



2b. Structured Analysis and Design Technique (SADT)

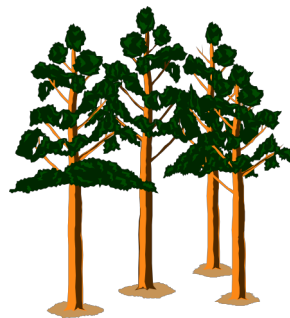
History

Data and Activities

SADT Diagrams

The SADT Analysis Process

Data Flow Diagrams



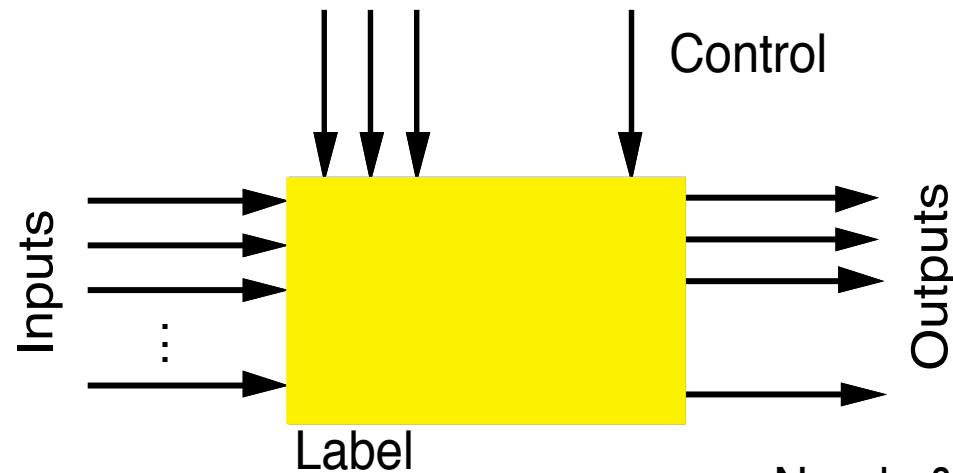


SADT: Structured Analysis and Design Technique

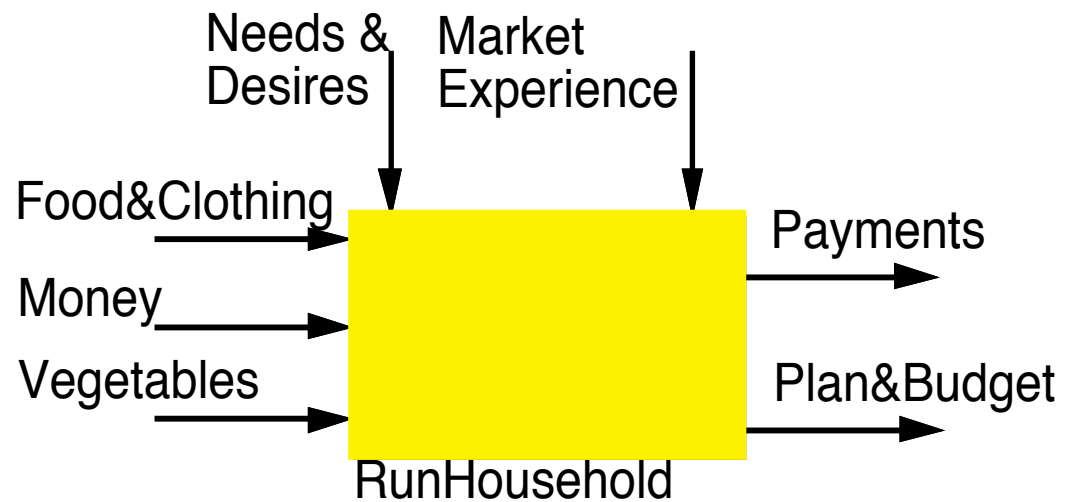
- Diagrammatic notation for constructing a sketch for an application.
- Offers boxes to represent entities and activities.
- Offers a variety of arrows to relate boxes.
- Boxes and arrows have an associated (informal) semantics; users are aided by box and arrow labels, other informal documentation.
- 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 IDEFO.



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

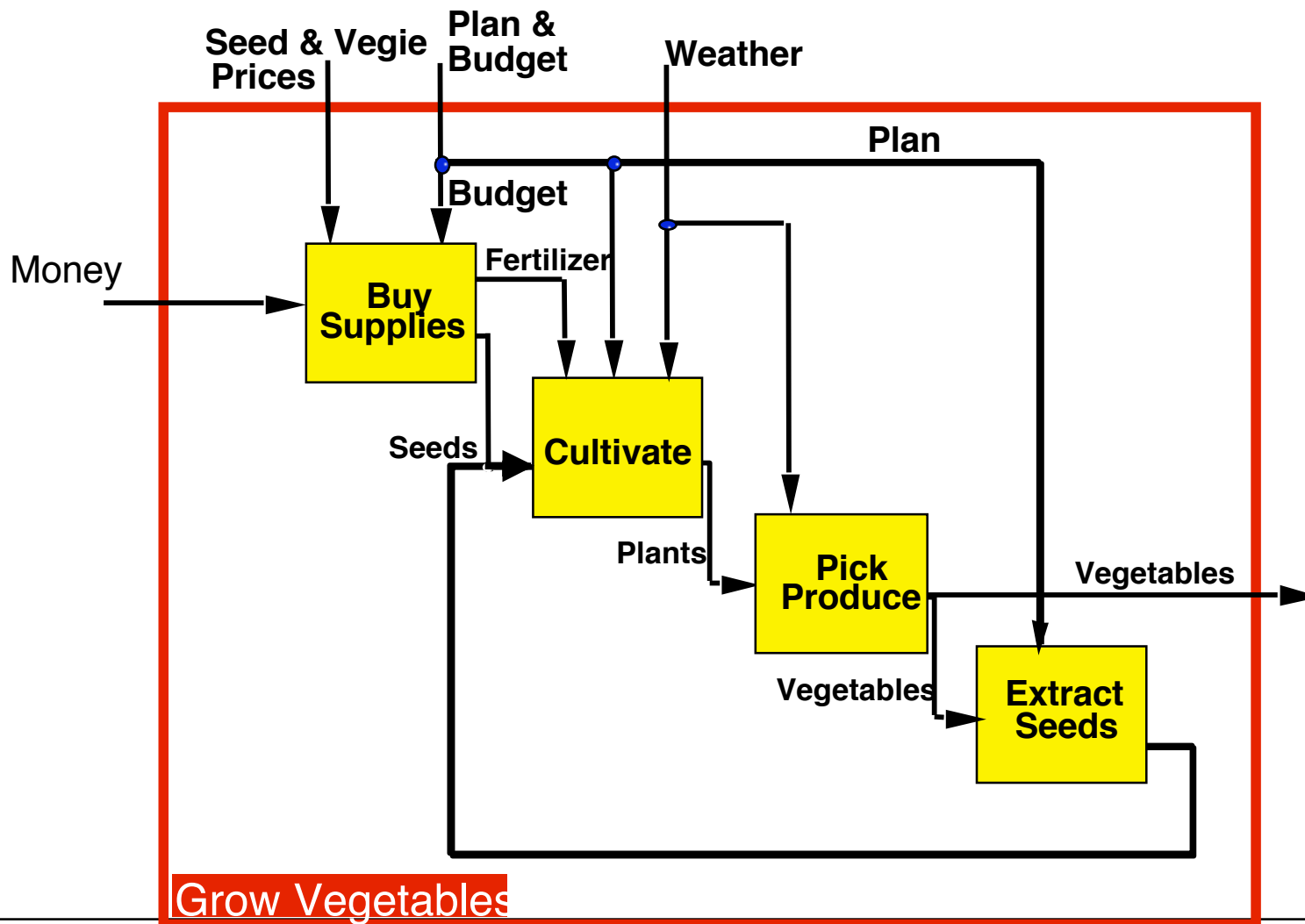
→ Two types of boxes: *data* boxes, *activity* boxes

→ 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*

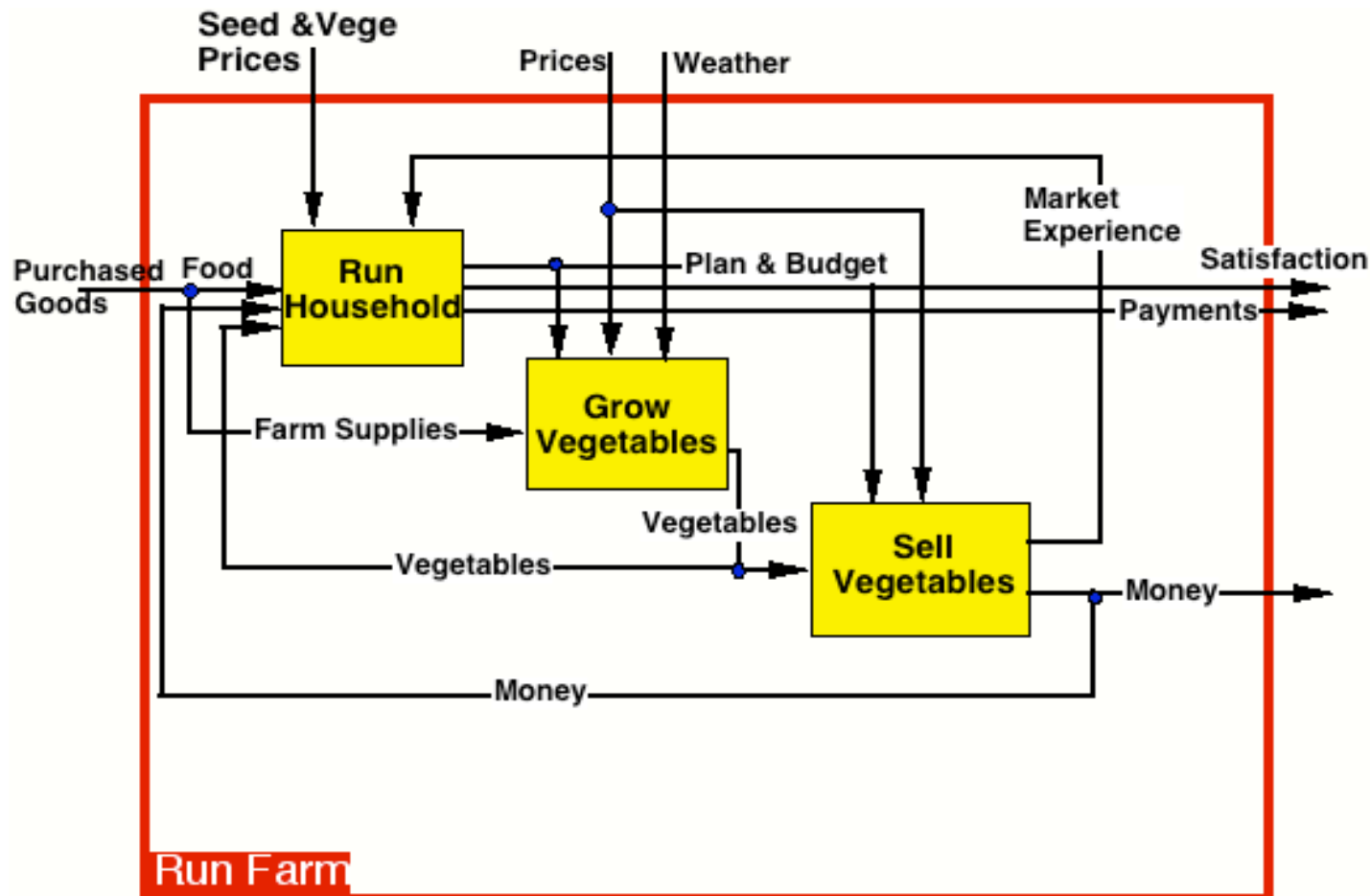
Inputs are activities that produce the data

Outputs consume the data

Controls influence the internal state of the data

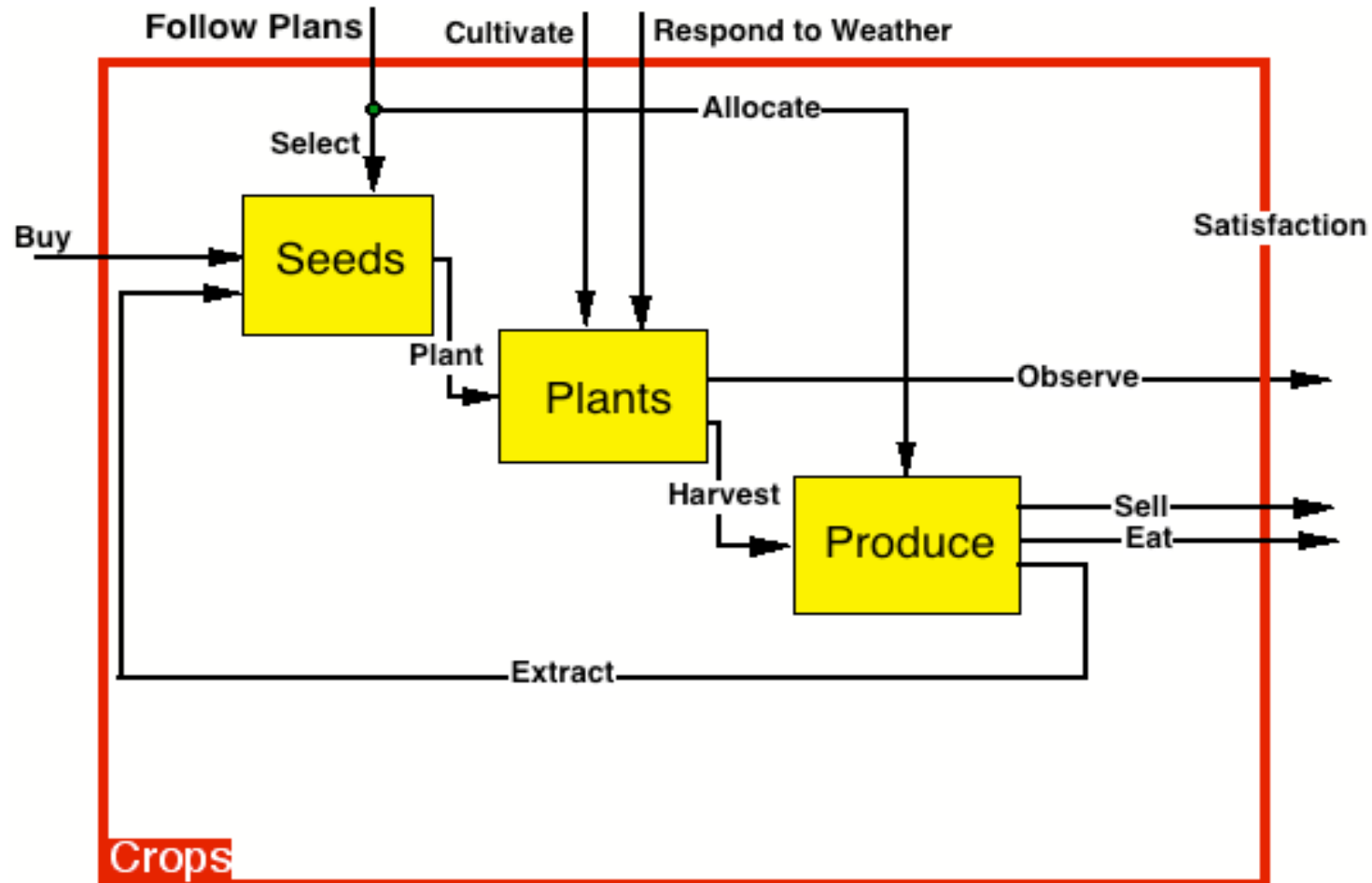


A Parent Activity





A Data Diagram





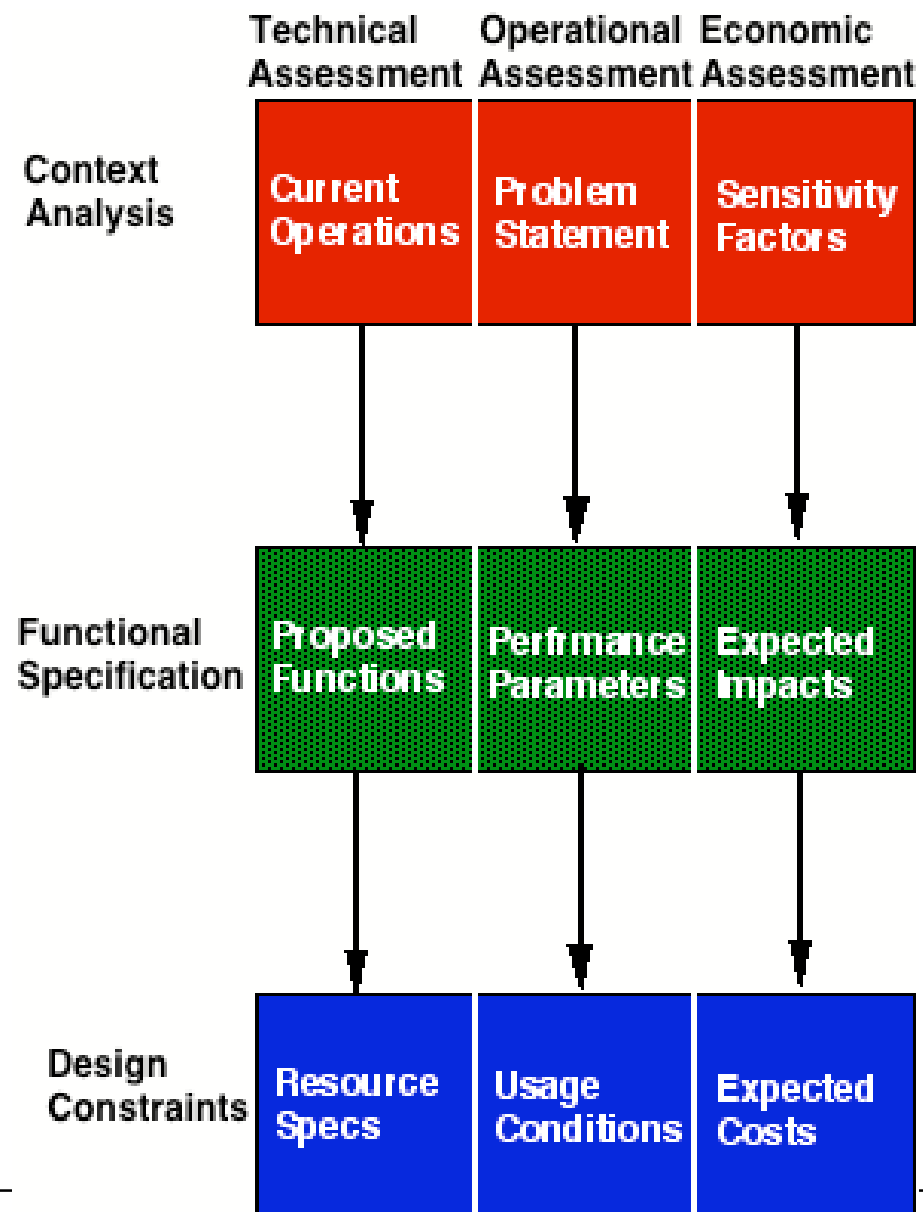
The SADT Process

- 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.





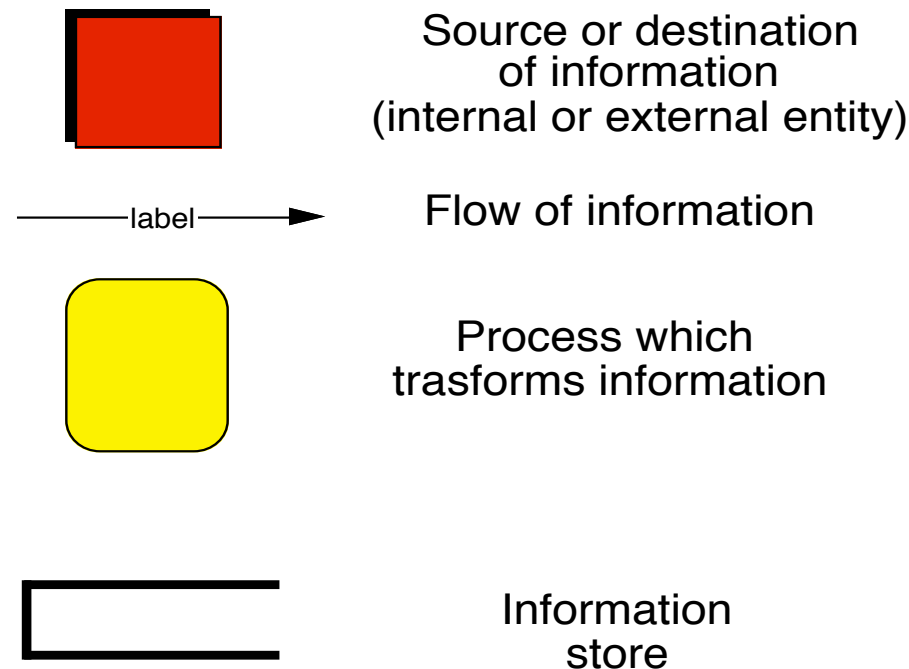
Roles in the SADT Process

- **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

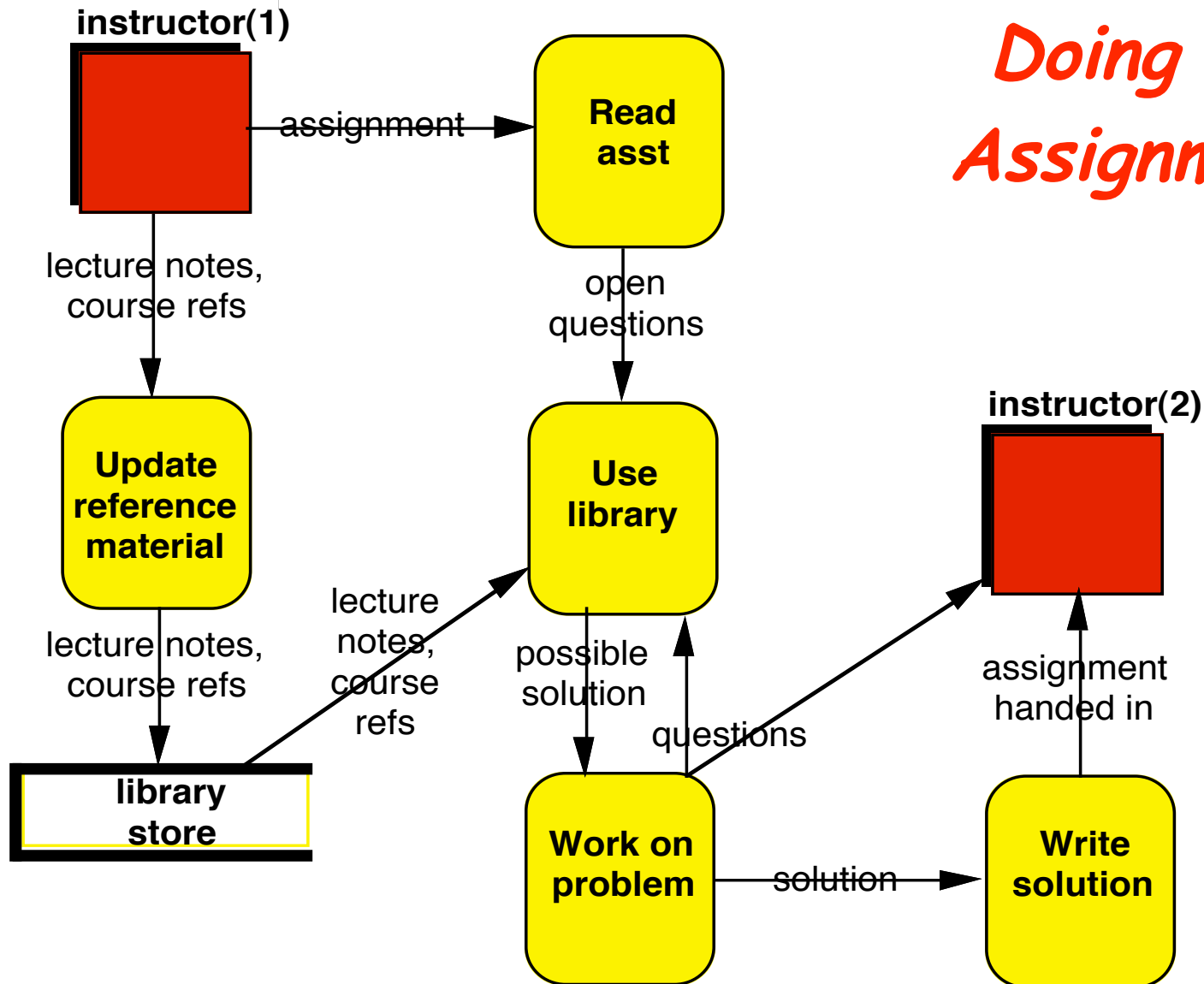
→ The Data Flow Model models flow of information within an organization



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



Doing An Assignment





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

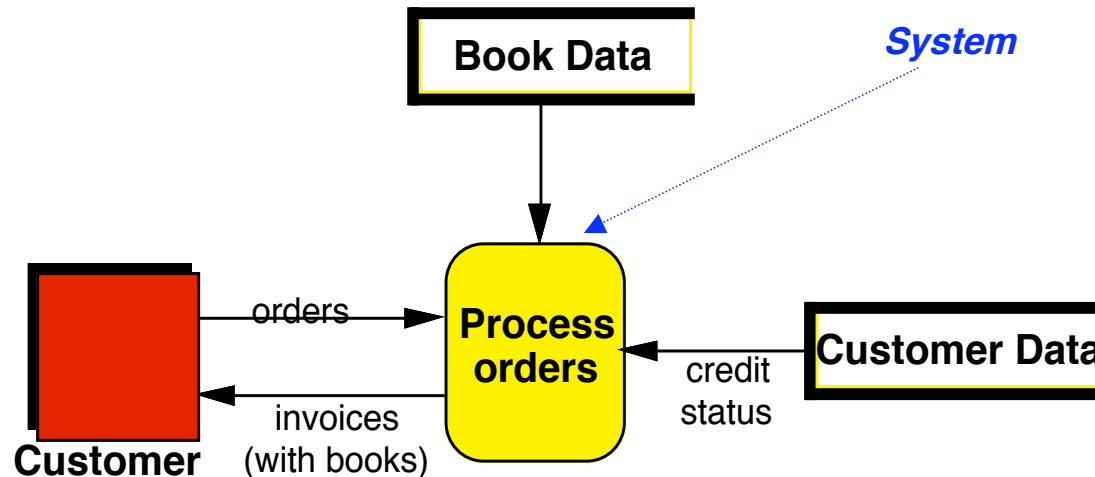
- Computerize the order verification process.
- Computerize accounts receivable.
- Integrate order verification, requisitions and accounts receivable.
- Of course, each one of these alternatives will have different budget and project-length implications.



The Computer Books By Mail Corp.

Step I: Draw a Context DFD

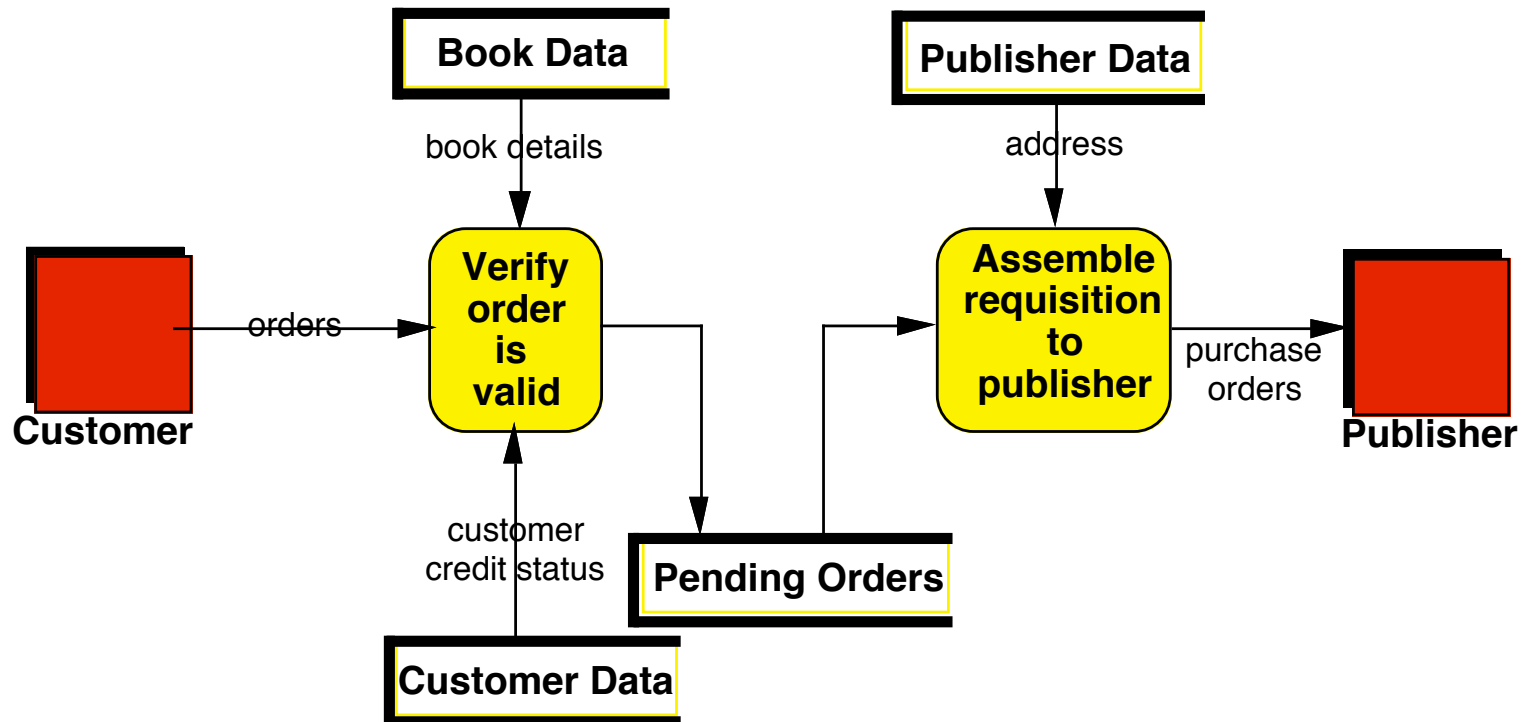
→ ...to describe the proposed system's relationship to the rest of the world



- 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

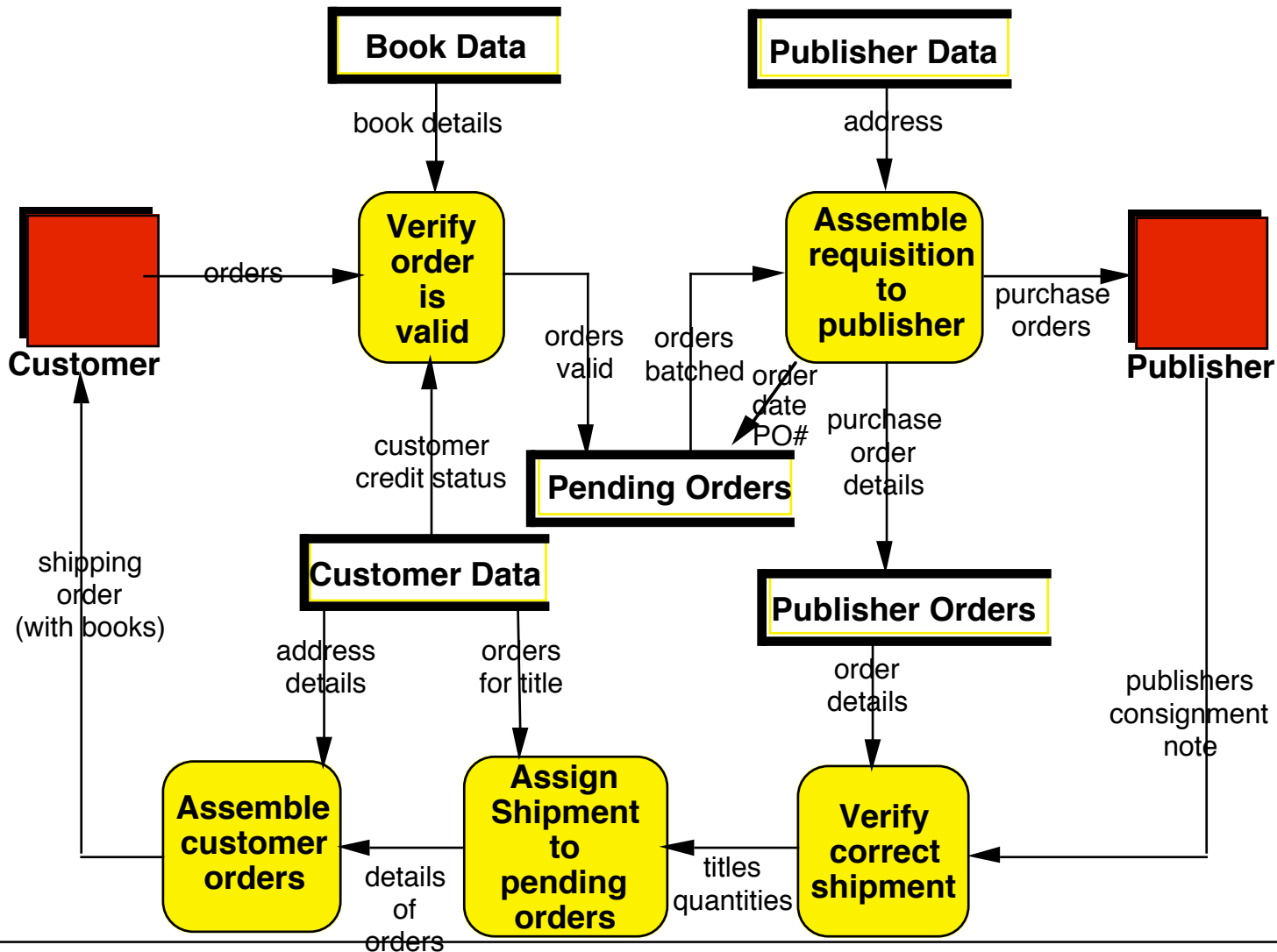
Show interfaces between organizational boundaries



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



Step II (cont'd): Further Expansion

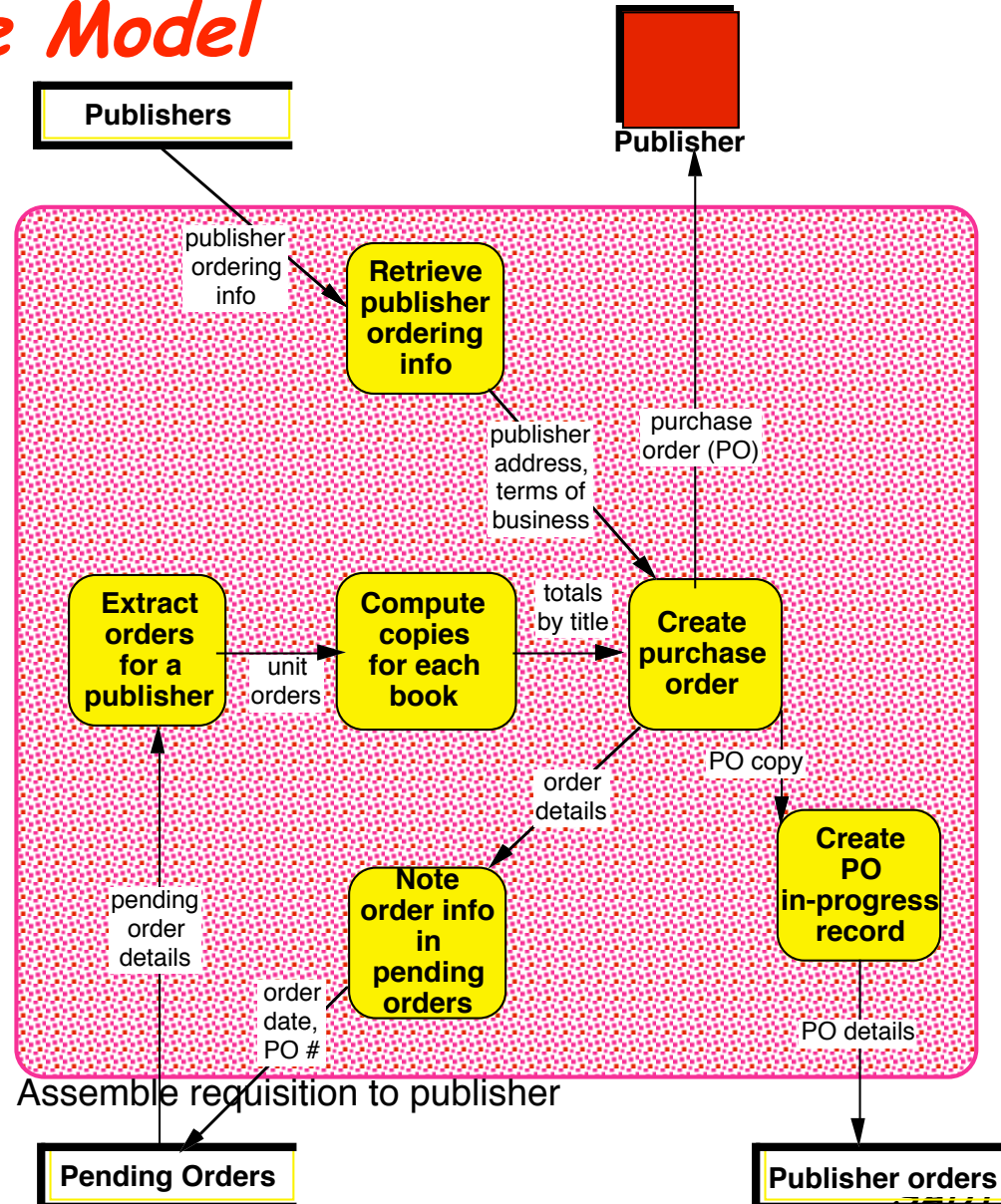


Step III: Refine Model

- Show work performed within a single organizational unit
- Explode a process into another DFD
- Do levels 1, 2,... until you have enough details

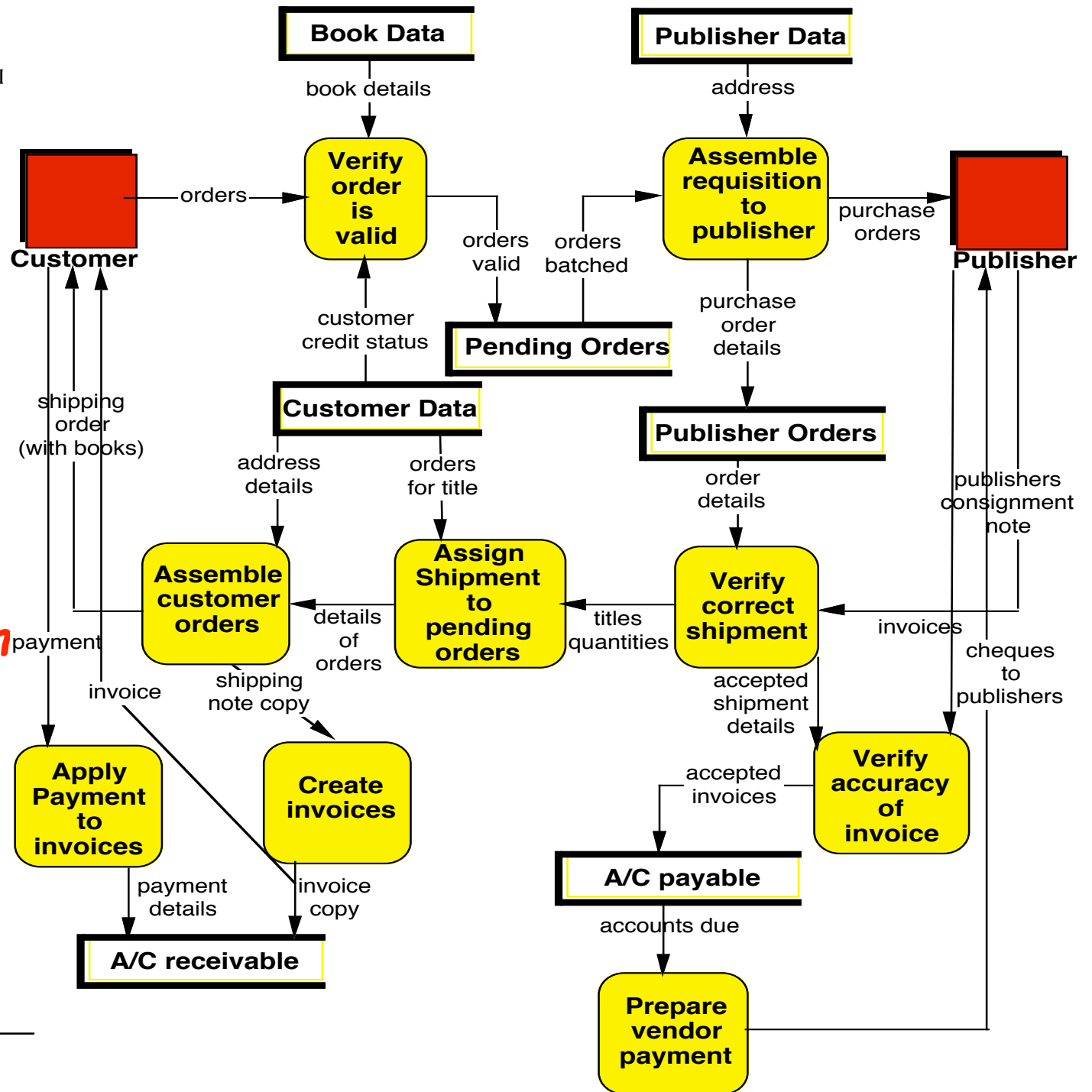
Step IV:

- Show detailed processing within each transaction





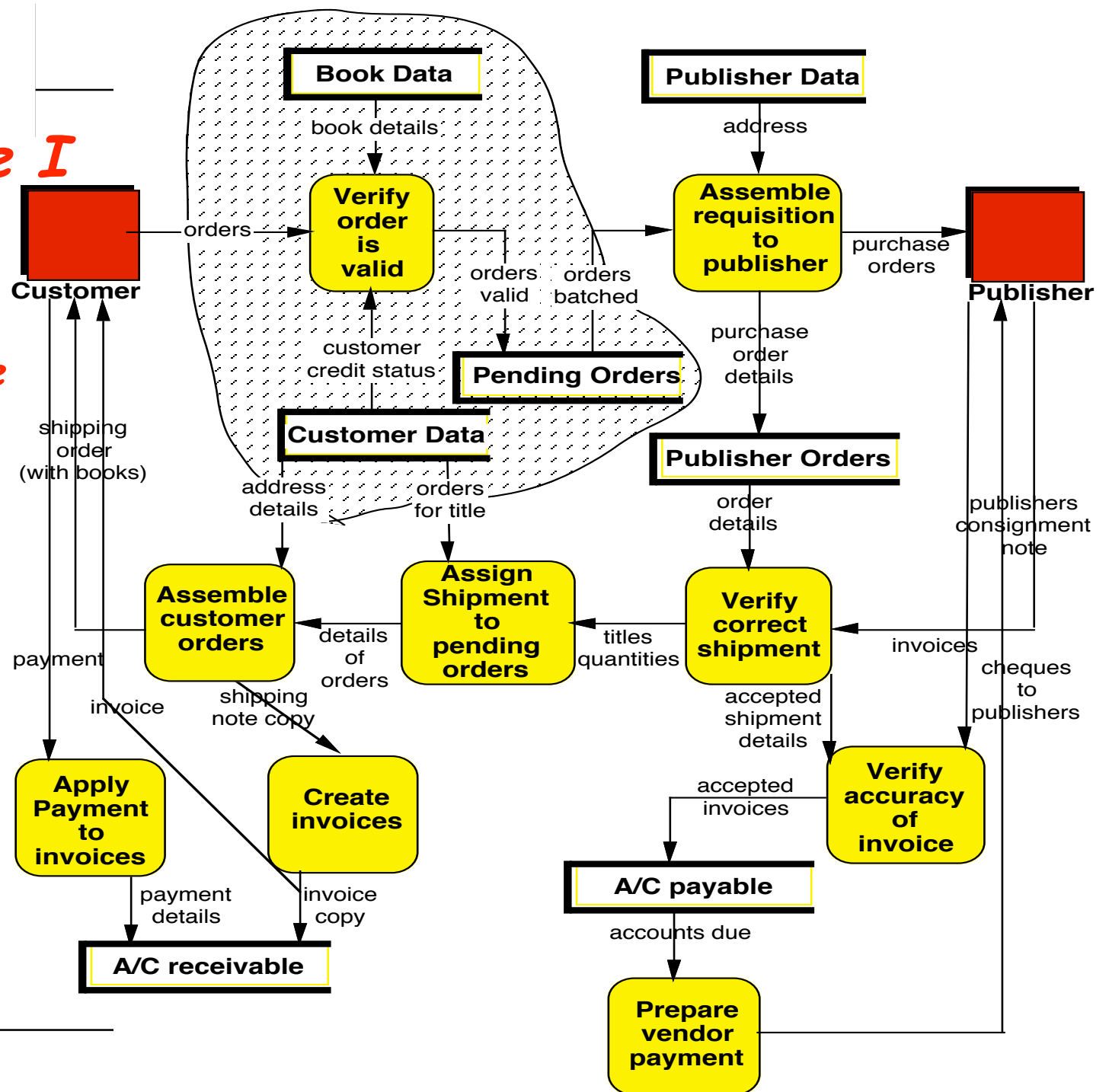
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Alternative I

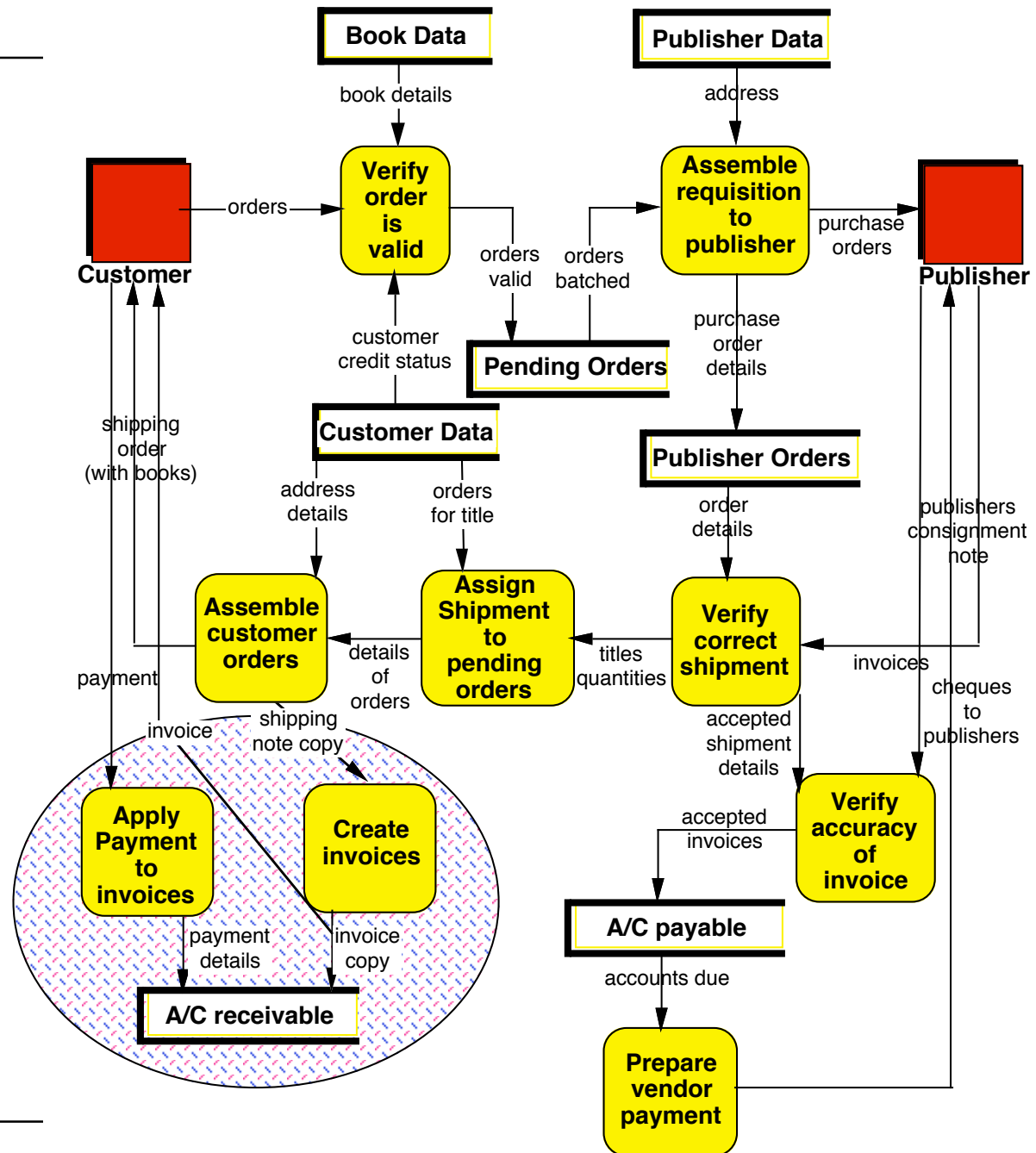
*Computerize
order
verification
process*





Alternative II

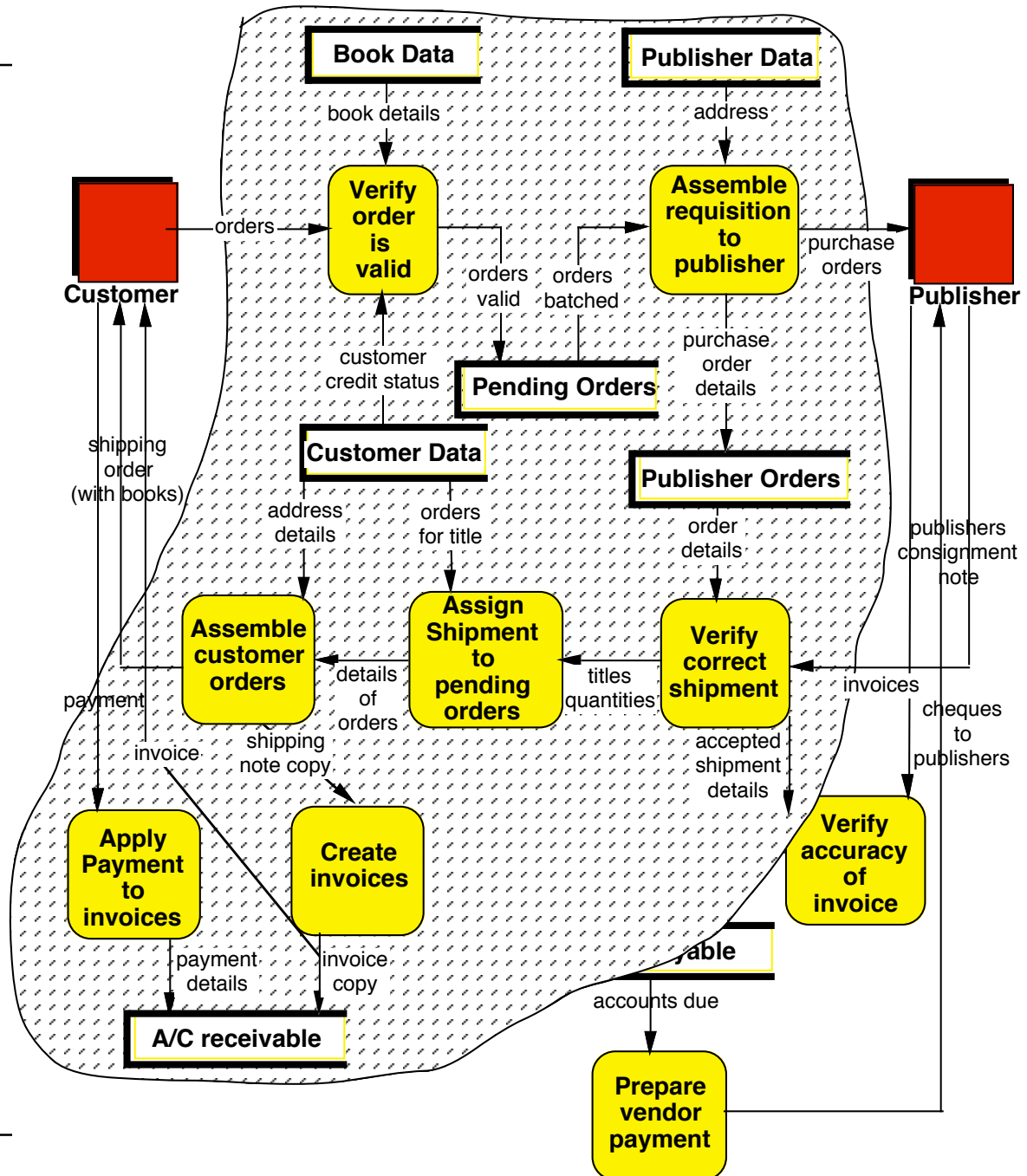
Computerize
accounts
receivable





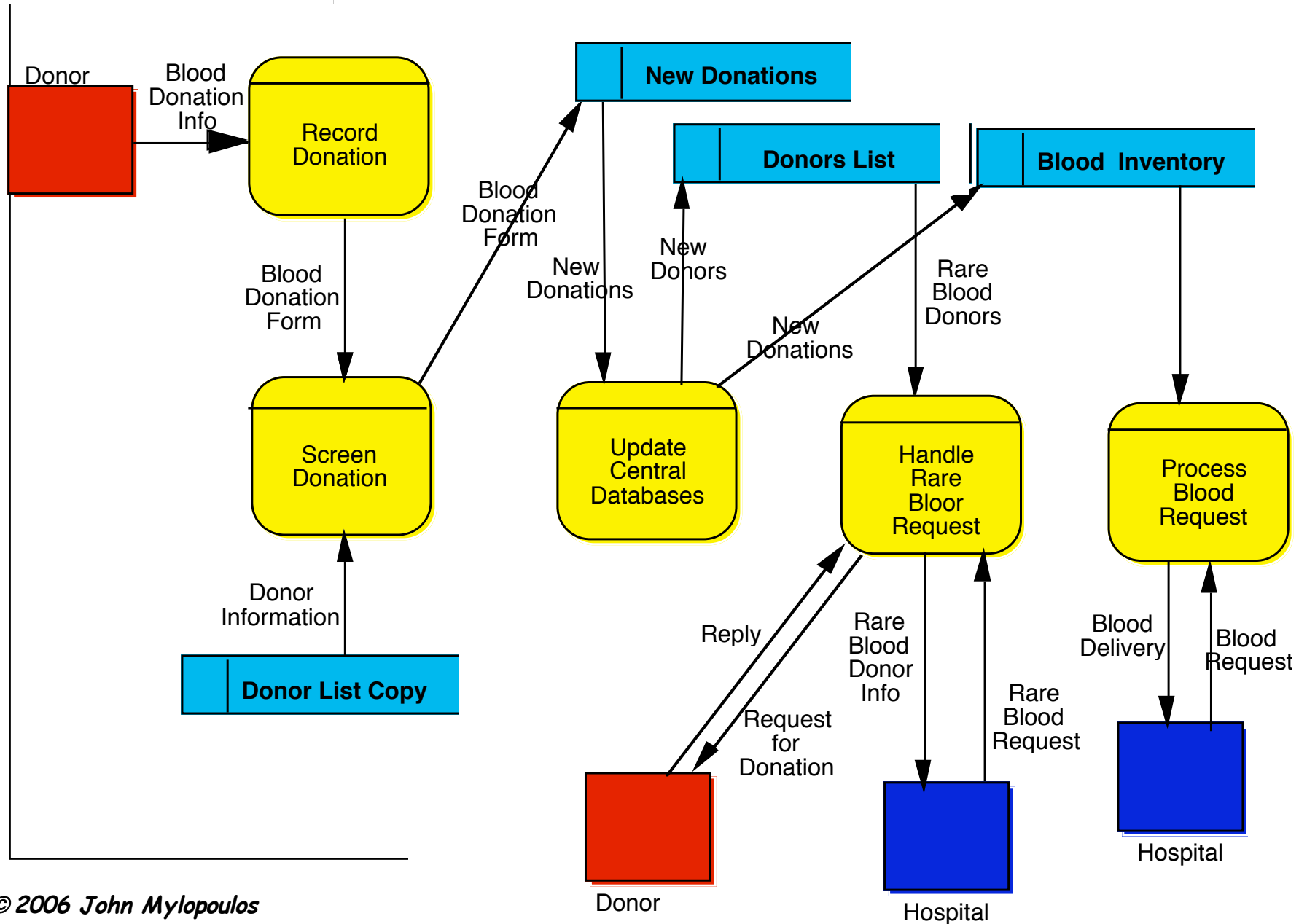
Alternative III

*Integrate
order verification,
requisitions and
accounts receivable*





What Does This DFD Say?





References

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- [Wirth71] Wirth, N., "Program Development by Stepwise Refinement," *Communications of the ACM* 14(4), 221-227, 1971.