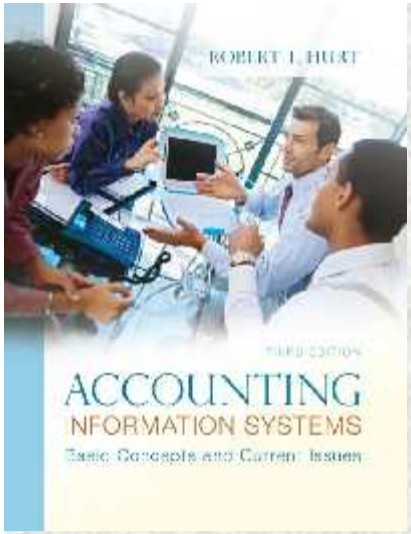


Chapter 7

Data Flow Diagramming

Outline

- Expected outcomes
- DFD symbols
- Leveled sets of DFDs
- Database tables
- Database normalization

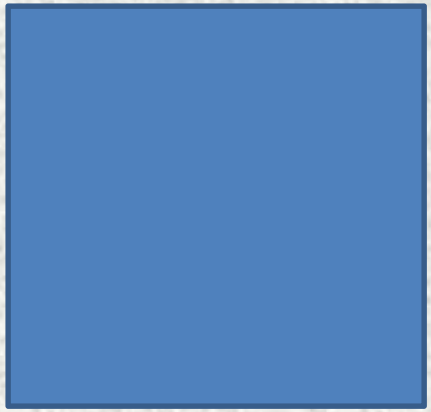
Expected outcomes

- Explain the symbols and design considerations associated with data flow diagrams.
- Compare and contrast flowcharts and DFDs with regard to purpose, content, structure and use in AIS.
- Discuss ways DFDs are used in AIS work.
- Construct a leveled set of DFDs.
- Design normalized database tables from a DFD.

DFD symbols

- Circles represent processes.
  - Labeled with verb phrases
  - Numbered sequentially within a single DFD
  - Number format indicated by DFD level
  - Each process must have both inputs and outputs.
  - Inputs and outputs must be different from one another.

DFD symbols

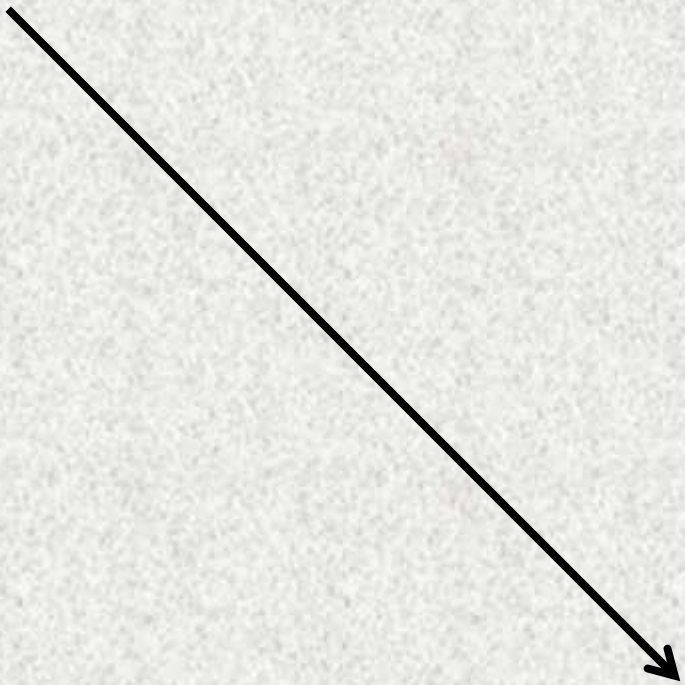


- Rectangles represent external entities.
  - Reside outside the system boundary
  - May input data to the system or receive data from system
  - Labeled with noun phrases
  - External entities may not exchange information with one another.

DFD symbols

- Sets of parallel lines represent databases.
  - Sometimes called “sinks” or “stores”
  - Labeled with noun phrases
  - Cannot exchange information directly with external entities; only via a process
  - Direct data flows to / from processes are permitted

DFD symbols



- Lines represent data flows.
  - Always labeled with noun phrases
  - Unidirectional; i.e., only one arrow

DFD symbols

- **Lecture break 7-1**

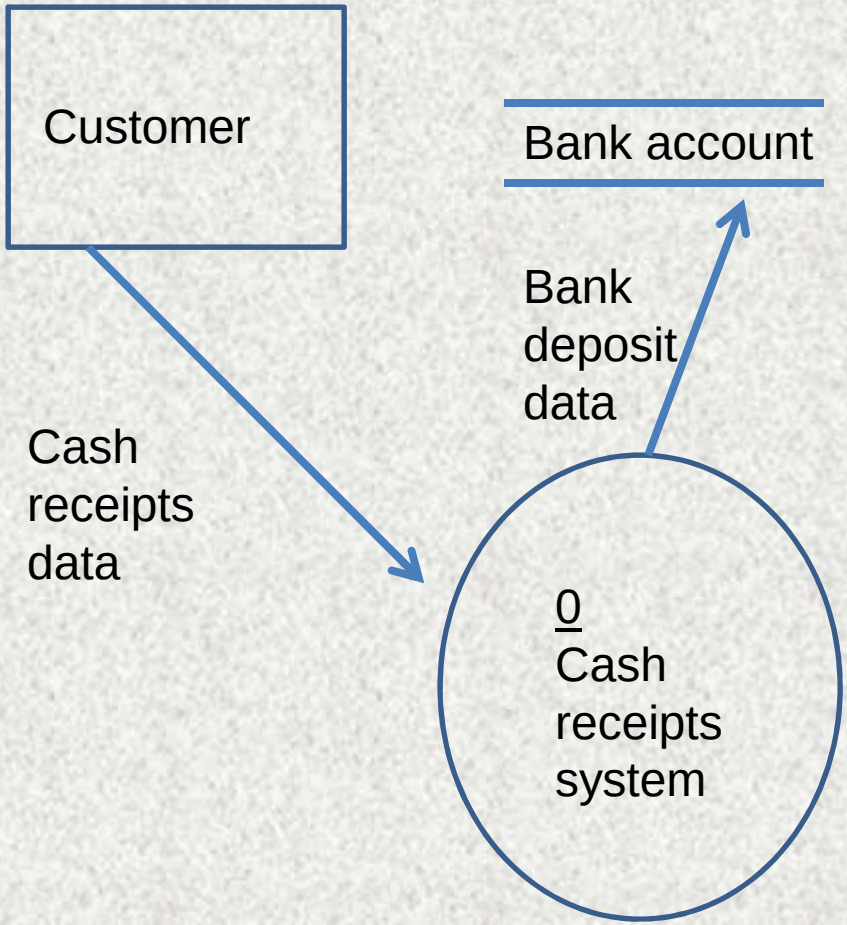
  How would you use the four symbols to depict the short sequence of events described on the right? (Hint: Look at everything from the clerk's perspective.)

A customer submits an order online. An order clerk verifies inventory availability from an electronic database.

Leveled sets of DFDs

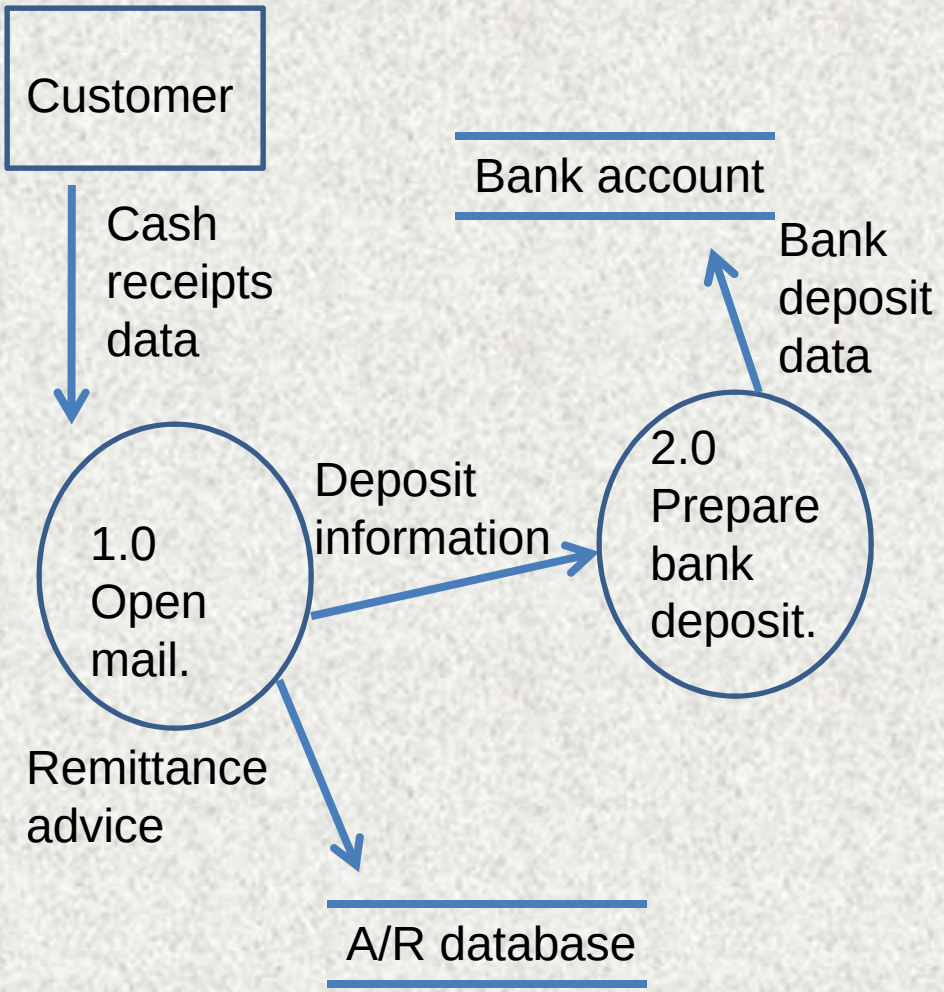
- DFDs are commonly prepared in leveled sets.
- Each level depicts more detail than the one before it.
- Levels must be **balanced**.
- Levels include:
  - Context diagram
  - Level Zero diagram
  - Level One diagrams
  - Level Two diagrams
- Further levels are possible, but not often necessary.

Leveled sets of DFDs



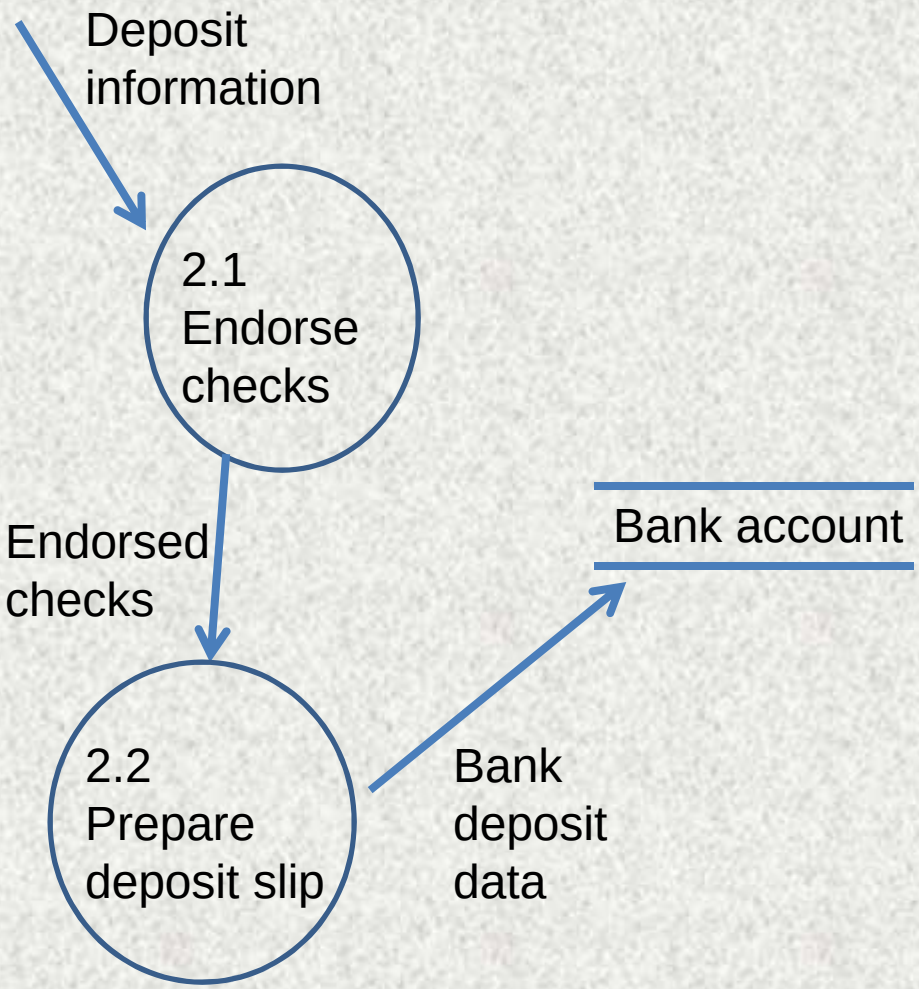
- Context diagram
  - Highest level view
  - Exactly one in every leveled set
  - Entire process depicted with a single circle
  - Shows relationships with external entities and external databases

Leveled sets of DFDs



- Level Zero
  - Exactly one in every leveled set
  - Breaks down single process depicted in context diagram
  - Must be balanced with context diagram
    - Cash receipts data
    - Bank deposit data

Leveled sets of DFDs



- Level One diagrams
  - May be many (or none) in a leveled set of DFDs
  - Provide additional detail for a single process depicted in Level Zero
    - Decomposing
    - Exploding

Leveled sets of DFDs

- When a process needs no further decomposition, it is said to be “primitive.”
- You should not have to go past Level Three for textbook problems.
- Numbering conventions
  - Level Zero: 1.0, 2.0
  - Level One: 1.1, 1.2, 1.3
  - Level Two: 1.1.1, 1.1.2

Leveled sets of DFDs

- **Lecture break 7-2**
  - Consider the DFDs presented on the previous slides.
  - Generate a narrative description of them.
  - Use the narrative to prepare a systems flowchart of the same events.

Database tables

- Data stores in leveled sets of DFDs often are “translated” into relational database tables.
- Terminology
  - Field: a “column” in a database table
  - Record: a “row” in a database table
  - Primary key: a unique identifier for each record

Database normalization

- Database tables must be normalized to:
  - Eliminate redundancy
  - Take up less electronic space
  - Make information searches efficient and effective.

Database normalization

- Normal forms
  - 1st normal form (1NF)

    Eliminate repeating groups
  - 2nd normal form (2NF)

    Eliminate redundant data
  - 3rd normal form (3NF)

    Eliminate columns not dependent on primary key
- Normal forms are additive.
- Additional normal forms exist, but will not be necessary for most AIS work.

Database normalization

Vendor	Items purchased
ABC Corp.	inventory, supplies
DEF Corp.	supplies, equipment
GHI Corp.	inventory, equipment

This table has two fields: vendor, items purchased.

It has three records: ABC Corp., DEF Corp., GHI Corp.

It is **not** in normal form.

Database normalization

Vendor	Items purchased
ABC Corp.	inventory
ABC Corp.	supplies
DEF Corp.	supplies
DEF Corp.	equipment
GHI Corp.	inventory
GHI Corp.	equipment

This table is in 1NF (eliminate repeating groups).

Data are repeated, but not in groups.

Database normalization

These tables are in 2NF.

No data are repeated in either table.

A junction table would be needed to show the relationships between "vendor" and "items purchased."

Vendor table
Vendor ID (field name)
ABC Corp
DEF Corp
GHI Corp

Items purchased table
Item name (field name)
Inventory
Supplies
Equipment

Database normalization

- To put the tables in 3NF, we must ensure that additional fields in each table help us know more about the table's primary key.
- Vendor table additional fields
  - Vendor address
  - Contact person
  - Phone number

Lecture break 7-3

What additional fields would you add to the "items purchased" table to put it in 3NF?

Classroom assessment

- This chapter has focused on data flow diagrams and their uses in accounting information systems.

- Try your hand at preparing a Level Zero DFD based on the short case on the next slide.
- Then, work with a partner to compare your work.
- Generate one Level One DFD, ensuring that it is balanced.

Classroom assessment

Certified Fraud Examiners are required to complete 20 hours of continuing professional education annually. At least ten of the hours must relate directly to fraud detection / deterrence; two hours must focus on ethics. Each month, the Association of Certified Fraud Examiners (www.acfe.com) searches its member database to determine which members need to certify CPE compliance. The Association mails a letter to those members, reminding them to log on to the web site and certify their compliance. Members must do so by the date specified in the letter. The ACFE may randomly select members to provide detailed information about the CPE units they completed. If a member is so selected and cannot provide required documentation, the ACFE may extend the deadline or revoke the certification.