An Introduction to Business Process Modeling using Data Flow Diagrams

BSAD 141
Dave Novak

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Lecture Overview

- Systems and Business processes
- Business process models
- Data Flow Diagrams (DFDs)
  - Context
  - Physical
  - Logical
  - And rules for each type of diagram
- Example

Systems and Business Processes

- **System**: Components that interact to accomplish an objective
- **Business Process**: Set of activities that accomplish a specific task
  - Processes describe how the activities that make up the core of the organization's value chain are performed and who performs them
- Visualize processes as systems and subsystems

Evaluating Business Processes

- Businesses can gain a competitive edge when they minimize costs and streamline business processes
- Each component of value chain is comprised of supporting business processes

Business Processes

- Processes receive some type of input
  - Data
  - Information
  - Raw materials
- TRANSFORM those inputs in some way (the sub-processes describe how this is done)
- Output something “new” or “different”
MIS and Business Processes

- The different activities that make up a business process often rely on IS
  - One IS may support an entire process, or individual activities within a process may have separate IS
  - This distinction is important because we are interested in tracking data flows and information requirements throughout the system

Business Process Modeling

- Business process modeling (or mapping) - The activity of creating a detailed map of a process showing inputs, sub-tasks, and activities, and outputs in a structured sequence
- Business process model - A graphic description of a process, showing the sequence of tasks/activities
  - As-Is process model
  - To-Be process model

Business Process Modeling

- As-Is process model
  - What the process currently looks like
- To-Be process model
  - What the improved process should look like

Purpose of Process Models

- Expose process detail gradually or in a controlled manner
- Encourage concision and accuracy in describing the process model
- Focus attention on Process Model Interfaces (with Internal and External Entities)
- Provide a powerful process analysis and consistent design vocabulary

Improving Business Processes

- Streamlining – Improves business process efficiencies by simplifying or eliminating unnecessary steps
- Bottleneck – Occur when resources reach full capacity and cannot handle any additional demands
- Redundancy – Occurs when a task or activity is unnecessarily repeated

Models

- Models are attempts to represent “reality”
  - “Essentially, all models are wrong, but some are useful.” George Box
  - In practice, models rarely represent “reality”
- Why in the world would you want to model something?
Different Models

- Some types of models
  - Maps (2 dimensions)
  - Music scores
  - Architectural drawings
  - Data flow diagrams
  - Mathematical models

\[
\text{Max } P = 18x_1 + 12x_2
\]
Subject to
1) \(0.16x_1 + 0.15x_2 \leq 0 \) (Cutting)
2) \(0.47x_1 + 0.28x_2 \leq 0 \) (Sewing)
3) \(0.40x_1 + 0.14x_2 \leq 0 \) (Decorating)
4) \(x_1, x_2 \geq 0 \) (Non negativity)

Worth Noting

- There can be many different types of graphical representations that are used to track various "flows" in an organization
- Each has its own set of "rules" and symbols
  - Flow chart
  - Audit flow diagram
  - Work flow diagram
  - Gantt chart
  - Etc.

Data Flow Diagram (DFD)

- A specific type of business process model
- Provides graphical representation how various sub-processes, people, and information are related
- The activities examined are either business processes or components of business processes
- DFDs show how data inputs are transformed to create higher-level products and services

Data Flow Diagram (DFD)

- Model of business processes that shows:
  - How data inputs are ultimately converted to information outputs
  - How the data flow through a system
  - Relationships between data flows and the entities (people, places, things) inside the system
  - How data ends up stored at certain locations
  - Who provides inputs to the system and who receives outputs from the system

Data Flow Diagram (DFD)

- A drawing of a system that shows how business processes, people, and information are related
- Model business processes (various activities, people, and data) that change or transform data
  - Provide context or meaning to data
  - Low-level info to high-level info
  - Make changes to existing info in some way (form, format, organize…)

Data Flow Diagram (DFD)

- 1) Descriptive
- 2) Prescriptive
- 3) Explanatory
Customer Completed Orders or Customer Completed Orders

DFD Symbols

1) External Entity
   - An object that either sends or receives flows from within the system (a.k.a. focus area) but doesn’t perform any processing activities of interest
   - a.k.a. terminator, source, or sink
2) Business Process
   - An activity, person, or thing that converts inputs into outputs
3) Data Flow
   - Data moving from one place to another without being transformed
   - a.k.a. pathway for data
4) Data Store
   - A data flow at rest
Three types of DFDs

1) Context Diagram
2) Physical DFD
3) Logical DFD

Typically, you would use ALL three together
- Each conveys unique information

Context Diagram

- The top-level, **least detailed** DFD
- Provides **overview** of system
- Contains only ONE unnumbered process
  - This represents the entire system being examined
- Includes boundaries of system, external entities that interact with the system, and data/information flows between external entities and system

Context Diagram

Example of a generic order entry system

- 1) Contains only **ONE** process bubble describing **entire** system being modeled
- 2) Name of process bubble should accurately describe the system
  - For example:
    - “Bank deposit transaction processing system” OK
    - “Bank system” **NOT OK** – doesn’t describe which banking system is being modeled
    - Customer withdrawals?
    - Customer deposits?
    - Loans?

Context Diagram

- 3) No data stores shown in CD
- 4) No flows between external entities
  - Not interested in **potential** flows between external entities – external to the system being modeled
    - Could involve a different process
- 5) Each external entity must have **at least** one flow going into OR one flow coming out of the process
  - Can have more

Context Diagram

- 6) Flow names (arrows showing data/information flows) are **NOUNS**
  - **NEVER** correct to include verbs on flows
  - **INCLUDE** the **form** of the flow
    - Need to show if flow is electronic or paper-based
    - For example:
      - “Sales Receipt (paper)’ OK
      - “Sending Sales Receipt” **NOT OK**
      - “Storing Paper Sales Receipt” **NOT OK**
      - “Paper Receipt?” ???? **VAGUE**
Context Diagram

Provides an overview of the entire process (Cash Receipts Process) and the external entities the process interacts with

Will have one or more flows coming into process and one or more flows exiting process

Logical DFD

Focus on WHAT is being transferred

Different Types of Diagrams

- Why use two “detailed” DFDs in addition to Context Diagram?
  - The different DFDs provide different “views” of the same system or process
    - Context
    - Physical
    - Logical

Balance the DFD

- Make sure you understand what a balanced DFD is and why it is important

Physical DFD Rules

- 1) External entities have one or more data flows
- 2) Labels on data flows must be nouns
  - Flows describe data moving through the system
  - What are the data that are moving?
  - Should include form these data take: paper, electronic (for physical and context more descriptive info is better)
  - DO NOT include verb descriptors in flows
Physical DFD Rules

3) No flows between external entities
   - We do not care what occurs outside the system
   - Flows between external entities (even if they seem intuitive) are not within the scope of the system / problem being modeled

4) Data stores are nouns
   - Data at rest
   - Where are data being stored? (file cabinet, electronic file – provide a name)

Physical DFD Rules

5) Process bubbles MUST have at least one flow in AND one flow out
   - In Physical DFD bubbles / processes are **internal entities**
   - Each must receive some input (a flow), change it or do something to that flow and produce a **different** output flow
   - A flow name should not be the same coming into a process and going out of a process

Physical DFD Rules

6) No flows between data stores
   - Data stores do not send / receive data
   - Processes send / receive data
   - Flows into or out of data stores start with or end with a process bubble
   - Physical DFD – the internal entities (process bubbles that are numbered) place data into a data store, pull data out of a data store, and update data stores

Physical DFD Rules

7) Requests for data (to a data store) are not shown by a request flow coming in, just a data flow coming out of the store
   - “Request” would be a verb
   - Flows are nouns that show the data on the move

Physical DFD Rules

8) In Physical DFD process bubbles are labeled with nouns
   - Internal entities (WHERE or WHO)
   - In Logical DFD process bubbles describe the activities or actions (WHAT is being done)

9) DFD must be balanced with CD

Using the EA Table

- Identify which activities (the rows in our EA table) are INFORMATION PROCESSING activities
Information Processing Activities
- Transform data (change it in some way) rather than just move it
- Pull from a data store
- Place into a data store

Non-Information Processing Activities
- These activities do not change data / objects in any way – they just move it from one point to another
  - Operational or physical activities
    - Placing items in inventory, picking inventory, packing/unpacking shipments, delivering product, making the product, etc.
  - Simple movement of data
    - Giving, sending, receiving, moving, mailing, emailing, walking a form, passing along data, etc.

Why does it matter?
- If an entity performs any type of information processing at any time, it is internal to the system
- Some internal entities may ALSO perform activities that are not information processing activities

Causeway Cash Receipts
- Examples of information processing activities
  - entering sales figures into a ledger book
  - creating, copying, completing, or editing documents/forms
  - performing checks, reviews, verifications, or classifications,
  - data entry (i.e. converting data in one format (e.g. paper form) to another format (electronic). e.g. typing, keying, scanning, printing, etc.
  - formatting, arranging/sorting, calculating, and summarizing data,
  - retrieving data from disk, storage, filing data, updating data in storage, etc.

Why does it matter?
- Entities that not involved in ANY information processing activities are external entities
- They are outside the system being modeled
- This means that they are providing inputs to the process and/or receiving outputs from the process, but are NOT part of the process itself

Causeway Cash Receipts
- What is the process being modeled?
- What are the external entities are involved in this process (what are the people are things that are outside of the process, but are providing input and/or receiving output)?
From the E/A table, what are the information flows between the external entities and the process being modeled?

Context Diagram

Physical DFD
- Start with the EXACT SAME external entities from context diagram
- Use same flows to/from those entities

Each INTERNAL ENTITY listed in the E/A table becomes a process bubble in the physical DFD
- How many processes/bubbles?
- What are these processes called?

What are the data stores?

Go through E/A table line-by-line and identify all information flows
- Insert and label flows between physical DFD bubbles and to/from physical bubbles and data stores
  - Flows involve the movement of data
  - WHO or WHAT is sending/receiving and WHAT data are they sending/receiving?
Lecture Summary

- Systems and Business processes
  - Define BP and give examples
  - Relationship to value chain
- Data Flow Diagrams (DFDs)
  - Proper notation
  - 3 types of diagrams and how they are used
  - Walk through of the Causeway Cash Receipts focusing on CONTEXT and PHYSICAL

Causeway Cash Receipts

- Physical DFD