.G. SPEECH RECOGNITION
       SPEECH SYNTHESIS

CONTENTS

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→ THE EVOLUTION OF APPLICATION DEVELOPMENT

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  & QUALITY

EVOLUTION
IN APPLICATION DEVELOPMENT

- OBJECT ORIENTED APPROACH

- MORE POWERFUL SPECIFICATION LANGUAGES

- CUSTOMIZING TEMPLATE APPLICATIONS

- RE-ENGINEERING

MORE POWERFUL SPECIFICATION
LANGUAGES

- ADVANCED KNOWLEDGE REPRESENTATION TECHNIQUES

- NATURAL LANGUAGE

- RULE BASED SYSTEMS

- EXPRESSING TEMPORAL & DYNAMIC ASPECTS

- COMBINING & REFORMULATING DIFFERENT SPECIFICATION
  LANGUAGES

NATURAL LANGUAGE
UNDERSTANDING

- FROM SIMPLE PSEUDO-NATURAL LANGUAGE TO REAL
  NATURAL UNDERSTANDING

- CAPTURING THE INFORMATION SYSTEM SPECIFICATIONS
  - THE CONCEPTUAL MODEL
    - *DATA PERSPECTIVE*
    - *THE PROCESS/BEHAVIOUR PERSPECTIVE*
  - THE EXTERNAL SPECIFICATIONS

- INQUIRY
  - RETRIEVAL REQUESTS IN NATURAL LANGUAGE
    FOR USERS and DEVELOPERS

NATURAL LANGUAGE
GENERATION

GENERATING NATURAL LANGUAGE SENTENCES FOR
EXPRESSING :

- *THE ER MODEL*
- *DIFFERENT KINDS OF RULES*
- *FIELD DESCRIPTIONS*

EXAMPLE RULE-BASED SPECIFICATIONS

STATIC CONSTRAINTS
A scheduled flight must have its city of arrival different from its city of departure

STATIC DERIVATION RULE
The cheapest supplier(s) for a product are those that offer this product at a minimum price

DYNAMIC INTEGRITY RULE
Issue a purchase order only if there isn't already one outstanding

DYNAMIC ACTION RULE
*The last day of the month issue purchase orders for products of which the quantity in stock is less than its reorder point*

RE-ENGINEERING CYCLE
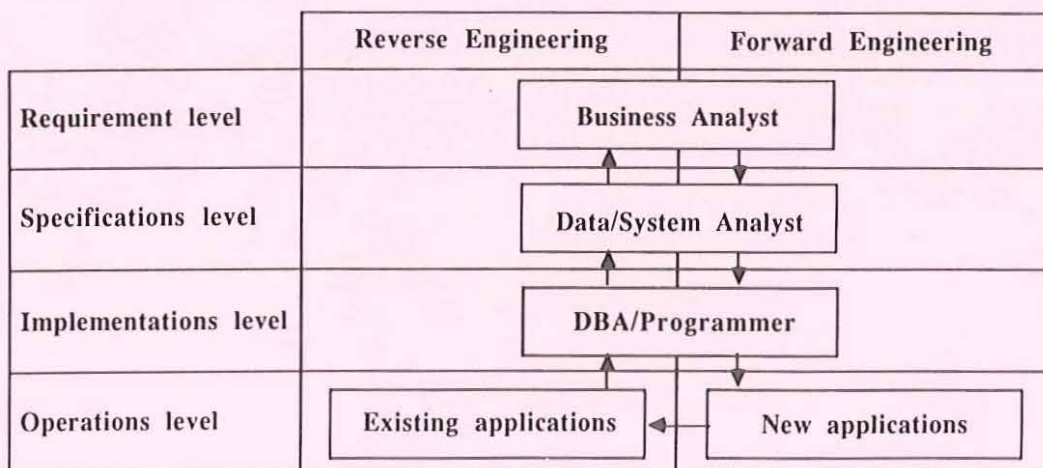
	Reverse Engineering	Forward Engineering
Requirement level	Business Analyst	
Specifications level	Data/System Analyst	
Implementations level	DBA/Programmer	
Operations level	Existing applications	New applications

CONTENTS

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- ⟹ EVOLUTION OF CASE TOOLS
- EVOLUTION OF CASE TOOL DEVELOPMENT
- THE IMPACT OF THESE INNOVATIONS ON PRODUCTIVITY & QUALITY

STAR ARCHITECTURE VS NETWORK
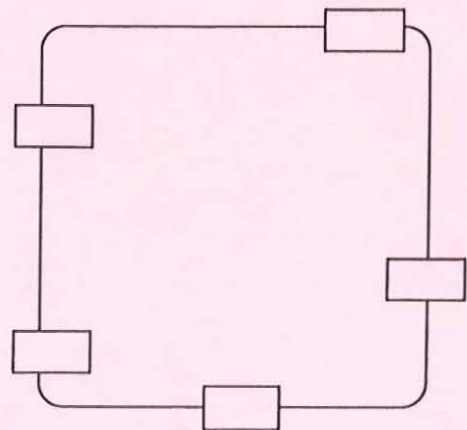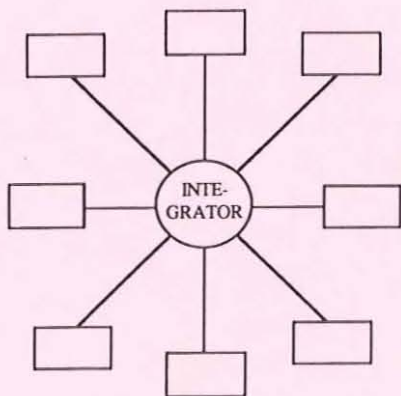
IMPORTANCE OF THE INTEGRATOR FUNCTION

EVOLUTION IN THE
HW ENVIRONMENT FOR CASE TOOLS

	PC	WORK STATIONS	MID RANGE	MAINFRAME
UPPER CASE				
LOWER CASE				

EVOLUTION IN THE
HW ENVIRONMENT FOR CASE TOOLS

	PC	WORK STATIONS	MID RANGE	MAINFRAME
UPPER CASE				
LOWER CASE				

EVOLUTION IN
GENERATING CAPABILITIES

INDEPENDENT VENDORS WILL SUPPORT MORE

DBMS
OPERATING   SYSTEMS
HARDWARE
3RD GENERATION LANGUAGES

STANDARDISATION

● STANDARDISATION OF METHODOLOGY

● STANDARDISATION OF METHODOLOGY COMPONENTS

● STANDARDISATION OF REPRESENTATION

● STANDARDISATION OF INTER FACES

● INTERNATIONAL STANDARDISATION EFFORTS
  - *Information Resource Dictionary System Standard*
  - *IEEE-CS Task Force or Professional Tools*
  - *Portable Common Tool Environment PCTE*
  - *Common Ada Interface Standard*
  - *ISO TC97/SC5/WG3 on Conceptual*

EVOLUTION IN ADMINISTRATION & CONFIGURATION MANAGEMENT

- CONFIGURING APPLICATIONS FROM (VERSIONS OF)

    GENERATED SOFTWARE COMPONENTS

- CONFIGURING SPECIFICATIONS FROM (VERSIONS OF)

    ANALYSIS & DESIGN COMPONENTS

EXPERT SYSTEMS

- THE EXPERT TECHNICAL TUNER
- THE EXPERT ANALYST/DESIGNER
- THE EXPERT CONSULTANT
- THE EXPERT CONFIGURATION MANAGER
- THE EXPERT PROJECT MANAGER
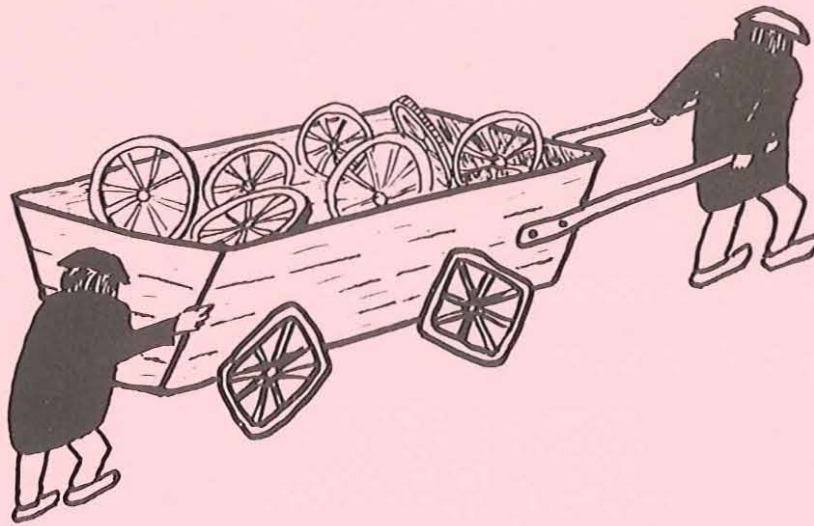
EXPERT CONSULTANT

DIFFERENT KINDS OF KNOWLEDGE INVOLVED

- METHODOLOGY KNOWLEDGE

- METHODOLOGY HEURISTICS

- DOMAIN KNOWLEDGE
  - *REFERENCE MODELS*
  - *MIXING & MATCHING OF PART OF DIFFERENT MODELS*
  - *PATTERN RECOGNITION*
  - *USING CERTAINTY FACTORS*

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THE CASE TOOL SUPPLIERS

EVOLUTION IN HOW
CASE TOOLS ARE DEVELOPPED

User specific
Standards & Methods → CASE SHELL ↔ Methods Standards Graphics

Information System
specifications ↔ CASE TOOL ↔ Spec Base

Application Data ↔ INFORMATION SYSTEMS ↔ User Data Base
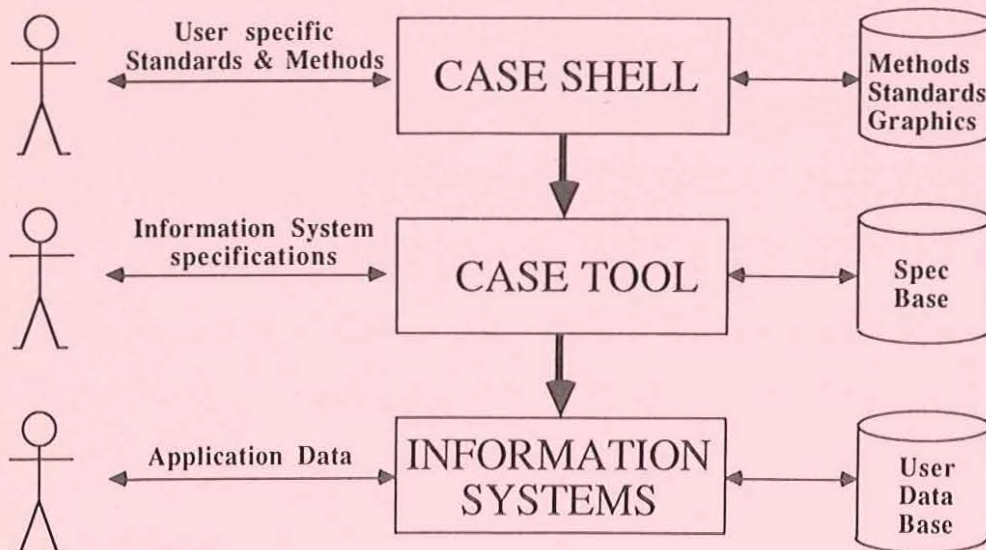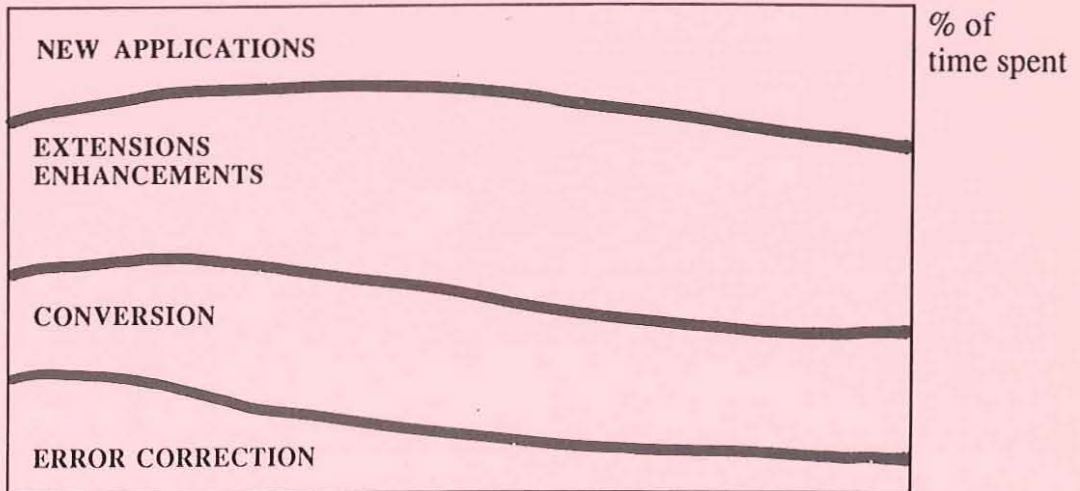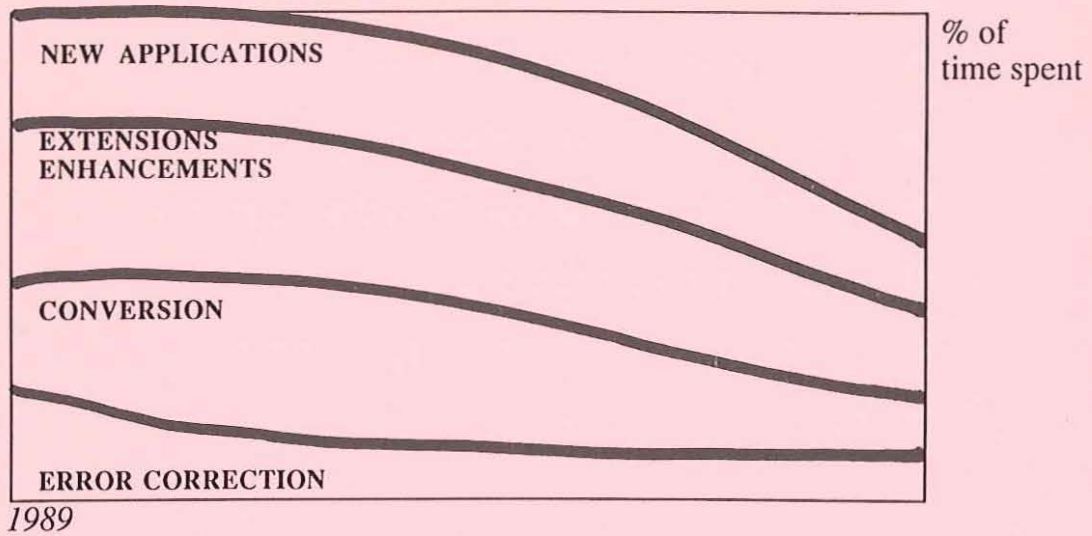
+ SELF REGENERATING CAPABILITIES

CONTENTS

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⟹ - THE IMPACT OF THESE INNOVATIONS ON PRODUCTIVITY & QUALITY

TIME SPENT BY DEVELOPERS

NEW APPLICATIONS

% of
time spent

EXTENSIONS
ENHANCEMENTS

CONVERSION

ERROR CORRECTION

1989

TIME SPENT BY DEVELOPERS

NEW APPLICATIONS

EXTENSIONS
ENHANCEMENTS

CONVERSION

ERROR CORRECTION

1989

% of
time spent

A FUTURE NEED FOR

- CONCEPTS
- METHODOLOGIES
- TOOLS

TO DEAL WITH CHANGING APPLICATIONS