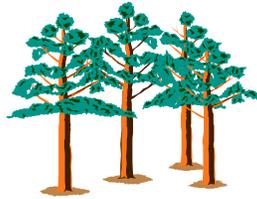


## ***III. Structured Analysis and Design Technique (SADT)***

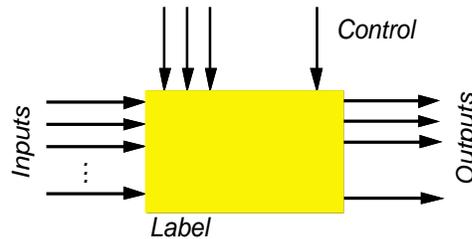
**History**  
**Data and Activities**  
**SADT Diagrams**  
**The SADT Analysis Process**  
**Data Flow Diagrams**



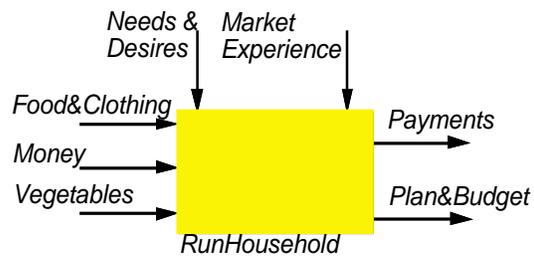
## ***SADT: Structured Analysis and Design Technique***

- *Diagrammatic notation for constructing a sketch for an application.*
- *Offers boxes to represent entities and activities.*
- *Offers a variety of arrows to relate boxes.*
- *Boxes and arrows have an associated (informal) semantics; users are aided by box and arrow labels, other informal documentation.*
- *Has inspired many other commercial tools.*
- *Has been in use since the mid-seventies [Ross77].*
- *SADT is available as a commercial CASE tool under the name IDEF0.*

## SADT Notation



An SADT diagram consists of boxes and arrows

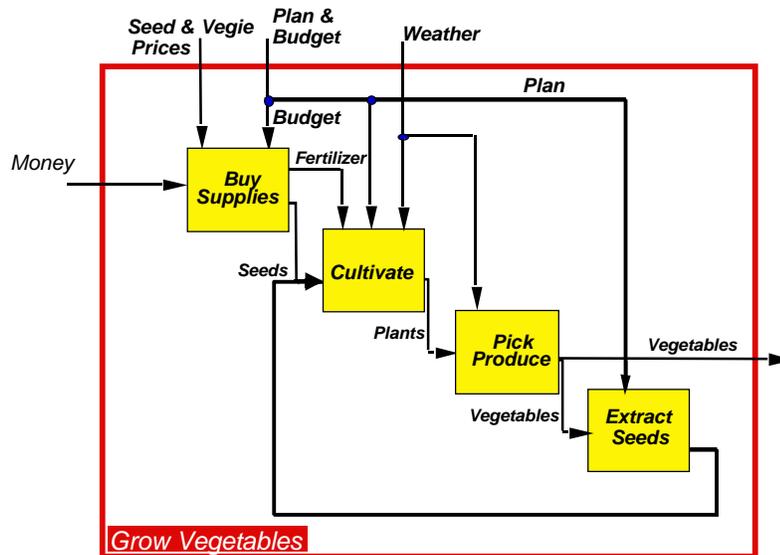


## SADT Primitives

- **Things** and **happenings**
  - Things** -- objects, data, nouns, information, substances, passive
  - Happenings** -- operations, activities, verbs, processing, events, active
- Two types of boxes: **data** boxes, **activity** boxes
- Boxes interconnected through arrows, form a diagram.
- Each diagram includes up to six boxes; each box has its own diagram, leading to hierarchical models of activities and data.



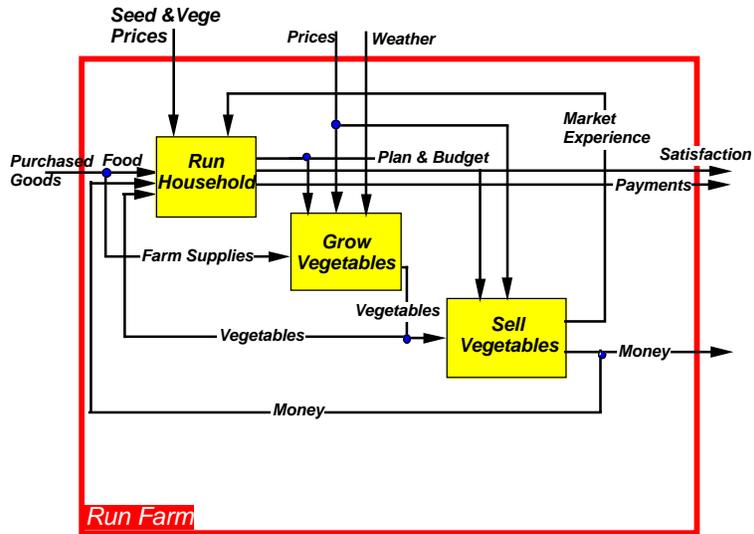
## An SADT Activity



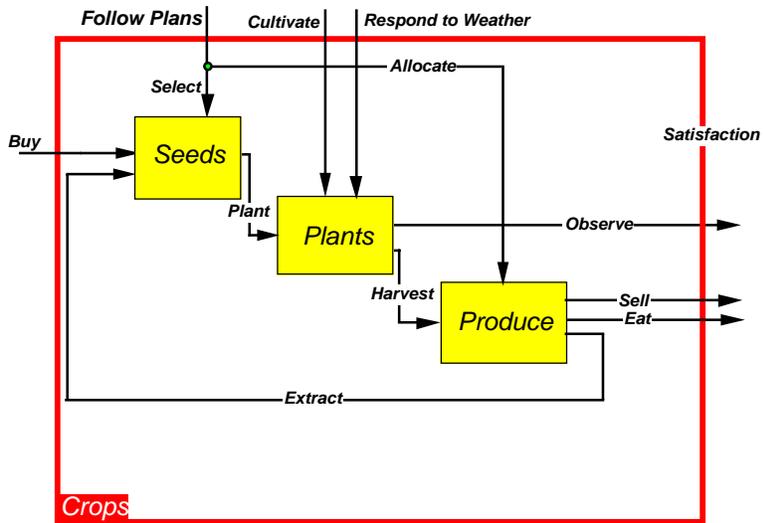
## Semantics of Arrows

- For **activities**
  - Inputs** are data that are consumed by the activity
  - Outputs** are produced by the activity
  - Controls** influence the execution of an activity but are not consumed
- For **data**
  - Inputs** are activities that produce the data
  - Outputs** consume the data
  - Controls** influence the internal state of the data

# A Parent Activity



# A Data Diagram



## The SADT Process

- Diagrams are created in a top-down fashion: a box in one diagram becomes a diagram in its own right with its own internal structure.
- Diagram decomposition is the main vehicle for refinement.
- However, this does not necessarily correspond to aggregation in conceptual modeling.
- For example, the boxes inside a box may represent specializations of the concept represented by the box, or even instances.

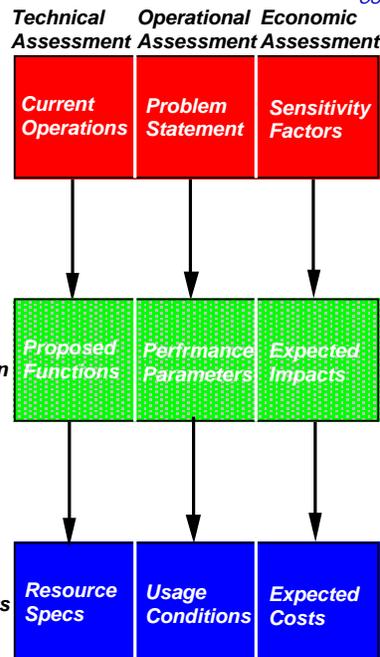
## What to Model

- **Technical assessment** is concerned with system architecture.
- **Operational assessment** is concerned with system performance.
- **Economic assessment** is concerned with cost and impact of system implementation and use.

Context Analysis

Functional Specification

Design Constraints

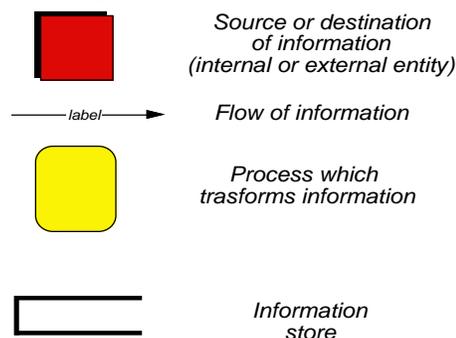


## ***Roles in the SADT Process***

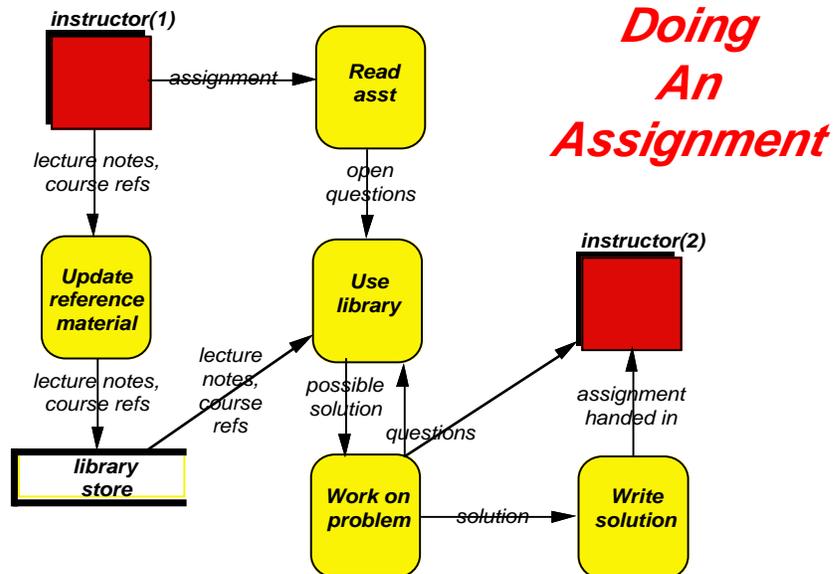
- **Authors** - the developers of an SADT model.
- **Commenters** - review the work of authors.
- **Readers** - the eventual users of the SADT diagrams.
- **Experts** - persons from whom authors obtain specialized information about requirements and constraints.
- **Technical committee** - technical personnel responsible for reviewing the SADT model at every level.
- **Project librarian** - responsible for all project documents.
- **Project manager** - has overall technical responsibility for the system analysis and design.
- **Monitor (Chief analyst)** - an expert in SADT who assists and advises project personnel in the use of SADT.
- **Instructor** - trains authors and commenters on SADT.

## ***The Data Flow Model***

- **The Data Flow Model models flow of information within an organization**



**Note:** An **external entity** is explicitly outside the system boundary, while an **internal one** is inside.



## The Computer Books By Mail Corp.

The **CBM (Computer Books by Mail)** Corporation was recently acquired by a national holding corporation and is now a division. Established 12 years ago, the company's business has been to act as book-jobber, receiving orders from librarians for books about computers, ordering the books from the appropriate publisher, at a discount, and filling the order on receipt of the books from the publisher. Invoices are produced by a service bureau computer from forms filled out by CBM staff. Business is currently running at about 100 invoices per day, each with an average of 4 book titles and an average value per invoice of \$150.

The new management plans to expand the operation considerably, improving service levels by holding stocks of the 100 most frequently ordered book titles and making it possible for all professionals (not only librarians) to order by calling a toll-free number, 1-800-372-6657 (800-DP-BOOKS, of course) as well as by mail, as at present. This will create problems of credit checking and create the need for an inventory control system of some sort. The people who take the orders over the phone will need rapid access to a catalog of books to verify authors and titles and to be able to advise callers what books are available on any given topic.

## The Computer Books By Mail Corp.

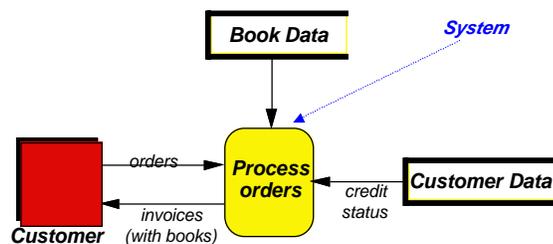
- The volume of transactions on the new system will, of course, depend on the acceptance of this new method of ordering, but it is projected to grow to 1,000 invoices per day or more, though with a lower average of books per invoice (since librarians tend to order more books at a time than professionals).
- A systems analyst has been assigned to this newly acquired division with the responsibility of investigating and specifying the new system on behalf of the Vice President of Marketing.

### Alternative Scopes

- Computerize the order verification process.
- Computerize accounts receivable.
- Integrate order verification, requisitions and accounts receivable.
- Of course, each one of these alternatives will have different budget and project-length implications.

## The Computer Books By Mail Corp. Step I: Draw a Context DFD

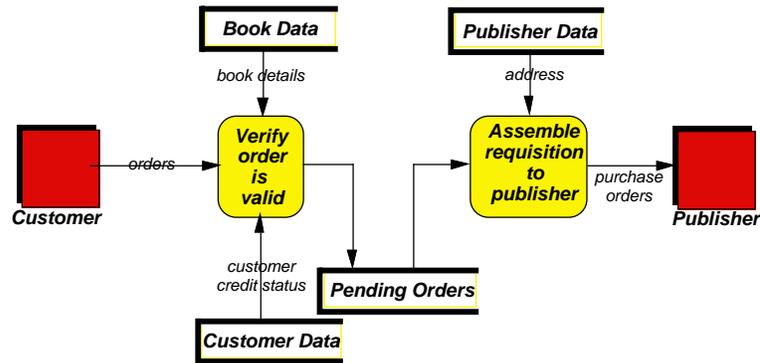
- ...to describe the proposed system's relationship to the rest of the world



- Customers order books and get back invoices
- Processing of orders fetches information from a book information store (publisher of the book, price,...) and from a customer information store (is customer's account current?)

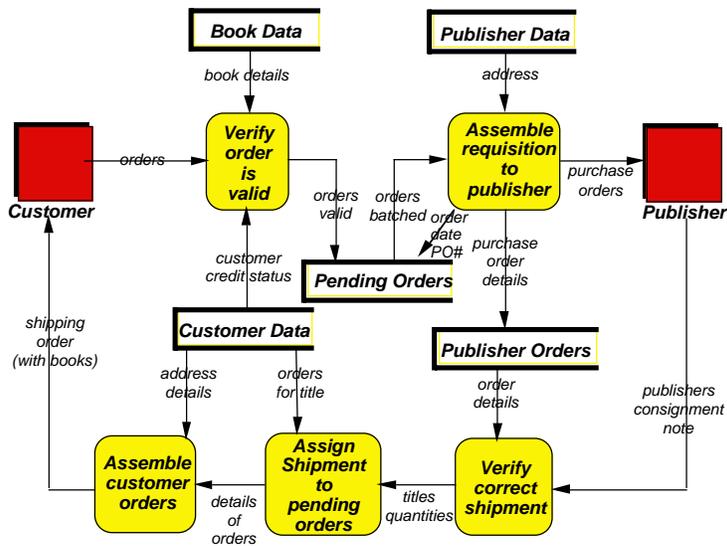
## Step II: Draw Level 0 Diagram --

Show interfaces between organizational boundaries



Processing orders involves checking the order and assembling a requisition to the publisher...

## Step II (cont'd): Further Expansion

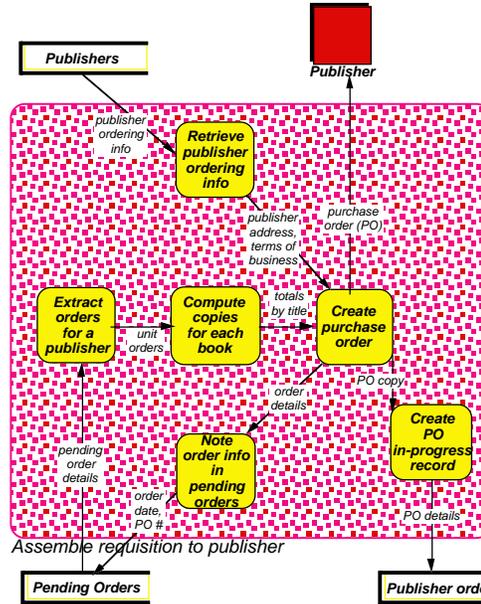


## Step III: Refine Model

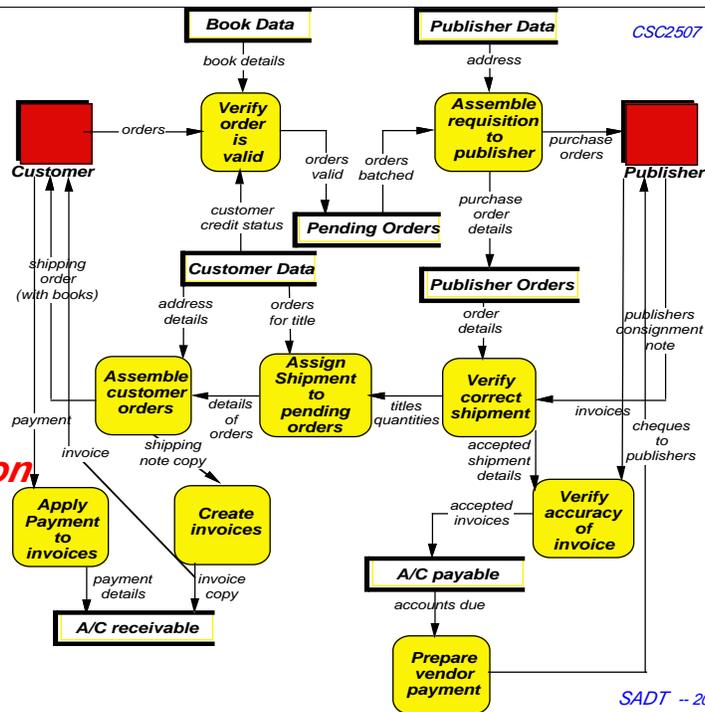
- Show Work Performed Within a Single Organizational Unit
- Explosion of a process into another DFD
- Do level 1, 2,... diagrams until you have enough details

### Step IV:

- Show detailed processing within each transaction

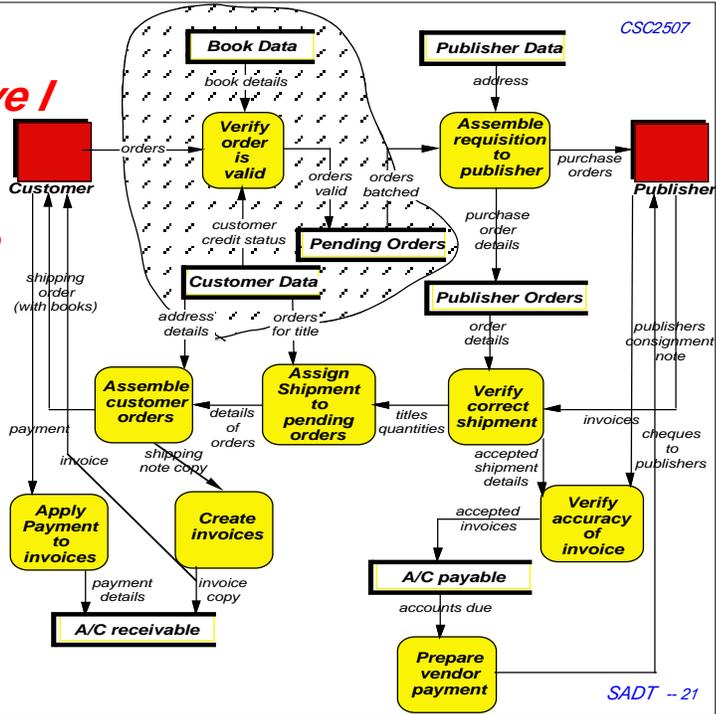


## The Computer Books By Mail Corporation



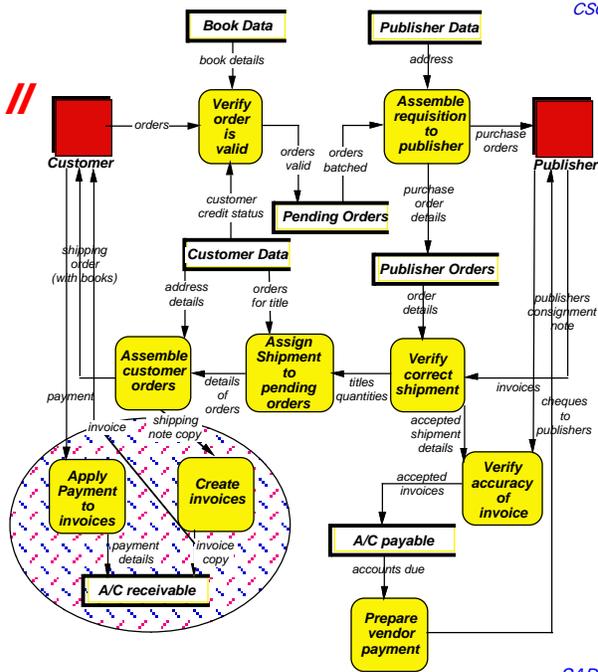
# Alternative I

Computerize order verification process



# Alternative II

Computerize accounts receivable





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- [Ross77a] Ross, D., and Schoman, K., "Structured Analysis for Requirements Definition," *IEEE Transactions on Software Engineering* 3(1), Special Issue on Requirements Analysis, January 1977, 86-95.
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