

ON THE FUTURE OF MODELLING :

WHY CURRENT CASE-TOOLS INSIST ON SUPPORTING
20 YEARS OLD METHODS AND TECHNIQUES.



Colette Rolland
Prof Université Paris 1.
Sorbonne

1. STATE OF ART

- 1.1 HIERARCHICAL DECOMPOSITION TECHNIQUES
- 1.2 DATA SEMANTIC ORIENTED TECHNIQUES
- 1.3 COMMENTS

2. NEW GENERATION OF MODELING TECHNIQUES

- 2.1 OBJECT ORIENTED TECHNIQUES
- 2.2 AI BASED TECHNIQUES

CONCLUSION

STATE OF ART

• FIRST GENERATION TECHNIQUES

HIERARCHICAL DECOMPOSITION
BASED METHODS (H-D)

→ FUNCTIONAL DESIGN APPROACH

→ CARTESIAN PARADIGM

STATE OF ART

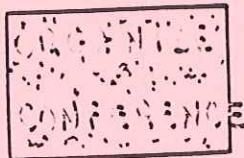
• FIRST GENERATION TECHNIQUES

HIERARCHICAL DECOMPOSITION BASED METHODS

→ FUNCTIONAL DESIGN APPROACH

- IS : DATA PROCESSING SYSTEM WHICH PERFORMS A BUSINESS FUNCTION
- THE ANALYSIS AND DESIGN PROCESS STARTS BY IDENTIFYING THE IS FUNCTION TO A BROAD BUSINESS FUNCTION

INFORMATION
SYSTEM



BROAD BUSINESS
FUNCTION

« INFORMATION ENGINEERING »

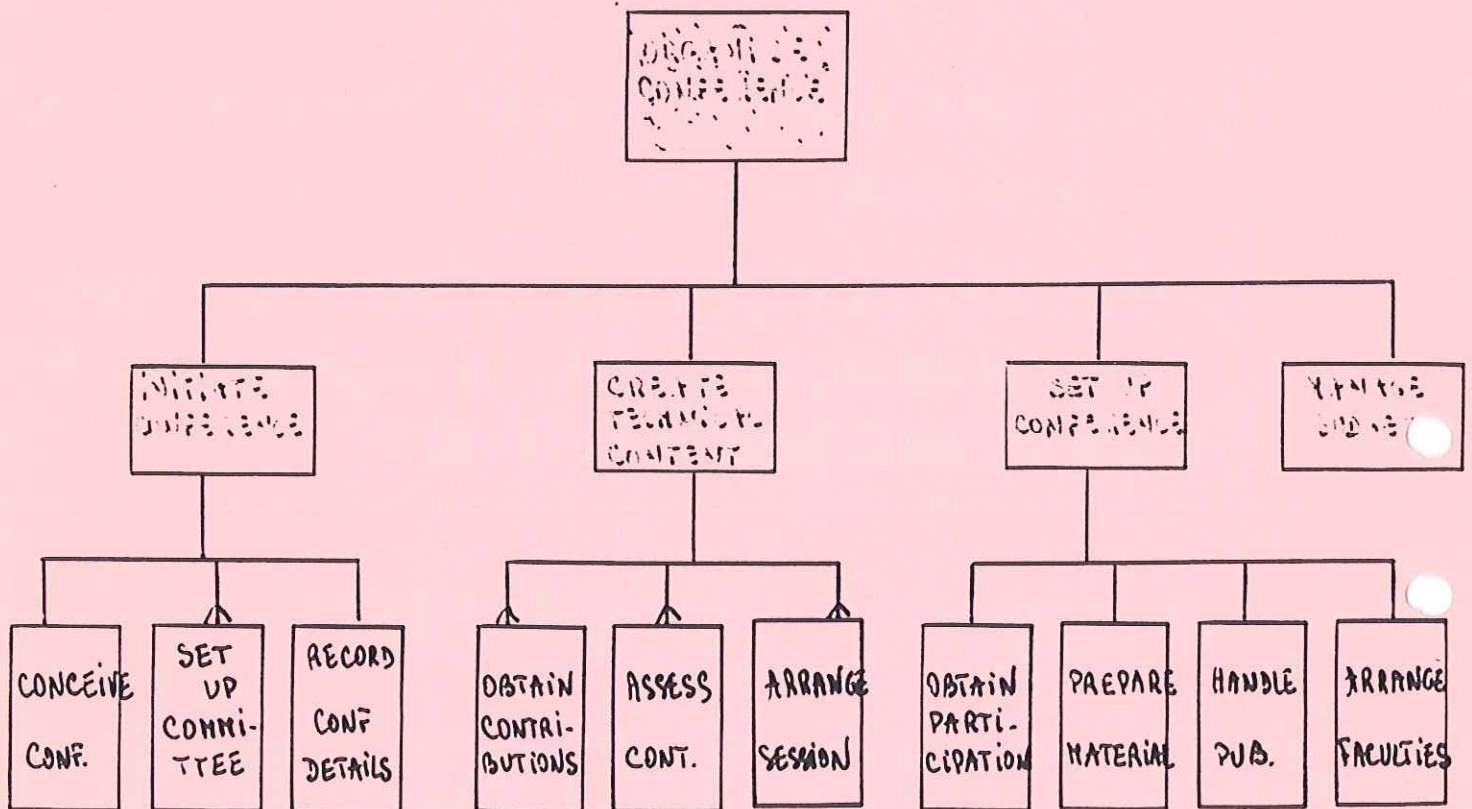
STATE OF ART

• FIRST GENERATION TECHNIQUES

HIERARCHICAL DECOMPOSITION BASED METHODS

→ CARTESIAN PHILOSOPHY and DISCIPLINE

TOP-DOWN DECOMPOSITION OF BUSINESS ACTIVITIES



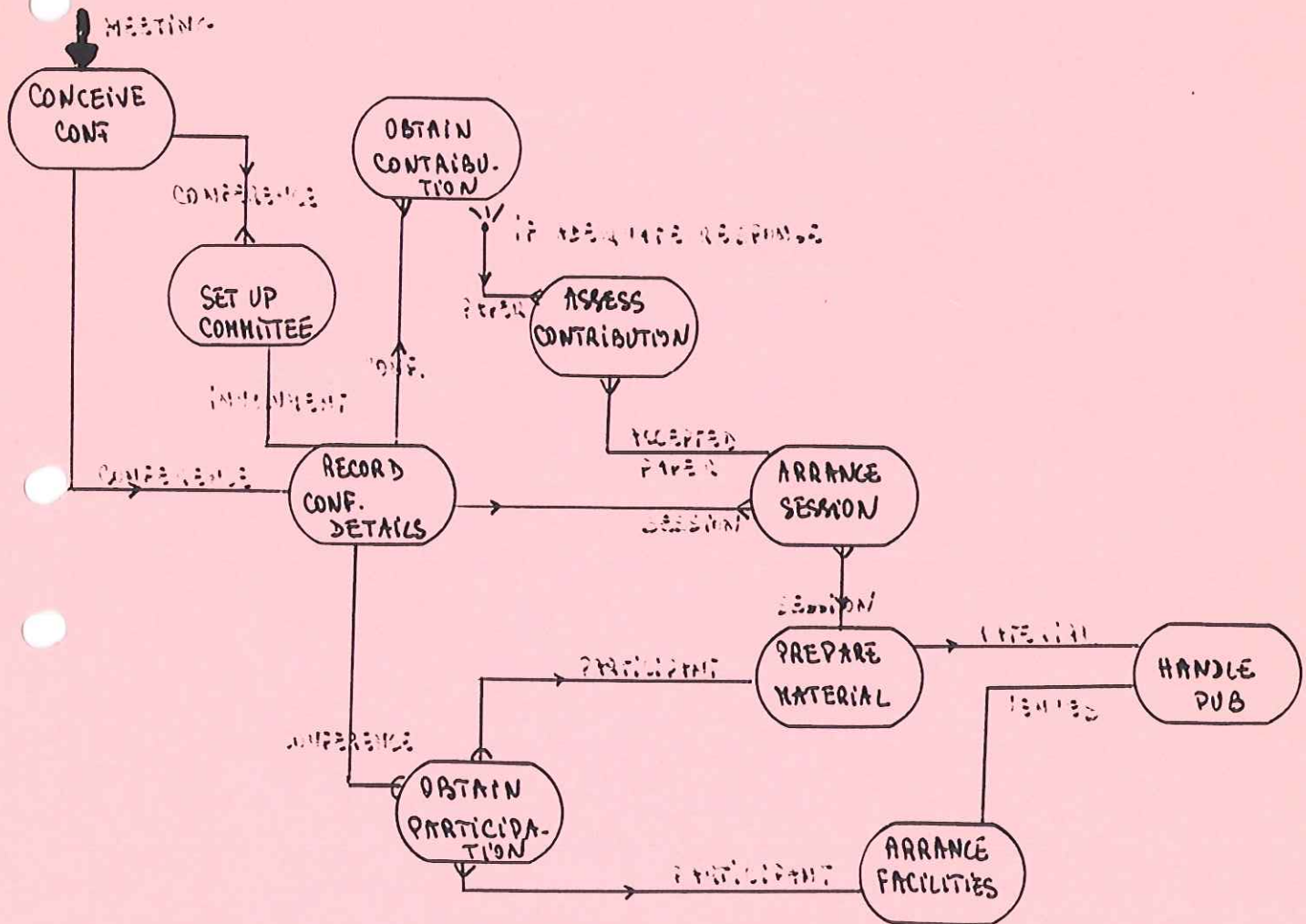
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• FIRST GENERATION TECHNIQUES

HIERARCHICAL DECOMPOSITION BASED METHODS

→ **CARTESIAN PHILOSOPHY and DISCIPLINE**

DATA and MATERIAL FLOWS

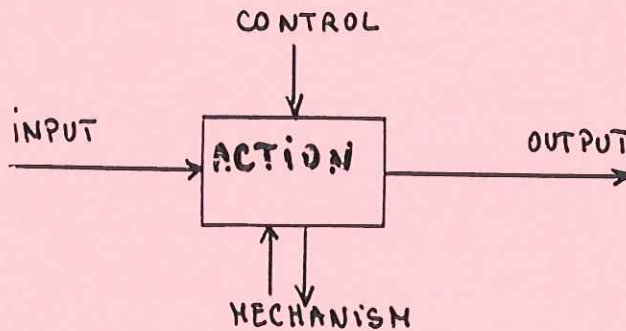


STATE OF ART

• FIRST GENERATION TECHNIQUES

HIERARCHICAL DECOMPOSITION BASED METHODS

„ SADT „



ACTIGRAM

STATE OF ART

• HIERARCHICAL DECOMPOSITION BASED METHODS

EVALUATION

• LITTLE THEORETICAL WORK

• UNSASTISFACTORY DEFINITIONS OF CONCEPTS

• DIFFICULTIES FOR EXPRESSING PARALLELISM, TIME, SYNCHRONIZATION

• EXCEPTION HANDLING

• ABSENCE OF DATA MODELING

• FEW METHODOLOGICAL GUIDELINES

• DIFFICULTY TO EVALUATE CONSISTENCY, COMPLETENESS, CORRECTNESS

STATE OF ART

. SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES
(D.M.)

→ SYSTEMIC PHILOSOPHY

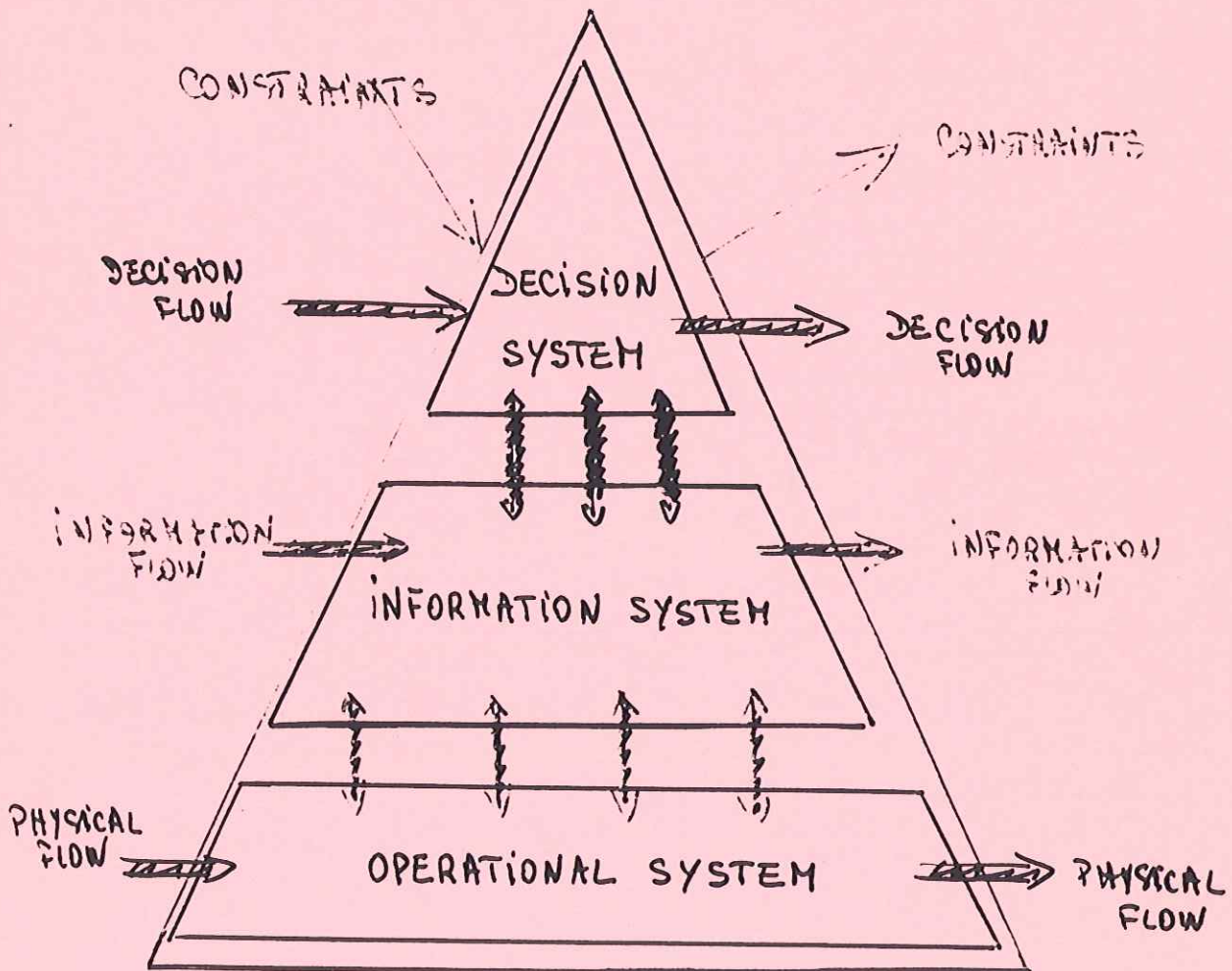
→ CONCEPTUAL (SEMANTIC) APPROACH

STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED METHODS

→ SYSTEMIC PHILOSOPHY and DISCIPLINE

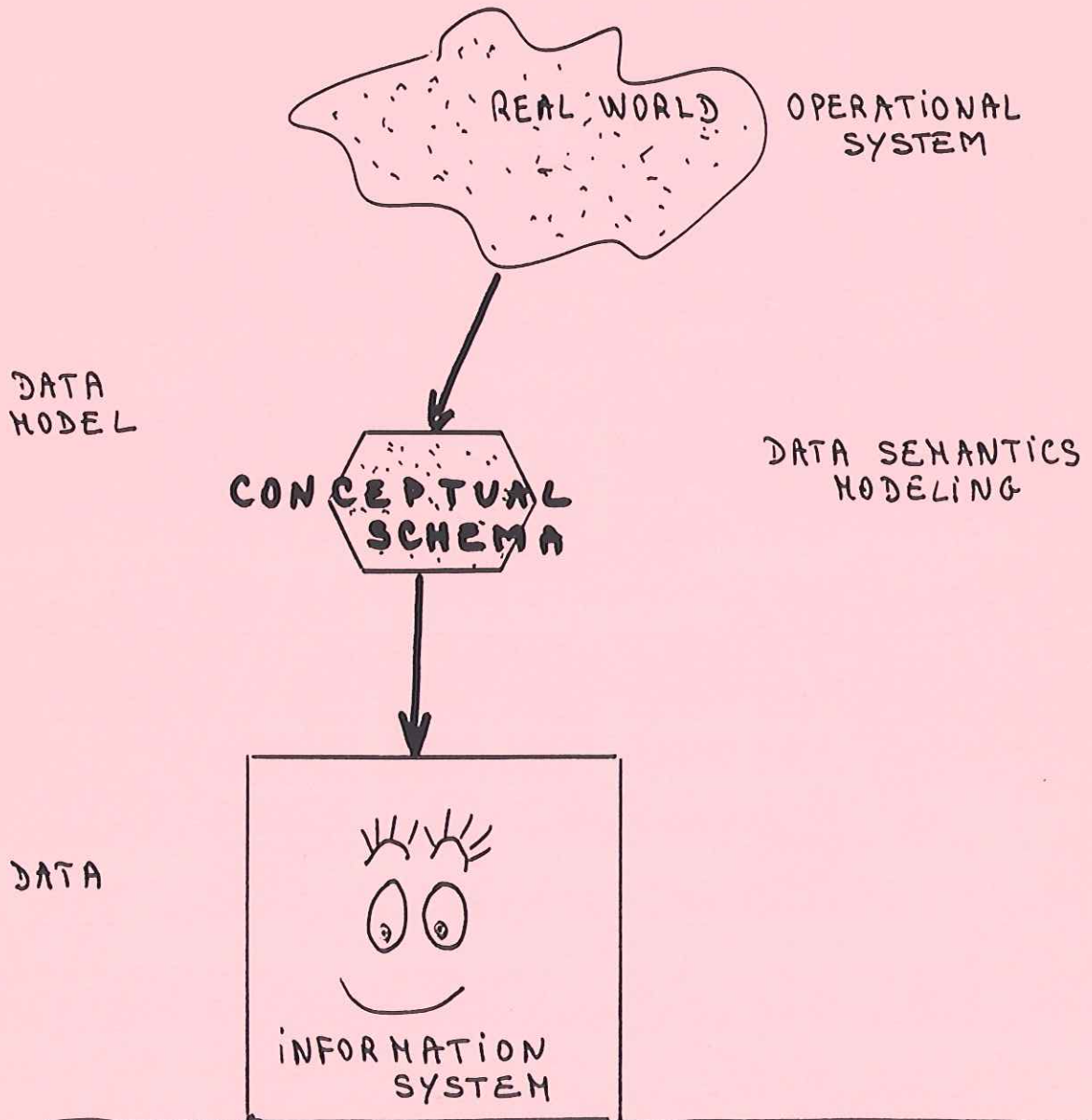


STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED METHODS

→ CONCEPTUAL APPROACH

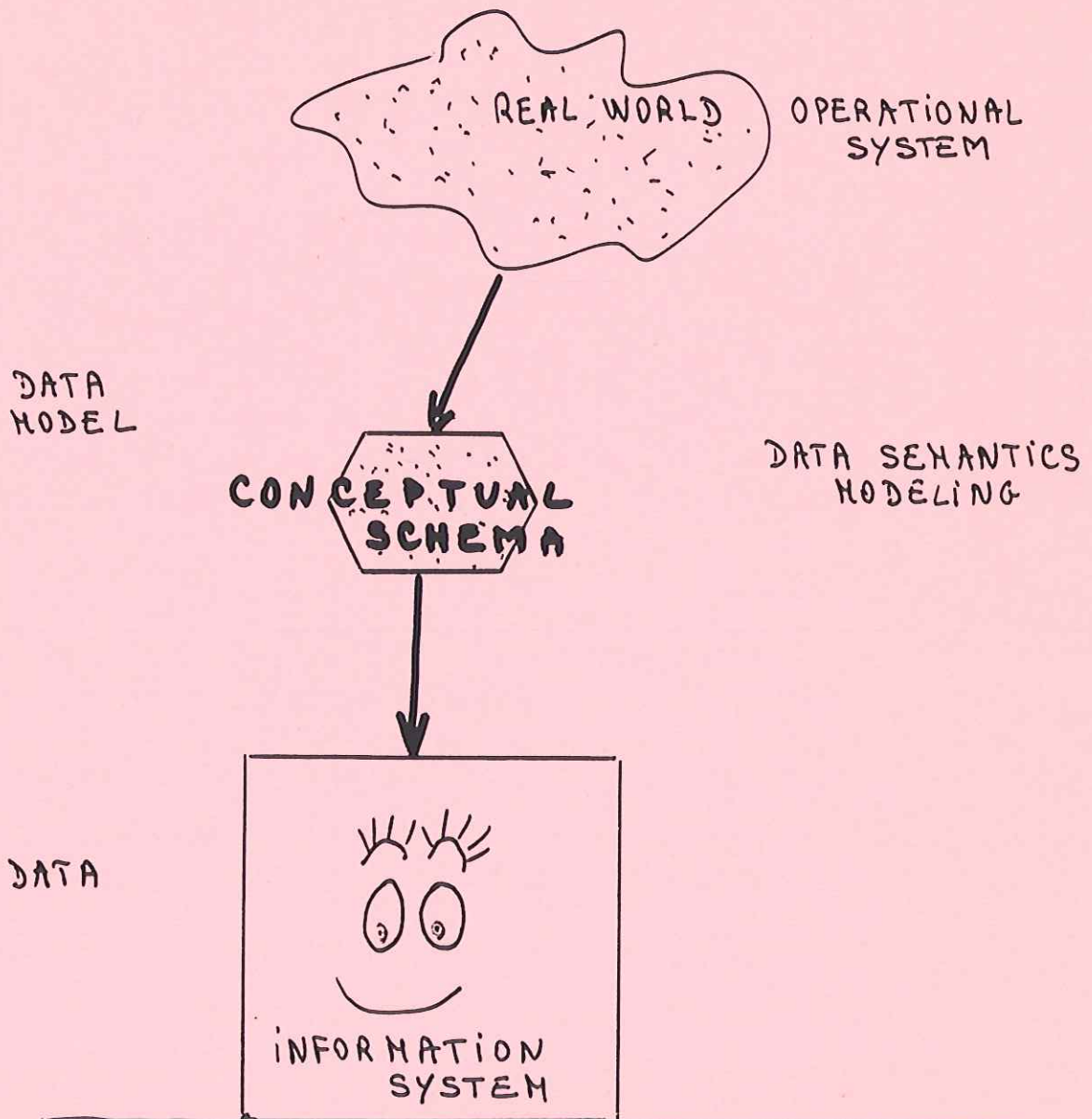


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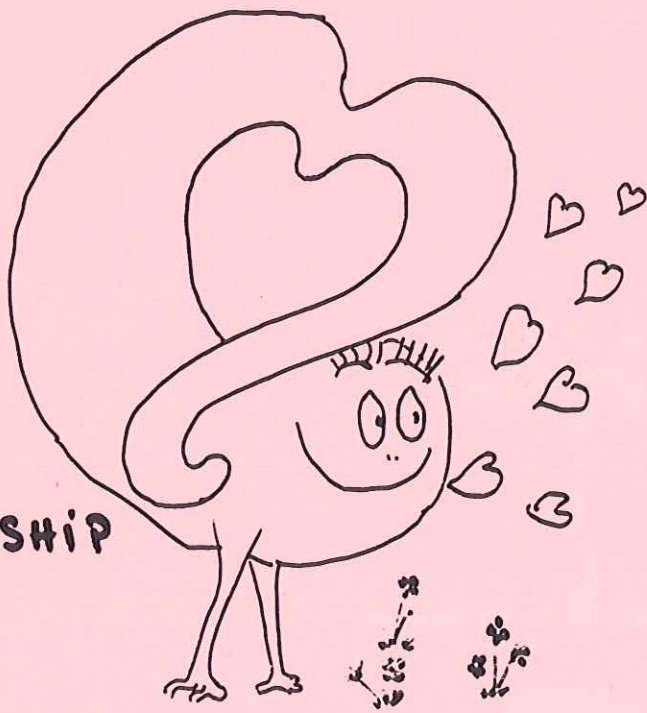
• SECOND GENERATION TECHNIQUES

DATA MODELING BASED METHODS

→ CONCEPTUAL APPROACH



RELATIONSHIP





STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

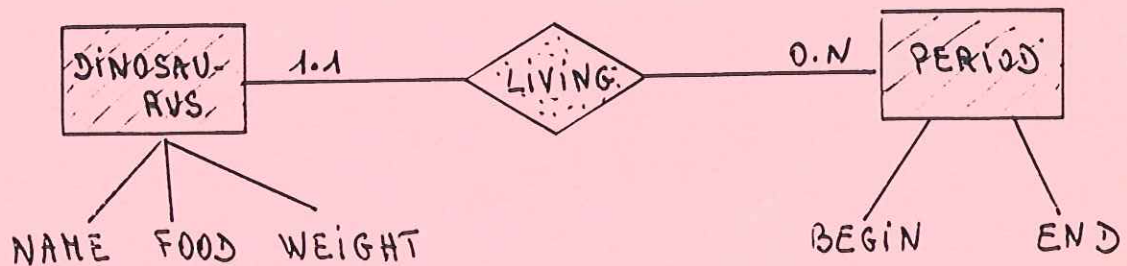
« THE REAL-WORLD CONSISTS OF TIME-VARYING ENTITIES AND RELATIONSHIPS AMONG THEM »

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• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

ENTITY-RELATIONSHIP MODEL



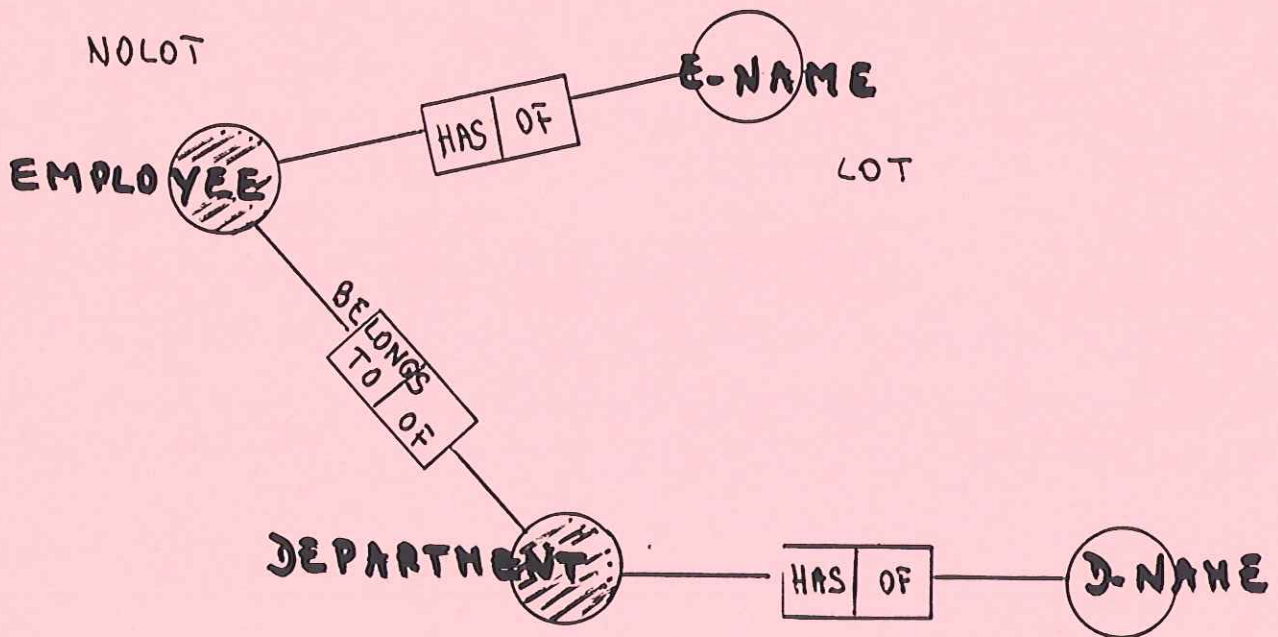
- N-ARY RELATIONSHIPS
- PROPERTY ON RELATIONSHIPS
- MULTIPLE RELATIONSHIPS
- VALUATION (CARDINALITIES)
- WEAK ENTITY and ID DEPENDENCE
- INTEGRITY CONSTRAINTS

STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

NIAM



« THE EMPLOYEE WITH E-NAME: Dupont BELONGS TO THE DEPARTMENT WITH D-NAME: Accountancy »>>

STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

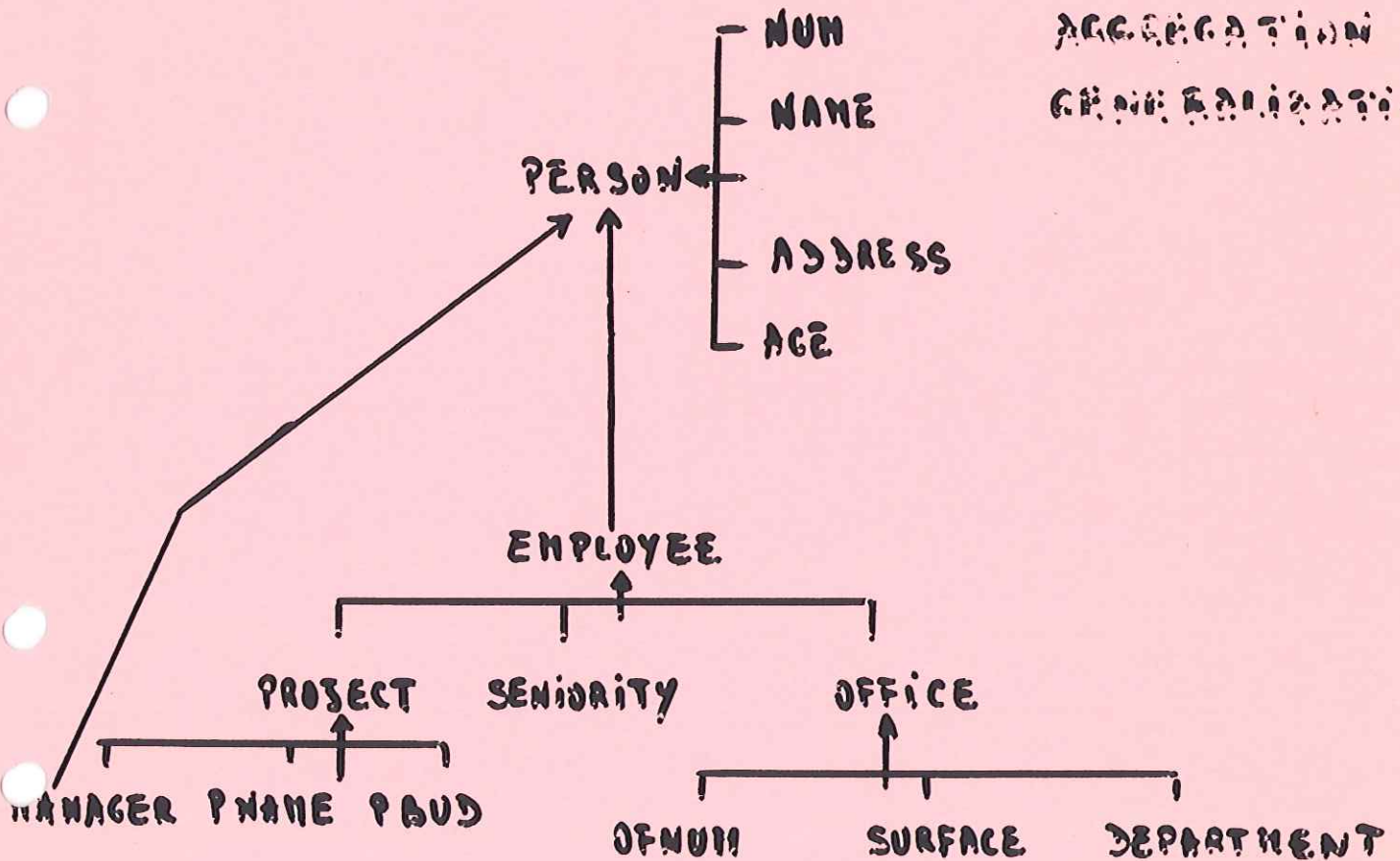
SEMANTIC DATA MODEL

ABSTRACTION

CLASSIFICATION

AGGREGATION

GENERALIZATION



Aggregation



Generalization

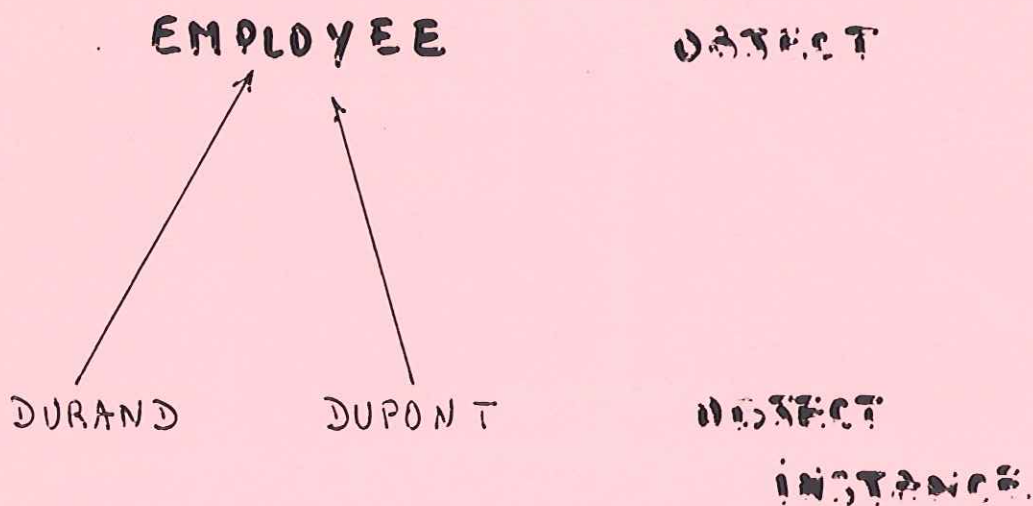
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Object

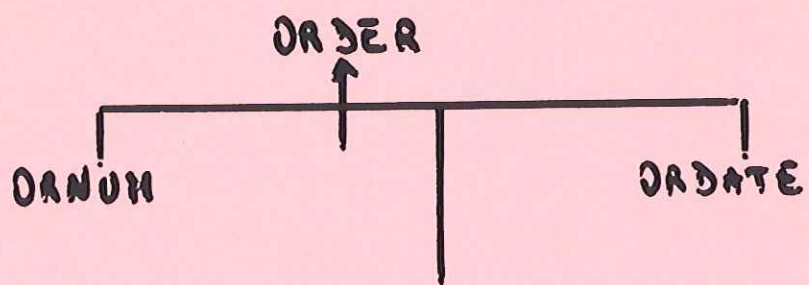
STATE OF ART

- SECOND GENERATION TECHNIQUES
DATA MODELING BASED TECHNIQUES
SEMANTIC DATA MODELS

ABSTRACTION FORM : CLASSIFICATION



CLASSIFICATION ALLOWS TO DISTINGUISH THE TOKEN
OR INSTANCE LEVEL AND THE TYPE LEVEL.



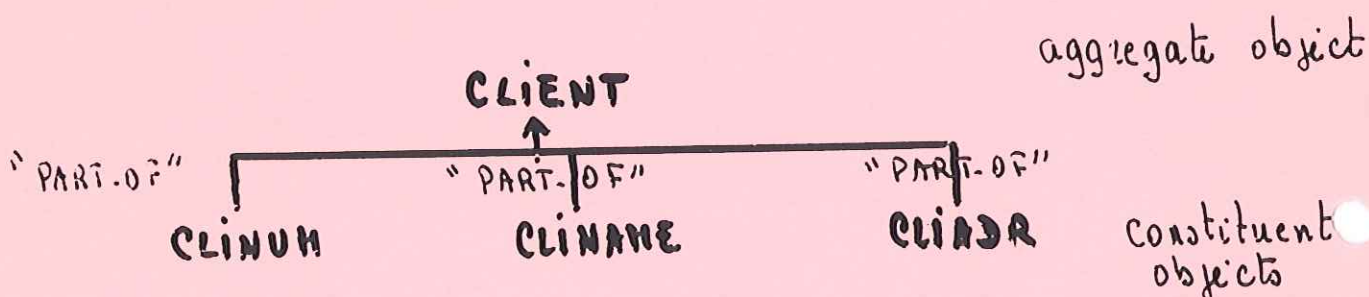
STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

SEMANTIC DATA MODELS

ABSTRACTION FORM : AGGREGATION



AGGREGATION IS THE ABSTRACTION BY WHICH AN OBJECT IS CONSTRUCTED FROM ITS CONSTITUENT OBJECTS.

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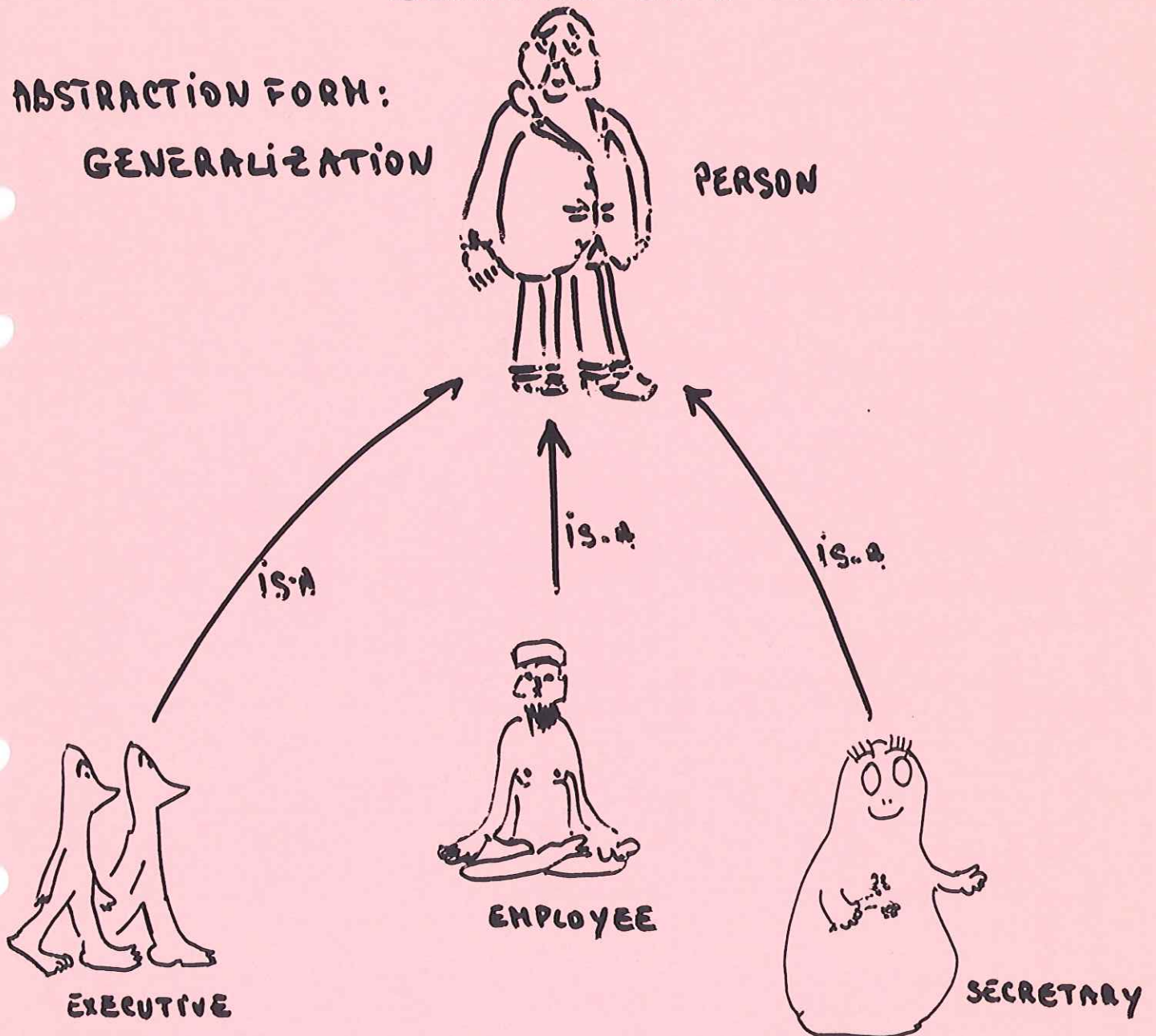
• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

SEMANTIC DATA MODELS

ABSTRACTION FORM:

GENERALIZATION



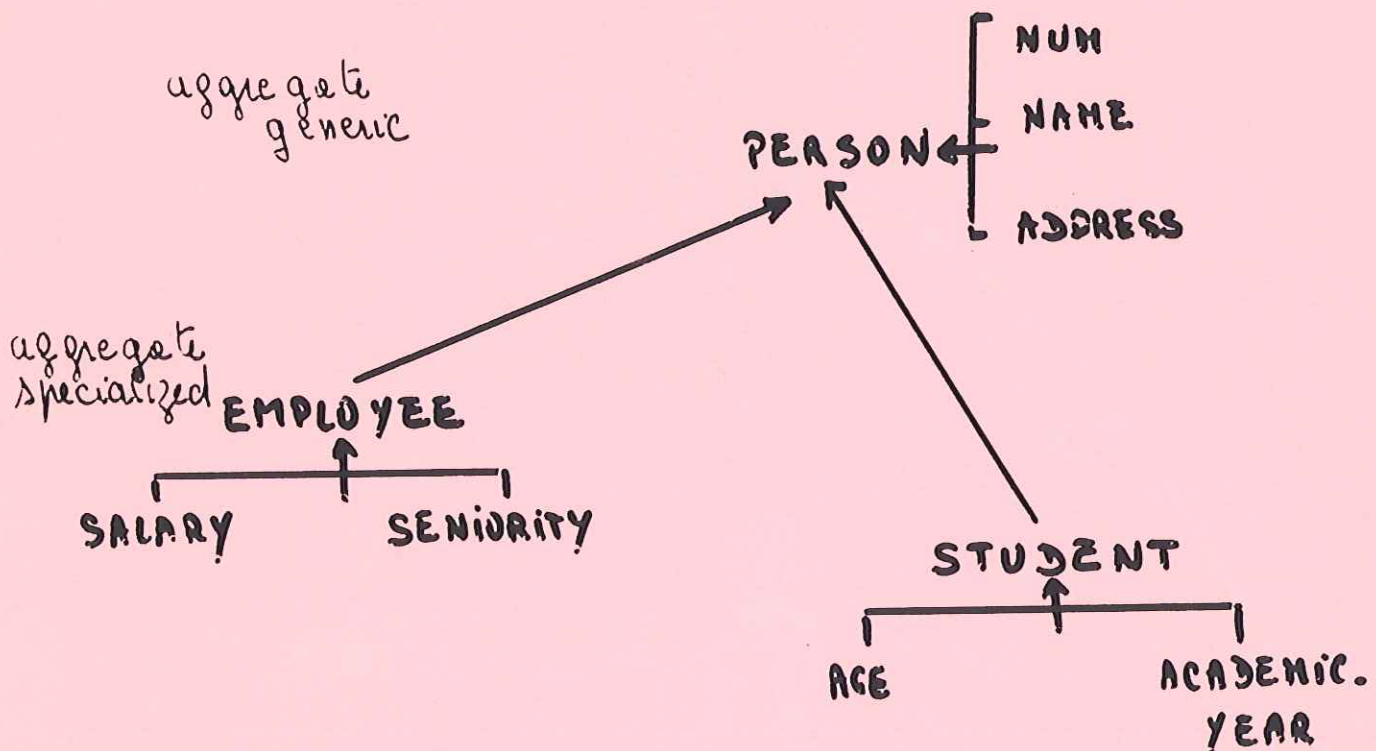
GENERALIZATION IS AN ABSTRACTION FORM THAT
ALLOWS TO CONSIDER A SET OF OBJECTS CALLED
SPECIALIZED OBJECTS AS ONE GENERIC TYPE.

STATE OF ART

. SECOND GENERATION TECHNIQUES DATA MODELING BASED TECHNIQUES

SEMANTIC DATA MODELS

GENERALIZATION



AGGREGATION AND GENERALIZATION CAN BE COMBINED
INHERITANCE OF PROPERTIES

STATE OF ART

• SECOND GENERATION TECHNIQUES

DATA MODELING BASED TECHNIQUES

SEMANTIC DATA MODELS

- GENERALIZATION ENHANCES UNDERSTANDING BY ALLOWING INDIVIDUAL TOKENS TO BE CLASSIFIED INTO TYPES. TYPES CAN BE FURTHER CLASSIFIED INTO OTHER MORE GENERAL TYPES
- AGGREGATION GRADUALLY MAKES VISIBLE THE STRUCTURE OF AN OBJECT AND HOW INDIVIDUAL COMPONENTS OF AN OBJECT RELATE TO IT AND TO EACH OTHER.

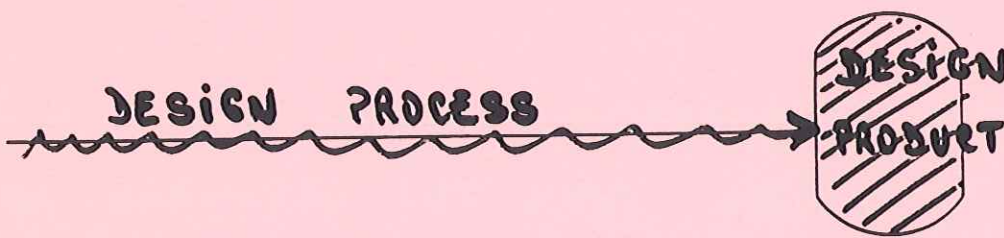
USED IN A COMPLEMENTARY FASHION AGG. AND GEN. ALLOW TO EXPRESS BOTH THE STRUCTURE AND CLASSIFICATION OF TYPES.

STATE OF ART

• FIRST GENERATION TECHNIQUES

COMMENTS : WHY CASE TOOLS ARE BASED
ON 20 YEARS OLD TECHNIQUES?

- TOOLS MANAGE SPECIFICATIONS (DESIGN PRODUCTS)
- THEY DO NOT SUPPORT THE DESIGN PROCESS



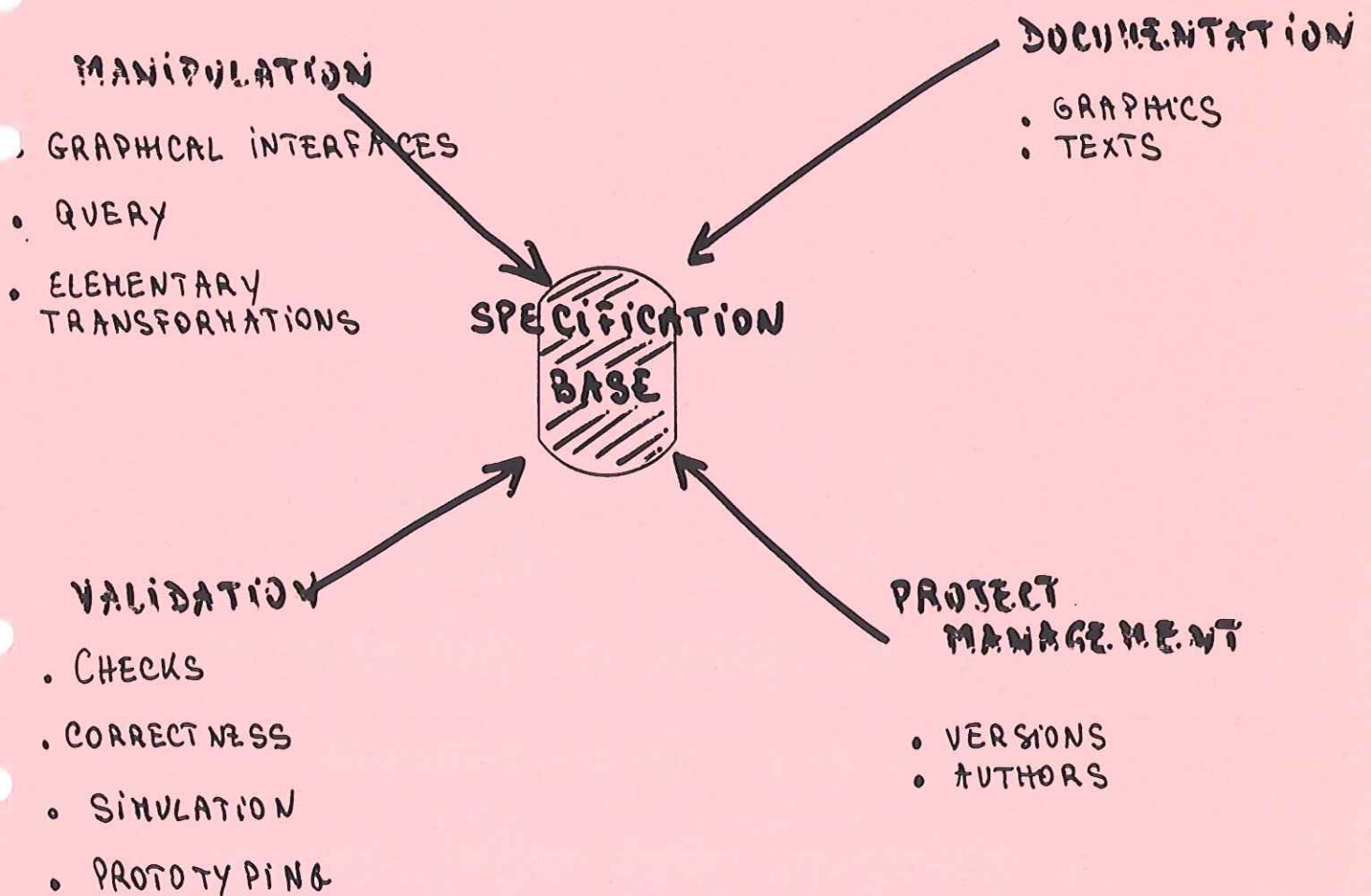
« INFORMATION SYSTEMS METHODOLOGIES : A FRAMEWORK FOR
UNDERSTANDING »

W. OLLE et al. (Addison Wesley)

STATE OF ART

• FIRST GENERATION TECHNIQUES

COMMENTS

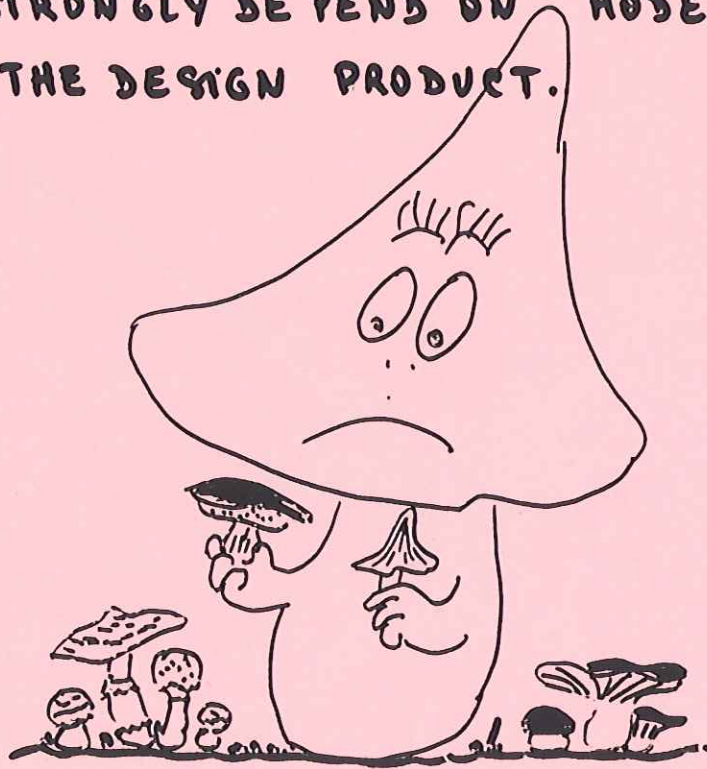


STATE OF ART

• FIRST GENERATION TECHNIQUES

CHARLES CHAFFIN

- TOOLS STRONGLY DEPEND ON MODELS USED TO DESCRIBE THE DESIGN PRODUCT.



- THE CHOICE OF MODELS IS CONSERVATIVE
 - DICHOTOMY DATA - PROCESS
 - ANALYSIS MORE THAN DESIGN
 - SIMPLICITY and READABILITY
 - AT LEAST 10 YEARS OF PROFESSIONAL EXPERIENCE

FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

A UNIFYING APPROACH FOR INFORMATION SYSTEMS AND DATABASES DESIGN

IS : COLLECTION OF INTERACTING OBJECTS THAT RETAIN, CARRY, GENERATE OR COMPUTE INFORMATION AND COOPERATE TO PROVIDE THE SERVICE EXPECTED FROM THE SYSTEM

→ OBJECT ORIENTED VIEW OF IS

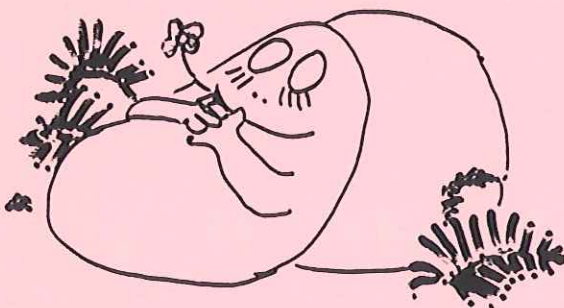
→ OBJECT ORIENTED PARADIGM

FUTURE OF MODELING TECHNIQUES

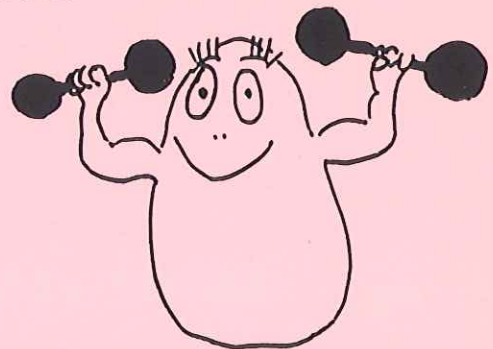
• OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED VIEW OF INFORMATION SYSTEMS

- A UNIFYING VIEW OF INFORMATION SYSTEM COMPONENTS BASED ON THE CONCEPT OF OBJECT AS THE BASIC BUILDING BLOCK OF IS.
- A VIEW WHICH OVERCOMES THE ARTIFICIAL BOUNDARIES BETWEEN PASSIVE AND ACTIVE COMPONENTS.



PASSIVE COMPONENTS
(DATA)



ACTIVE COMPONENT
(PROCESSES)

- A SUGGESTION : WE SHOULD LOOK TO ALL THOSE COMPONENTS AS EXAMPLES OF THE SAME CONCEPT : THE OBJECT.

FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

- ANY OBJECT IS CONSIDERED AS HAVING STRUCTURAL, BEHAVIOURAL AND INHERITED PROPERTIES WHICH ARE ENCAPSULATED IN THE OBJECT SPECIFICATION.

- ANY OBJECT IS STRUCTURED,
ACTIVE
ENCAPSULATED
TYPED .

FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

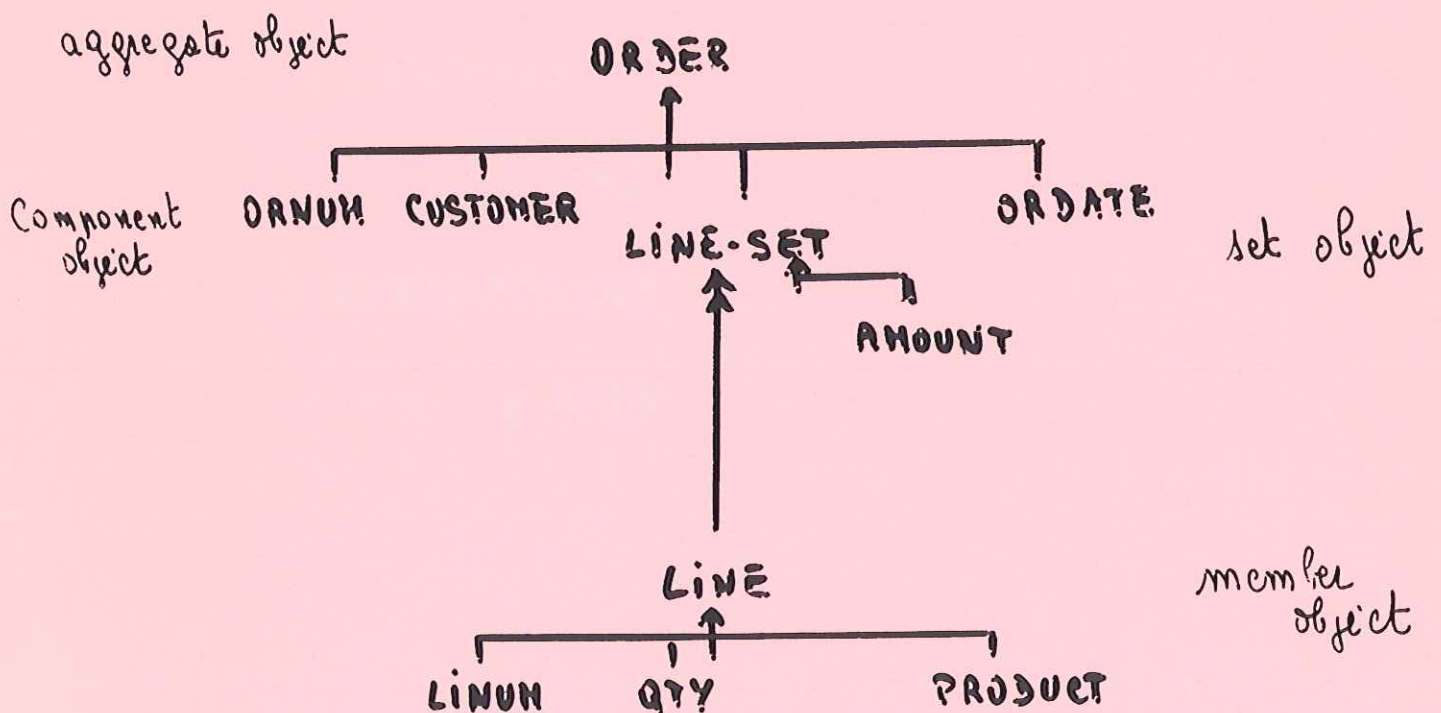
OBJECT ORIENTED PARADIGM

STRUCTURE

ABSTRACTION
FORMS

AGGREGATION

GROUPING / ASSOCIATION



GROUPING IS AN ABSTRACTION FORM BY WHICH A COMPLEX OBJECT CALLED GROUP IS CONSTRUCTED AS A SET OF MEMBER OBJECTS.

FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

BEHAVIOUR

PROGRAMMING LANGUAGES : THE BEHAVIOUR OF AN OBJECT IS ENCAPSULATED IN METHODS.

INFORMATION SYSTEMS DESIGN METHODOLOGIES : INTEGRATION OF STRUCTURE AND BEHAVIOUR MODELING

REHORA, ACH-PCH, CIM, ERAC, TAXIS, SDH.....

CONVERGENCE : OBJECTS ARE TIME-VARYING. THEY ARE CHANGING ON TIME, HAVE A LIFE-SPAN AND A LIFE-HISTORY OF ON-GOING CHANGES. OBJECTS HAVE BOTH STRUCTURAL AND BEHAVIOURAL PROPERTIES AND RELATIONSHIPS WITH EACH OTHER AND WITH THE ENVIRONMENT. OBJECT BEHAVIOUR EXPRESSES

HOW and WHEN

CHANGES OCCUR TO OBJECTS AND RELATE ONE WITH OTHERS.

FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

O*

BEHAVIOUR

ACTION : AN ELEMENTARY OPERATION WHICH ALTERS ONLY ONE OBJECT

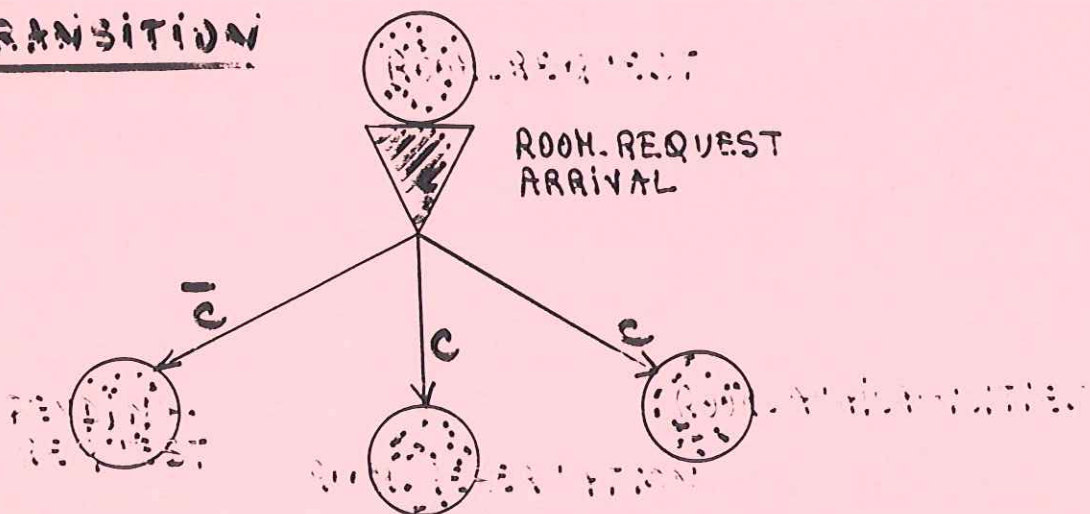
ADD A NEW ROOM, MODIFY AN ADDRESS.....

EVENT : AN EVENT INSTANCE HAPPENS WHEN A PARTICULAR STATE CHANGE OCCURS ON AN OBJECT INSTANCE

THE BOOK BECOMES AVAILABLE ; THE DEPARTMENT BECOMES EMPTY.....

EVENTS TRIGGER ACTION

STATE-TRANSITION



FUTURE OF MODELING TECHNIQUES

• OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

ENCAPSULATION

ROOM : OBJECT

AGGREGATE OF

(bed-nb : BED-NB ,

room-number : ROOM-NUMERO ,

price : ROOM-PRICE ,

availabilities : SET-OF (L:PERIOD) ,

category : ROOM-CATEGORY) ;

ACTIONS

a1 : MODIFY-BED-NB ,

a2 : MODIFY-CATEGORY ,

a3 : MODIFY-STANDING ,

a4 : CHANGE-AVAILABILITIES ,

a5 : CLOSE-ROOM ,

a6 : INSERT-ROOM ;

EVENTS

e1 : ROOM-CLOSURE ,

e2 : ROOM-AVAILABILITY ;

END ;

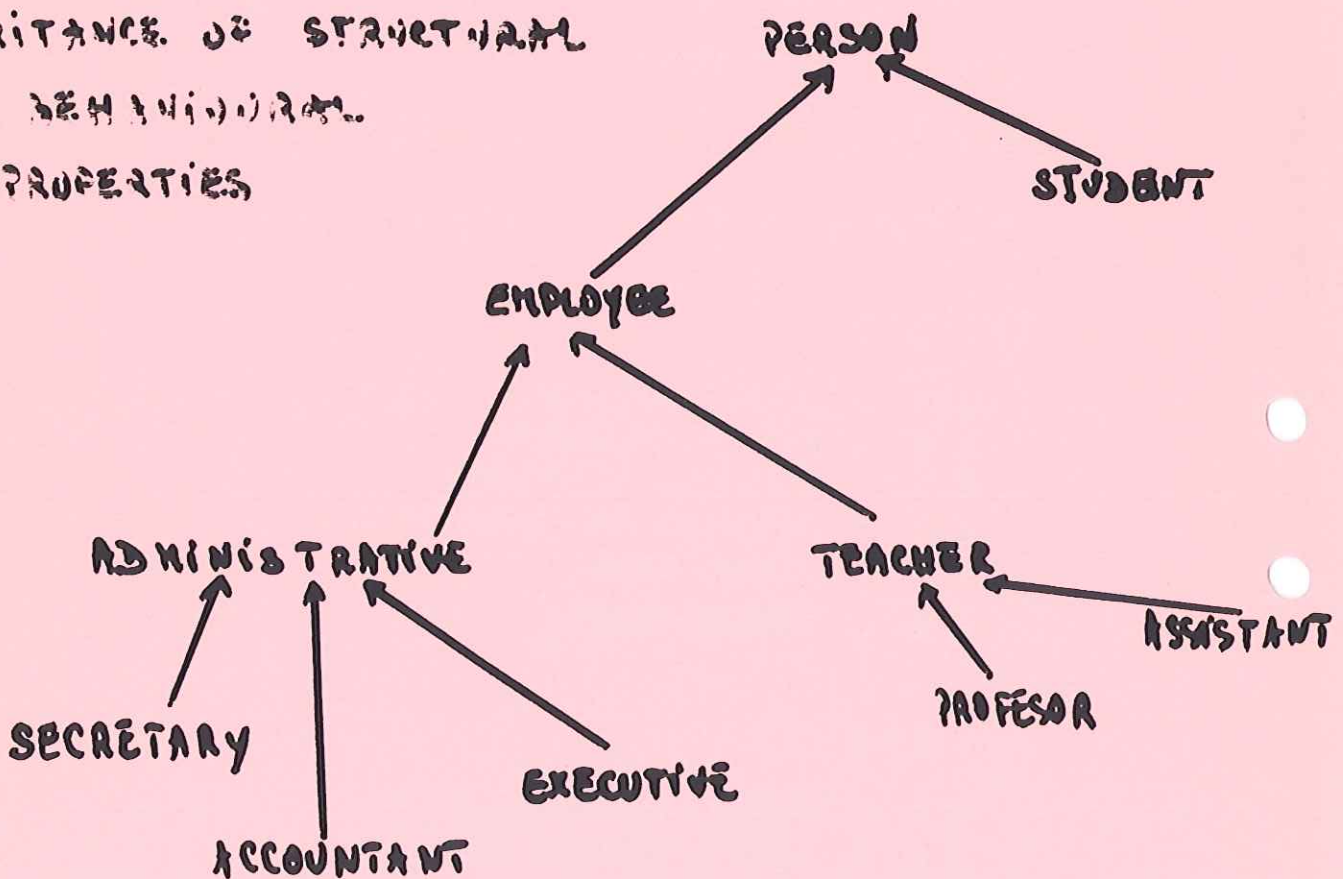
FUTURE OF MODELING TECHNIQUES

. OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

TYPES

INHERITANCE OF STRUCTURAL
AND BEHAVIORAL
PROPERTIES

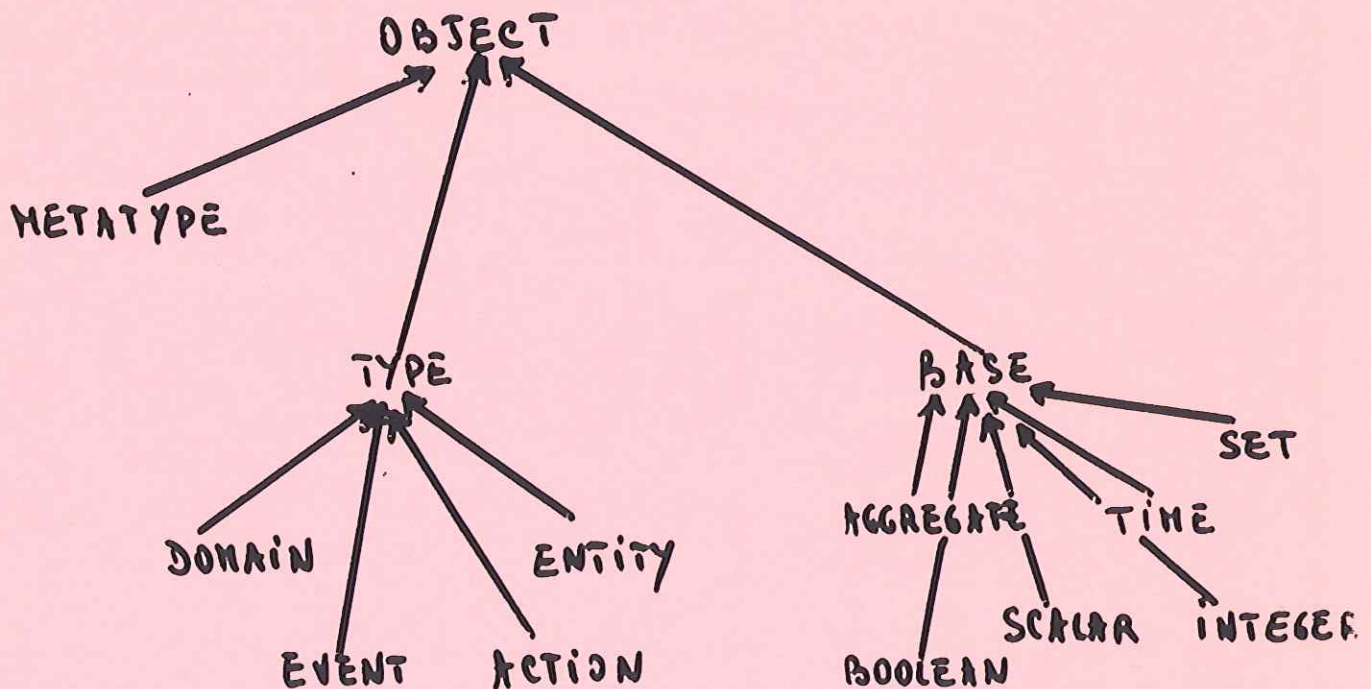


FUTURE OF MODELING TECHNIQUES

. OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

PREDEFINED TYPES



HIERARCHY OF PREDEFINED OBJECT TYPES

0*

FUTURE OF MODELING TECHNIQUES

. OBJECT ORIENTED TECHNIQUES

OBJECT ORIENTED PARADIGM

MODIFY-STANDING : ACTION ;

AGGREGATE-OF

OP1 : MODIFY-BED-NB,

OP2 : MODIFY-CATEGORY);

ACTIONS

CHANGE-TEXT-A3 IS-A CHANGE-TEXT;

EVENTS

ON-ACTION-TEXT-CHANGE;

END;

FUTURE OF MODELING TECHNIQUES

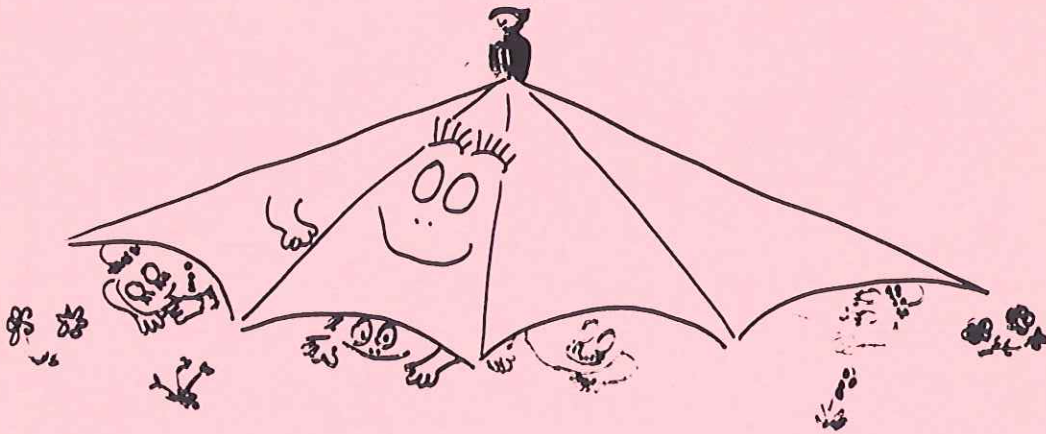
. OBJECT ORIENTED TECHNIQUES

OBJECT = IDEAL BUILDING BLOCK FOR
IS DESIGN

. STRUCTURE and BEHAVIOUR
CLUSTERING

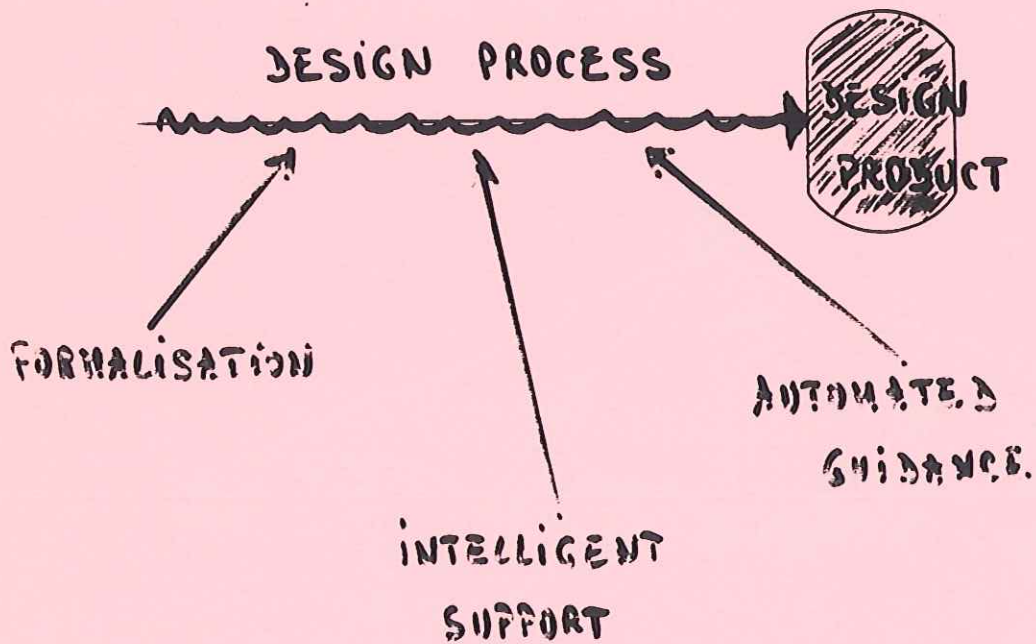
. COMPLEX OBJECTS

. . ACTIVE OBJECTS



FUTURE OF MODELING TECHNIQUES

AI BASED TECHNIQUES



FUTURE OF MODELING TECHNIQUES

. AI BASED TECHNIQUES

DESIGN KNOWLEDGE REPRESENTATION
EXPERT SYSTEM APPROACH

- . THE DESIGN PROCESS IS A LONG, COMPLEX, ITERATIVE AND TEDIOUS TASK CHARACTERIZED BY A CERTAIN UNCERTAINTY
- . A PURELY ALGORITHMIC SOLUTION IS IMPOSSIBLE
- . A HEURISTIC APPROACH LOOKS ADEQUATE

FUTURE OF MODELING TECHNIQUES

AI BASED TECHNIQUES

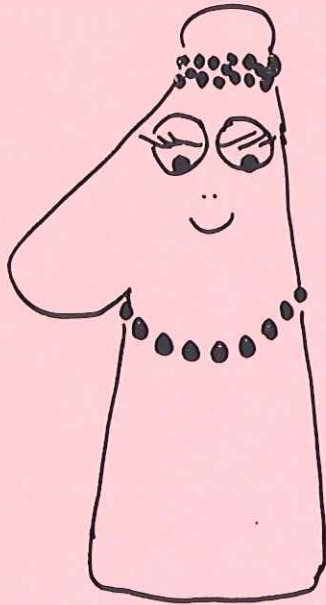
"DOMAIN SPECIFIC" KNOWLEDGE REPRESENTATION
LEARNING.

- DESIGNERS REUSE DOMAIN-SPECIFIC KNOWLEDGE
- COULD A TOOL LEARN FROM PREVIOUS DESIGN EXPERIENCE, USE IT DURING A NEW PROJECT AND REMEMBER IT IN SUBSEQUENT PROJECTS?

AI TECHNIQUES

LEARNING TECHNIQUES

CONCLUSION



STATE OF ART
OF EXISTING MODELING
TECHNIQUES



FUTURE OF
MODELING

- OBJECT ORIENTED APPROACHES
- AI TECHNIQUES APPLIED TO DESIGN KNOWLEDGE REPRESENTATION