Software Engineering and Information System

Lecture 07:
Design Representation Schemes

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Design Representation Schemes

- Code Listing
- Table of Attributes
- Pseudo-code
- Flowchart
- Structured Flowchart
- Control Graph
- Structure Chart
- HIPO (Hierarchy plus Input-Process-Output) Diagram
- Design Tree and Control Graph
- Decision Table
- Warnier-Orr Diagram
- PDL (Process Design Language)

HIPO Diagram

- HIPO: Hierarchy plus Input-Process-Output
- A tool for planning and/or documenting a computer program.
- It consists of
  - a hierarchy chart that graphically represents the program’s control structure (the top-down structure).
  - a set of IPO (Input-Process-Output) charts that describe the inputs to, the outputs from, and the functions (or processes) performed by each module on the hierarchy chart.

Strengths, Weaknesses and Limitations

- Designers can evaluate and refine a program’s design, and correct flaws prior to implementation.
- Given the graphic nature of HIPO, users and managers can easily follow a program’s structure.
- The hierarchy chart serves as a useful planning and visualization document for managing the program development process.
- The IPO charts define for the programmer each module’s inputs, outputs, and algorithms.
- The “text plus flowchart” nature of the IPO charts makes them difficult to maintain.
- So the documentation often does not represent the current state of the program.
- By its very nature, the HIPO technique is best used to plan and/or document a hierarchically structured program.

An Interactive Inventory Program

❑ Tasks Set

- **1.0** Manage inventory
  - **2.0** Update stock
    - **2.1** Process sale
    - **2.2** Process return
    - **2.3** Process shipment
  - **3.0** Generate report
    - **3.1** Respond to query
    - **3.2** Display status report
  - **4.0** Maintain inventory data
    - **4.1** Modify record
    - **4.2** Add record
    - **4.3** Delete record

The Hierarchy Chart

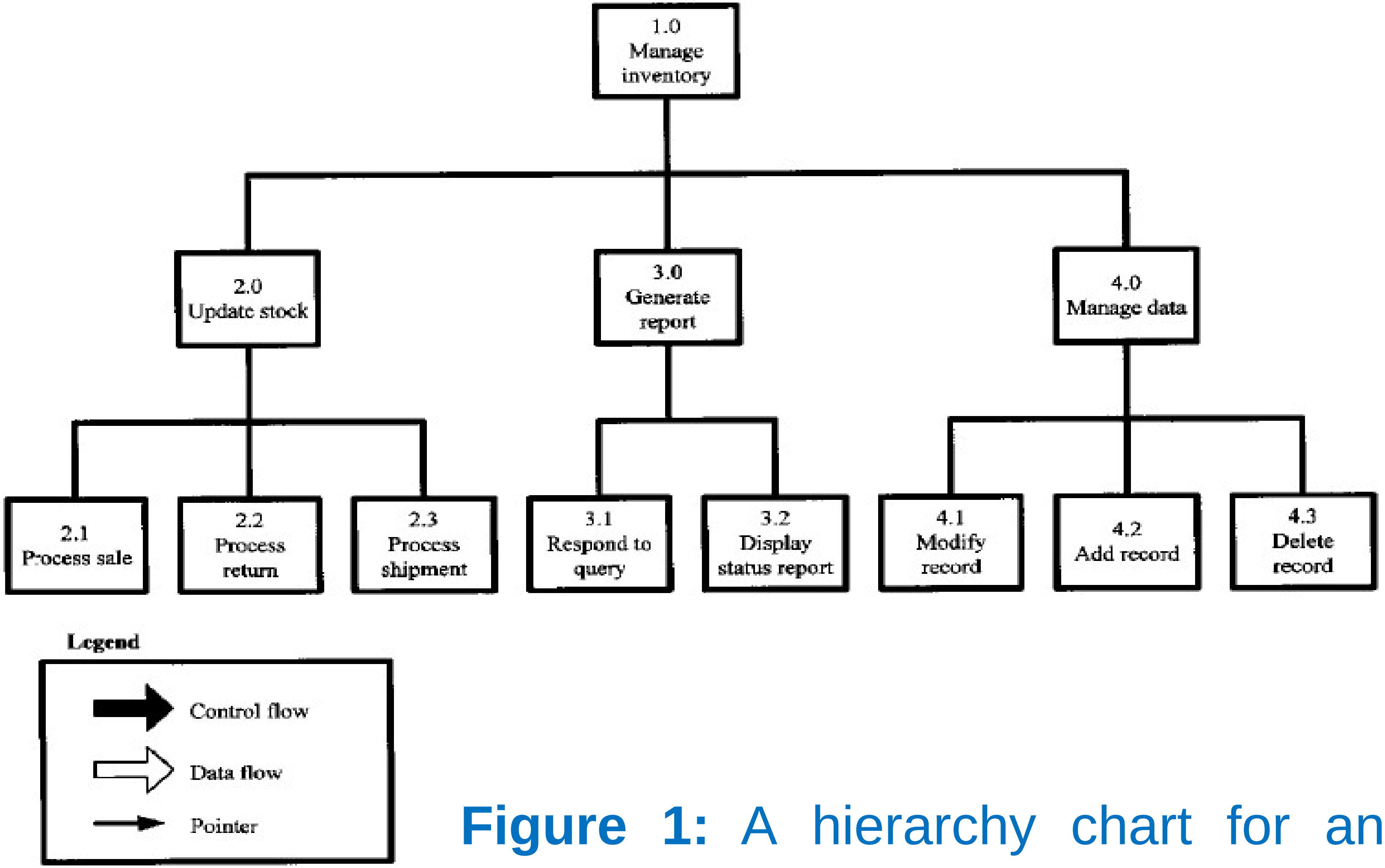
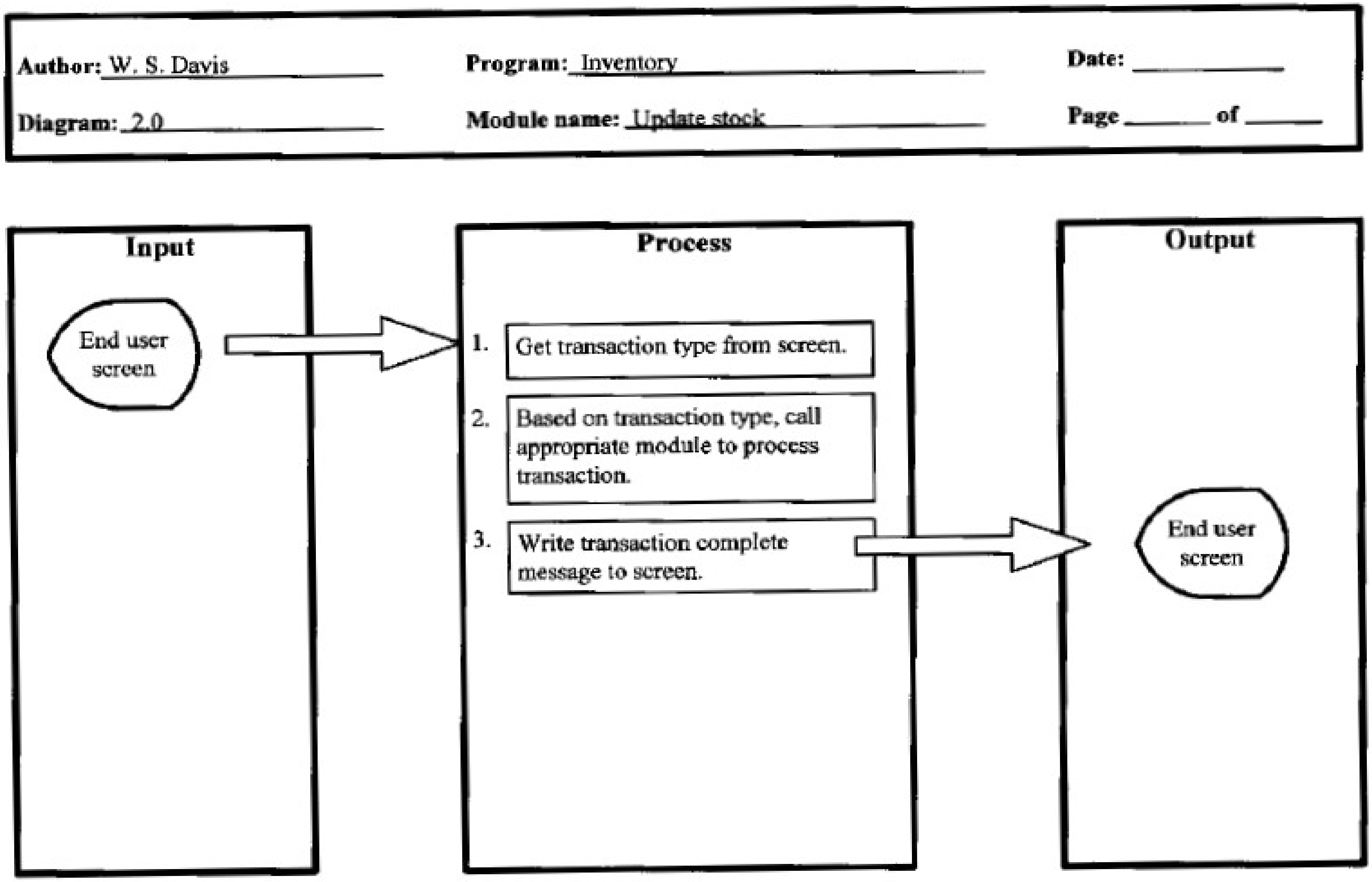


Figure 1: A hierarchy chart for an interactive inventory control program.

The IPO Charts



Author: W. S. Davis

Program: Inventory

Date: ____________

Diagram: 2.0

Module name: Update stock

Page ______ of ______

Input

End user screen

Process

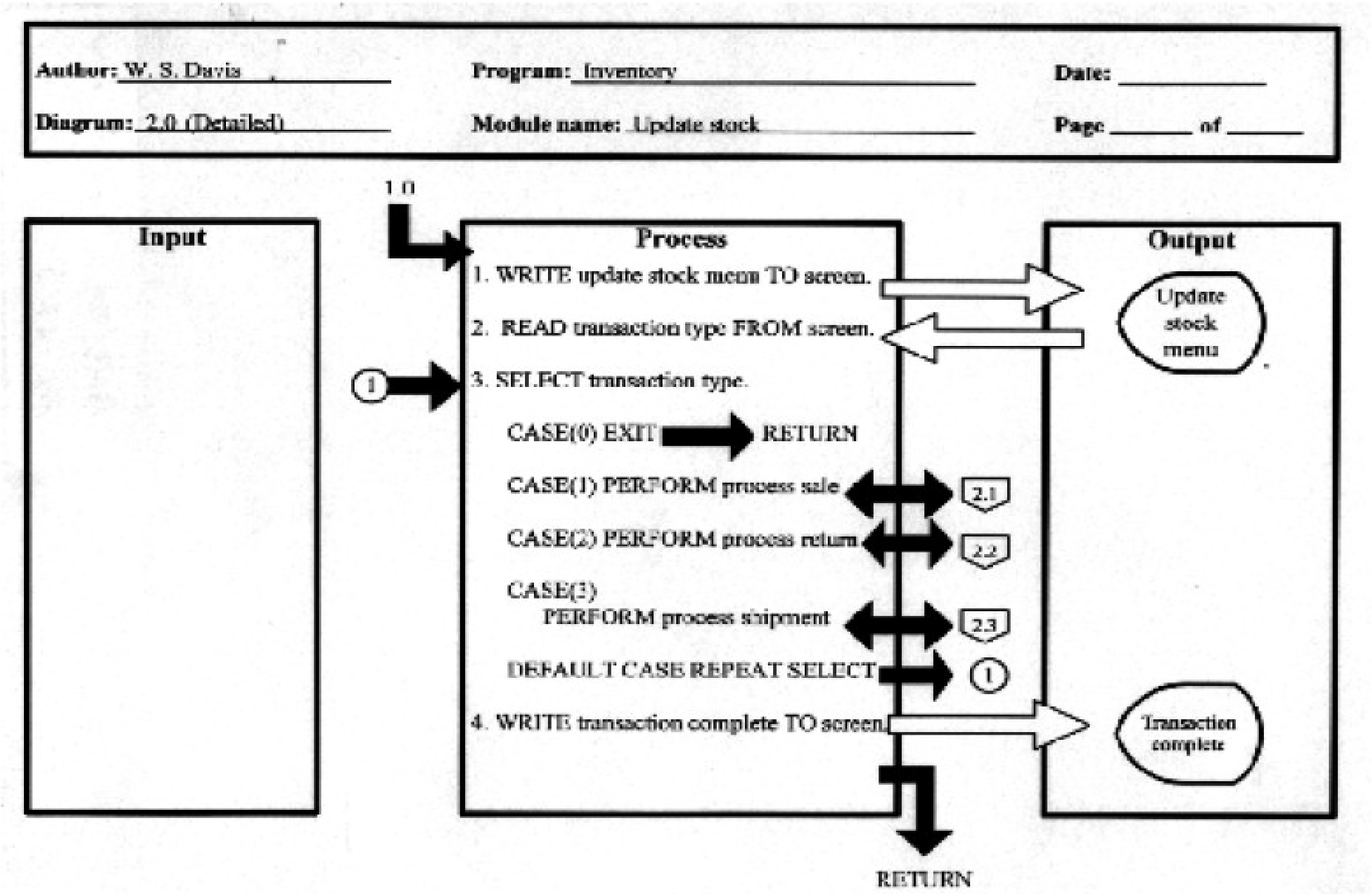
1. Get transaction type from screen.
2. Based on transaction type, call appropriate module to process transaction.
3. Write transaction complete message to screen.

Output

End user screen

Figure 2: An overview diagram for process 2.0.

Detail Diagrams



Author: W. S. Davis

Diagram: 2.0 (Detailed)

Program: Inventory

Module name: Update stock

Date: ____________

Page ______ of ______

1.0

Input

Process

```
1. WRITE update stock menu TO screen.
2. READ transaction type FROM screen.
3. SELECT transaction type.
     CASE(0) EXIT    RETURN
     CASE(1) PERFORM process sale    2.1
     CASE(2) PERFORM process return    2.2
     CASE(3)
          PERFORM process shipment    2.3
     DEFAULT CASE REPEAT SELECT    1
4. WRITE transaction complete TO screen.
```

1

RETURN

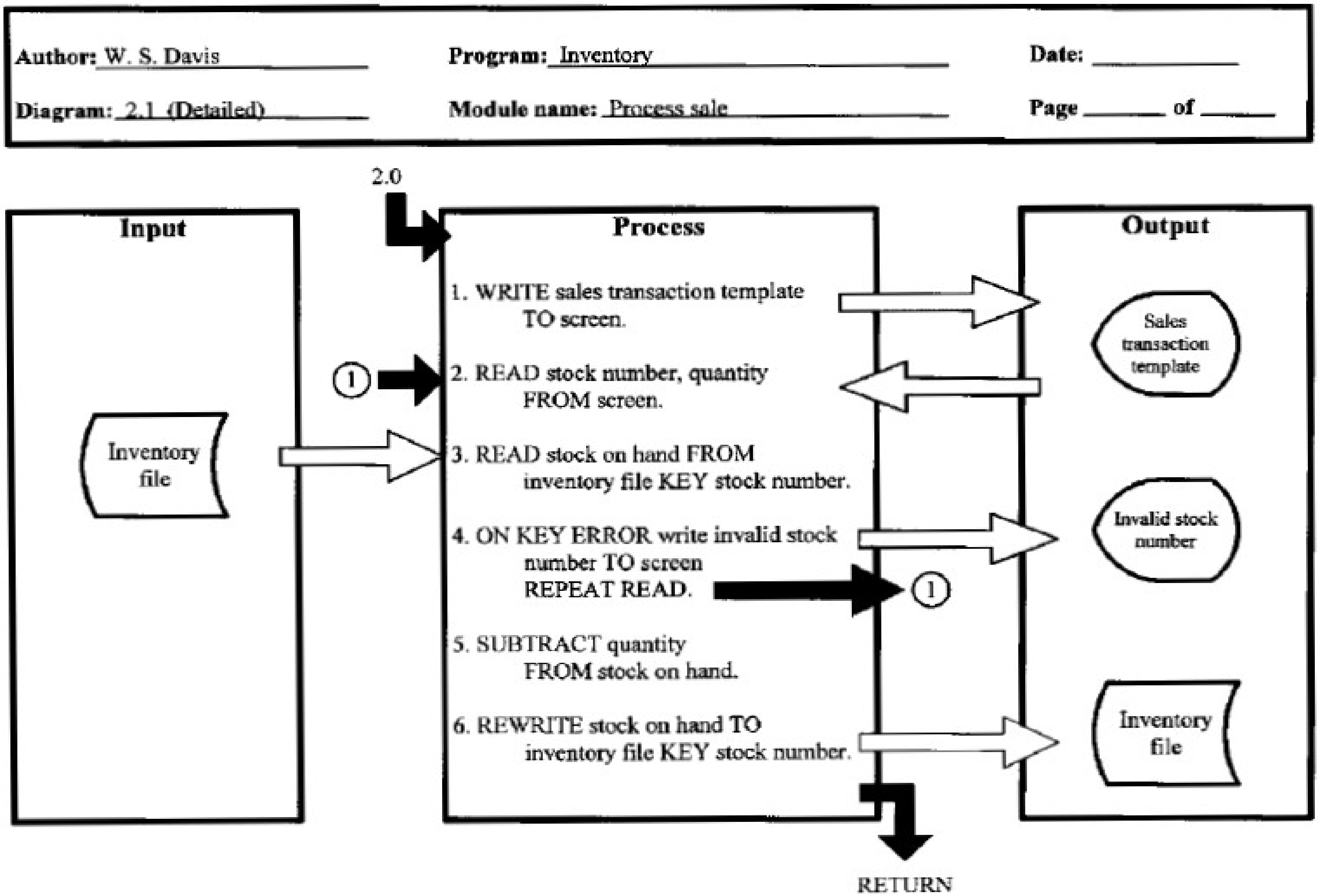
Output

Update stock menu

Transaction complete

Figure 3: A detail diagram for process 2.0.

Detail Diagrams



Author: W. S. Davis

Program: Inventory

Date: ____

Diagram: 2.1 (Detailed)

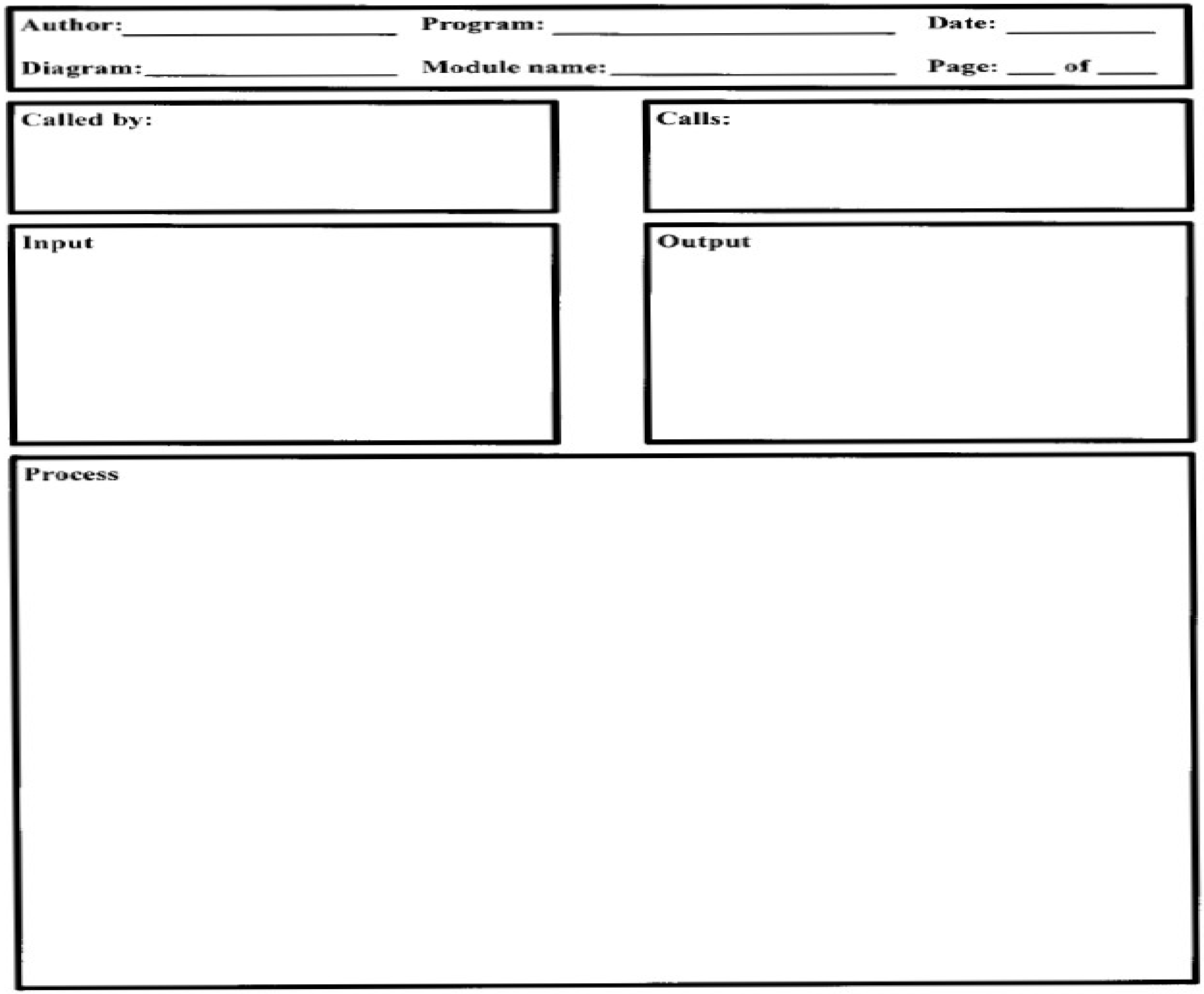
Module name: Process sale

Page ____ of ____

1. WRITE sales transaction template TO screen.
2. READ stock number, quantity FROM screen.
3. READ stock on hand FROM inventory file KEY stock number.
4. ON KEY ERROR write invalid stock number TO screen REPEAT READ.
5. SUBTRACT quantity FROM stock on hand.
6. REWRITE stock on hand TO inventory file KEY stock number.

Figure 4: A detail diagram for process 2.1.

Simplified IPO Charts



Author:____________________ Program: _________________________ Date: __________

Diagram:____________________ Module name:_____________________ Page: ____ of ____

Called by:

Calls:

Input

Output

Process

Figure 5: A simplified IPO diagram.

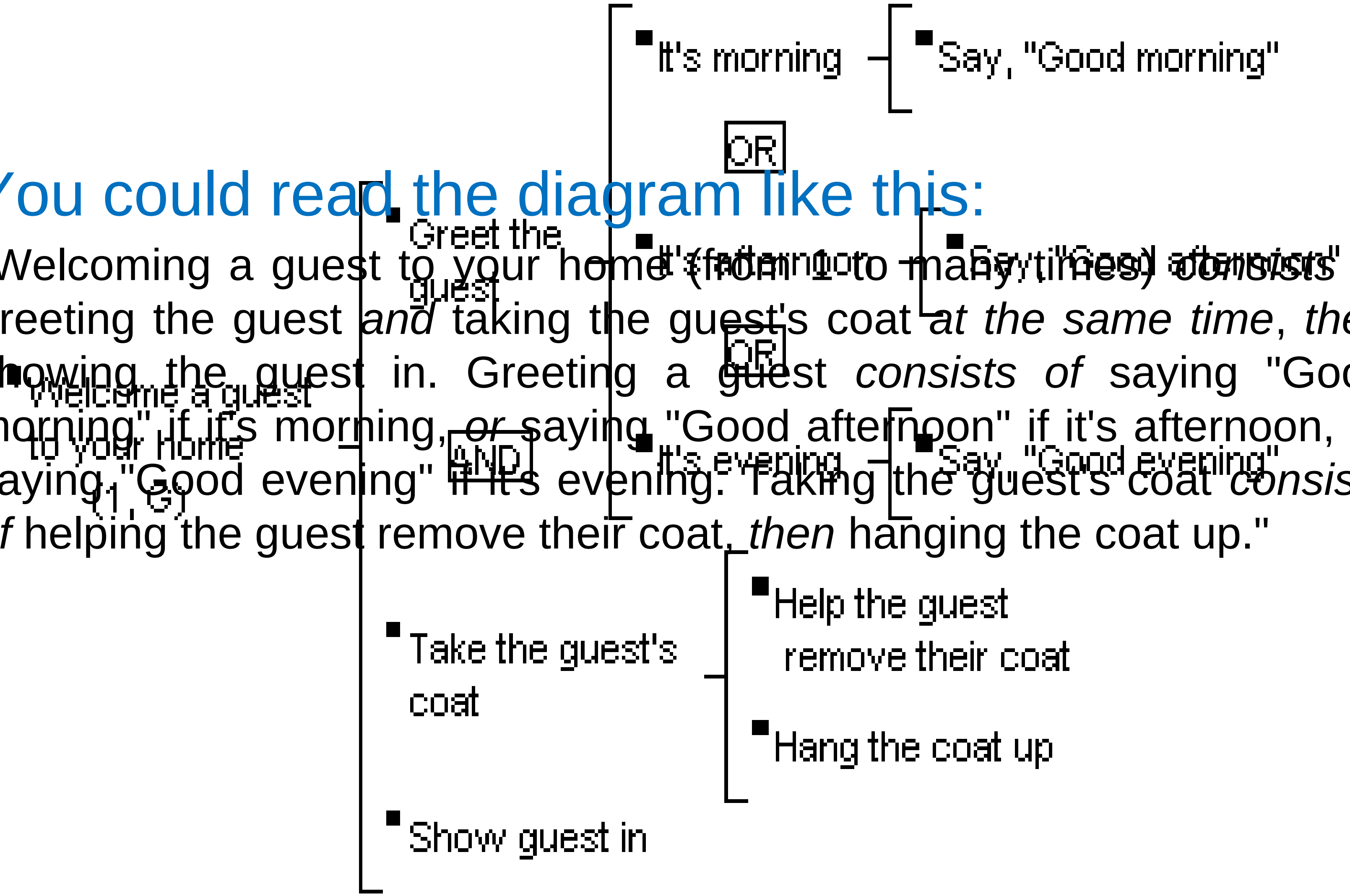
Warnier/Orr Diagrams

- A **Warnier/Orr** diagram is a style of diagram which is extremely useful for describing complex processes e.g.,
    - computer programs, business processes, instructions and
    - objects (e.g., data structures, documents, parts explosions).
- It is elegant, easy to understand and easy to create.

Main Elements

Bracket:	**A bracket encloses a level of decomposition in a diagram. It reveals what something "consists of" at the next level of detail.**
Sequence:	The sequence of events is defined by the top-to-bottom order in a diagram. That is, an event occurs after everything above it in a diagram, but before anything below it.
OR:	You represent choice in a diagram by placing an "OR" operator between the items of a choice. The "OR" operator looks either like or .
AND:	You represent concurrency in a diagram by placing an "AND" operator between the concurrent actions. The "AND" operator looks either like or .
Repetition:	To show that an action repeats (loops), you simply put the number of repetitions of the action in parentheses below the action.

A Simple Process



You could read the diagram like this:

"Welcoming a guest to your home (from 1 to many times) *consists of* greeting the guest *and* taking the guest's coat *at the same time*, *then* showing the guest in. Greeting a guest *consists of* saying "Good morning" if it's morning, *or* saying "Good afternoon" if it's afternoon, *or* saying "Good evening" if it's evening. Taking the guest's coat *consists of* helping the guest remove their coat, *then* hanging the coat up."

Recommended Design-Representation Techniques

1. An H diagram is drawn and major subprograms are identified.
2. High-level flowcharts are drawn for the control structure and each major subprogram.
3. Pseudo-code is written for each flowchart.
4. The program (code) is written in the source language

Comparison of Design-Representation Techniques

Table 2.8 (Self)

References:

- http://www.hit.ac.il/staff/leonidm/information-systems/ch64.html
- http://www.hit.ac.il/staff/leonidm/information-systems/ch33.html

Thank You