MONASH University

# FIT2090
# BUSINESS INFORMATION SYSTEMS AND PROCESSES

## Lecture 4: Business Process Design and System Flow Charts

CLAYTON, FACULTY OF INFORMATION TECHNOLOGY
MONASH UNIVERSITY



GROUP OF EIGHT AUSTRALIA

# Learning Objectives

On completion of this lecture, you will be able to:

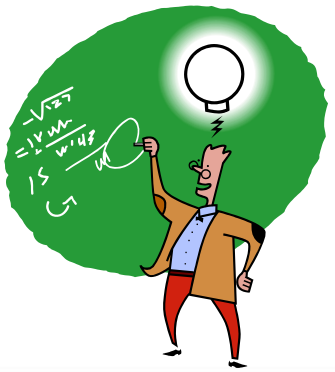
- Describe the basic tools for business process design
- Read and evaluate systems flowcharts
- Prepare systems flowcharts from a narrative.
- Apply graphical tools like flow-charts for business process design and process flow analysis

# Why should we study/understand business process design and systems flowcharts?

- Graphical tools can be used by business analysts to understand and improve the performance of business processes
- Graphical tools can be used by business analysts to measure the performance of business processes
- System flowcharts present a comprehensive picture of the management, operations, information systems, and process controls embodied in business processes.

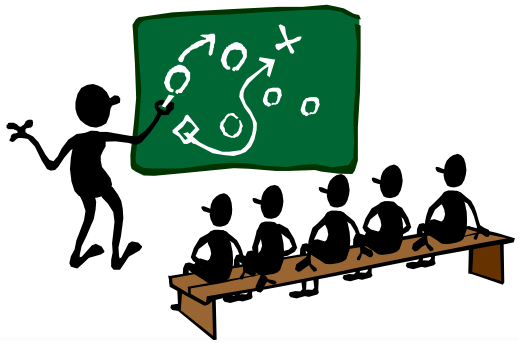
# Acquiring Process Understanding

- Subtle difference between redesigning an existing process and designing a new currently non-existing process
  - In both cases we need to understand the purpose of the process and what the customers desire from it
  - If the process exists, we need to understand what it is currently doing and why it is unsatisfactory
- Business Process Benchmarking may be a useful tool (see Lecture 3)
  - To gain process understanding
  - To inspire creative new designs



# Understanding the Existing Process

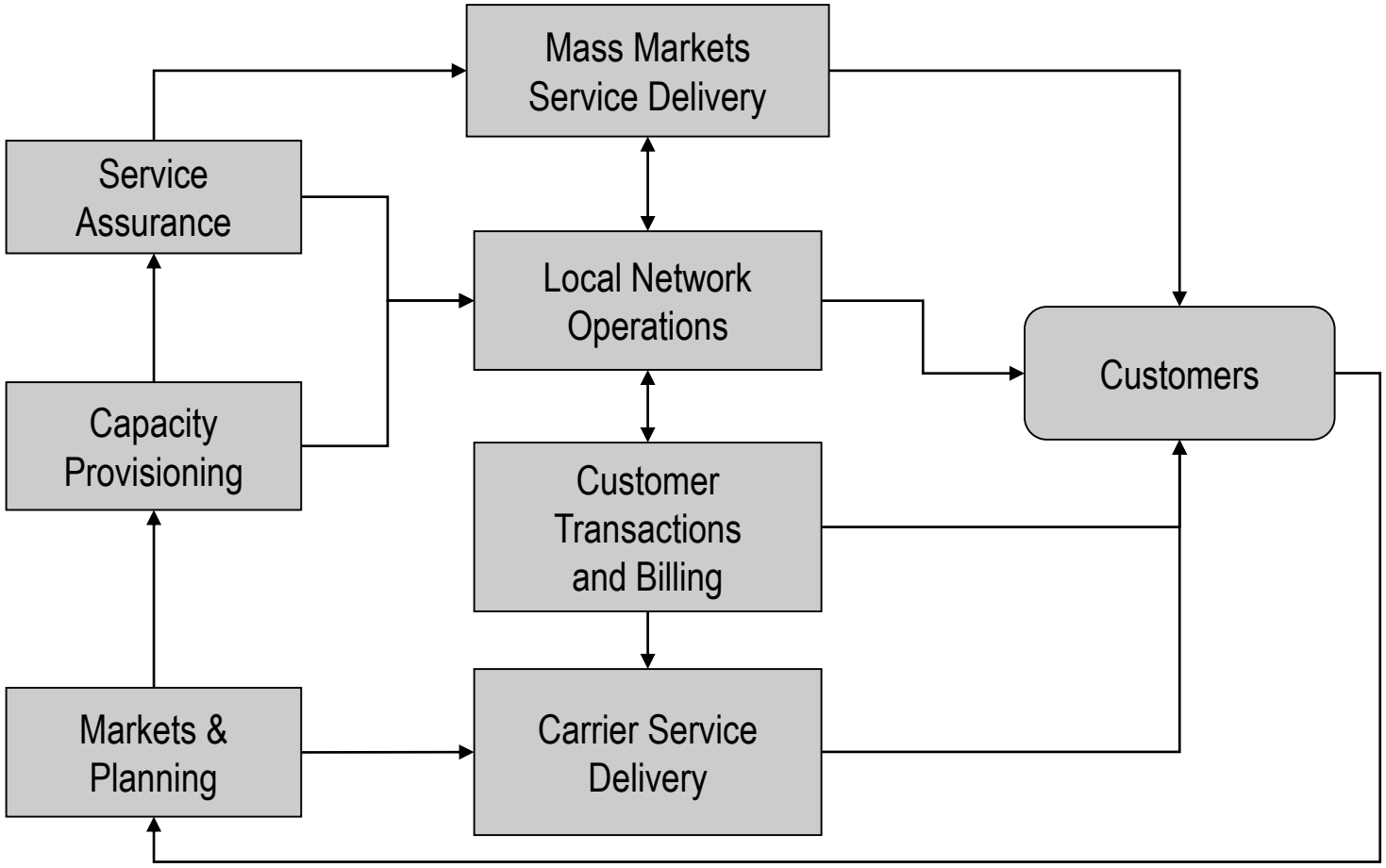
- Questions the design team needs to answer
  - What is the existing process doing?
  - How well does it perform?
  - What are the critical issues that impact the process performance?
- The redesign team must understand the process but should not overanalyze it in order to avoid “analysis paralysis”
- Essential activities for building process understanding
  1. Configure the redesign team
  2. Build a high level process map
  3. Test the initial scope and scale
  4. Identify the process owner



# Activities for Building Process Understanding (I)

1. Configure the (re)design team
2. Build a high level process map
   - Neither a low level flow chart nor an organizational chart
   - Shows interactions between sub-processes, not the flow of data
   - Focuses on customers and business outcomes

# High Level Process Map for a Telecom Company



# Activities for Building Process Understanding (II)

3. Test the initial scope and scale
   - Self examination
   - Environmental scanning/benchmarking
   - Customer visits
4. Identify the process owner
   - The person that will take responsibility and be accountable for the performance of the new process

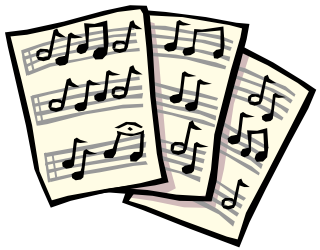
# Understanding the Customer

- The customer end is the best place to start understanding a business process
  - What are the customers' real requirements?
  - What do they say they need and what do they really need?
  - What problems do they have?
  - What do they do with the process output?

- The ultimate goal with a business process is to satisfy the customers' real needs in an efficient way!

# Basic Tools for Business Process Design

- Introduction Graphical tools
  - General Process Charts
  - Process Activity Charts
  - Process Flow Diagrams
  - Flow Charts
  - Service System Mapping
- Workflow Design Principles and Tools
  - Establish product orientation in the process
  - Eliminate buffers
  - One-at-a-time processing
  - Balancing bottleneck flows
  - Etc.



# Objectives and Tools

| Objective | Tool |
|---|---|
| Eliminate non-value-added activities and measure process improvement | General process chart |
| Relate process flow to facility layout | Process-flow diagram, and load-distance analysis |
| Understand flow of work through network of activities | Flowcharting |
| Mapping flows onto services | Service System Mapping |
| Balancing flow and capacity | Line balancing |
| Minimising process cycle times | Scheduling |

# Basic Tools for Process Design

- Deterministic tools and modelling approaches to help designers analyze processes and check proposed designs for
  - Feasibility
  - Completeness
  - Efficiency
- Quantitative tools require data regarding important process characteristics
  - Steps required to complete the process
  - Processing and activity times are key
- Tagging is an important technique for gathering process data
  - Follow a job through the process
  - Data is collected on a document (a tag) accompanying the job
  - Particularly useful for gathering data on processing and activity times

# General Process Charts

- Summarizes the current process, the redesigned process and the expected improvements
- Characterises the process by
  - The number of activities per category
  - The amount of time spent in each activity category
  - The percentage of the total processing time spent on each category
- Clearly indicates
  - Major problems with the existing process
  - How the redesigned process remedies these problems
    - Problems measured in terms of the time and the percentage of time spent on non-value adding activities

# Illustration of a General Process Chart

| **Activities** | **Current Process** | | |
|---|---|---|---|
| | ***No.*** | ***Time*** | ***%*** |
| Operations | 5 | 30 | 10 |
| Inspections | 3 | 60 | 20 |
| Transport | 10 | 120 | 40 |
| Storage | 0 | 0 | 0 |
| Delays | 7 | 90 | 30 |
| **Total** | **25** | **300** | **100** |

# Illustration of a General Process Chart

no. of value added activities for operations remain unchanged in the redesigned process

% of time the process performs operations increases from 10% to 37.5%.

| Activities | Current Process | | | Redesigned Process | | |
|---|---|---|---|---|---|---|
| | *No* | *Time* | *%* | *No.* | *Time* | *%* |
| Operations | 5 | 30 | 10 | 5 | 30 | 37.5 |
| Inspections | 3 | 60 | 20 | 1 | 20 | 25.0 |
| Transport. | 10 | 120 | 40 | 2 | 20 | 25.0 |
| Storage | 0 | 0 | 0 | 0 | 0 | 0 |
| Delays | 7 | 90 | 30 | 1 | 10 | 12.5 |
| **Total** | **25** | **300** | **100** | **9** | **80** | **100** |

# Illustration of a General Process Chart

no. of value added activities for operations remain unchanged in the redesigned process

% of time the process performs operations increases from 10% to 37.5%.

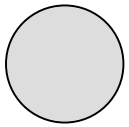
| Activities | Current Process | | | Redesigned Process | | | Difference | |
|---|---|---|---|---|---|---|---|---|
| | *No.* | *Time* | *%* | *No.* | *Time* | *%* | *No.* | *Time* |
| Operations | 5 | 30 | 10 | 5 | 30 | 37.5 | 0 | 0 |
| Inspections | 3 | 60 | 20 | 1 | 20 | 25.0 | -2 | -40 |
| Transport. | 10 | 120 | 40 | 2 | 20 | 25.0 | -8 | -100 |
| Storage | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Delays | 7 | 90 | 30 | 1 | 10 | 12.5 | -6 | -80 |
| **Total** | **25** | **300** | **100** | **9** | **80** | **100** | **-16** | **-220** |

# Process Activity Chart

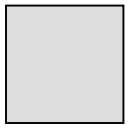
- Complements the General Process Chart
  - Provides details regarding the sequence of activities

# Illustration of a Process Activity Chart

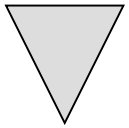
## Symbols



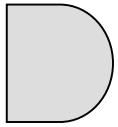
Operation



Inspection



Storage



Delay

Transportation of a physical item

**Process Activity Chart** Page: 1 of 6

Process: Adoption Date: 9/8/2016

Developed by: Current Process [X] Proposed Process [ ]

| No. | Description | Time | Value code (V/N/C) | Symbol |
|---|---|---|---|---|
| 1 | Find where to go | 2-10 | N | |
| 2 | Walk through | 10-45 | V | |
| 3 | What's next? | 1-5 | N | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

For each activity, fill in the required information. Also, connect the symbols to show the flow through the process.
The value code indicates whether the activity adds value (V), does not add value (N), or controls (C).

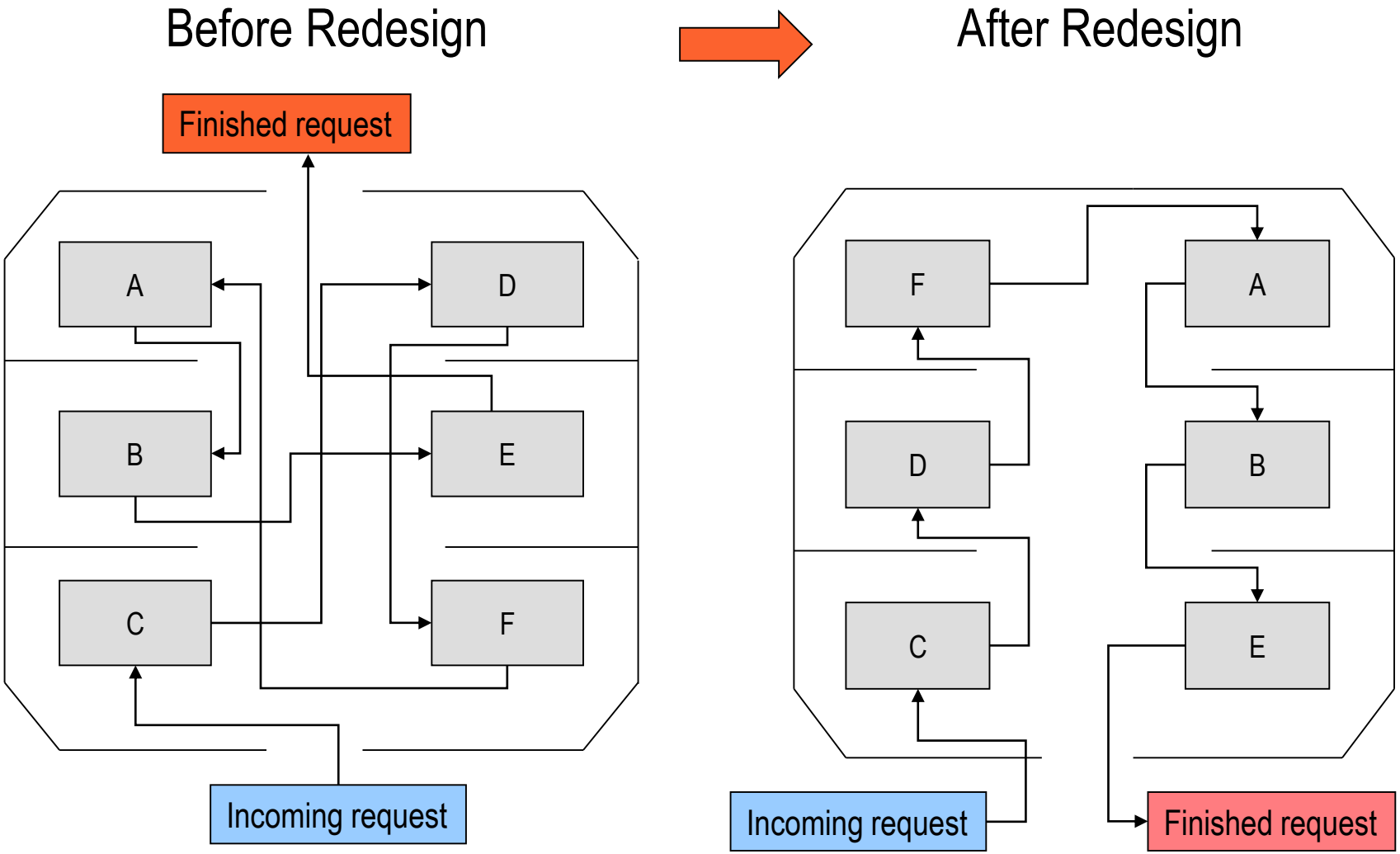
# Process Activity Chart

- Disadvantages
  - Only considers average activity times
  - If the process includes several variants with different paths (i.e. multiple paths through the process) each variant needs its own activity chart
  - Cannot depict parallel activities

# Process Flow Diagrams (I)

- Provide a picture of the spatial relationships between activities
  - Typical application is for production floor layout problems.
- The diagram is used for measuring process performance in units of time and distance
  - Including both horizontal and vertical movements.
  - Assumes that moving items requires a time proportional to the distance.
- Can be used in conjunction with Process Activity Charts
  - By labelling areas in the process flow diagram and by adding a column to the activity chart, indicating for each activity which area it belongs to.
  - Alternatively, the flow diagram includes the activity numbers in the activity chart.

# Illustration of a Process Flow Diagram



# Process Flow Diagrams (II)

- Analysis geared towards reducing excessive and unnecessary transportation and movements of items/jobs
  - Long distances
  - Crisscrossing paths
  - Repeated movements between the same activities
  - Other illogical flows
- Can be used as a basis for computing Load Distance (LD) scores
  - Useful for quantitatively comparing alternative designs/layouts with regards to flow rates and distances

# Load Distance Analysis

- LD(i,j) = LD score between work stations i and j

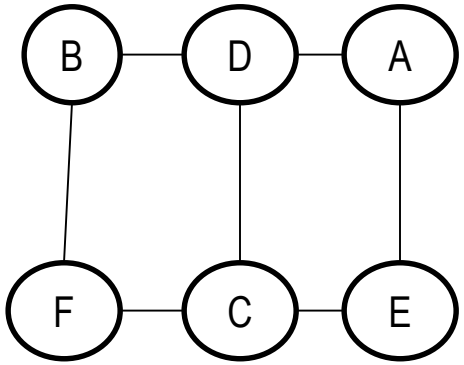
  LD(i,j) = Load(i,j) X Distance(i,j)

- The LD score measures the attraction between two work stations (activities)
  - The larger the traffic volume the higher the score and the higher the incentive to keep the work stations together
- The goal is to find a design that minimizes the total LD score (the sum of individual scores between work stations)

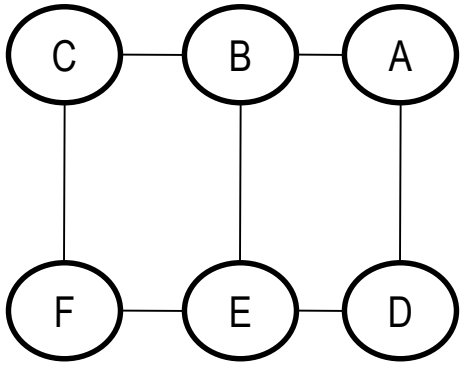
- The Load Matrix summarizes the load (flow rate = # of jobs) that needs to be shipped between each pair of work stations

# A Sample Load Matrix

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A | | 20 | | 20 | | 80 |
| B | | | 10 | | 75 | |
| C | | | | 15 | | 90 |
| D | | | | | 70 | |



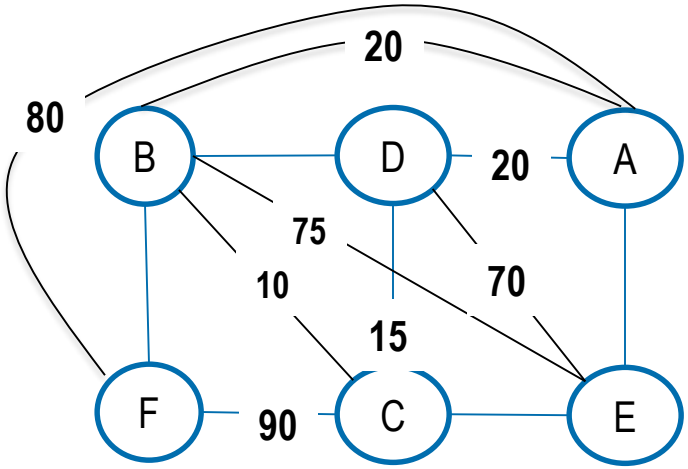

Current Design

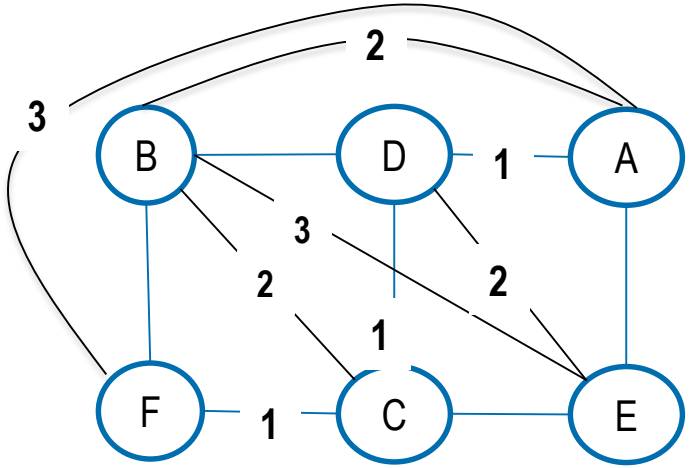



Proposed Design

# A Sample Load Matrix

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| A | | 20 | | 20 | | 80 |
| B | | | 10 | | 75 | |
| C | | | | 15 | | 90 |
| D | | | | | 70 | |



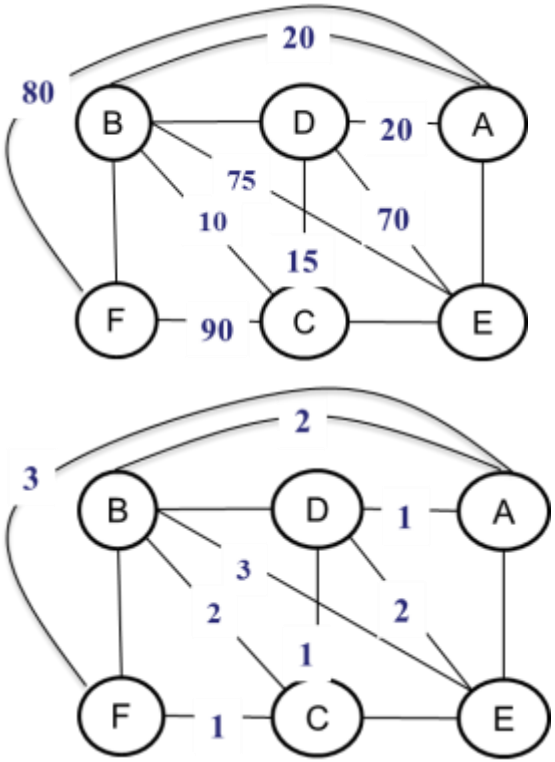




Current Design

# Load Distance Calculation

## Current Design

| Centre | Load | Distance | LD Score |
|---|---|---|---|
| (A,B) | 20 | 2 | 40 |
| (A,D) | 20 | 1 | 20 |
| (A,F) | 80 | 3 | 240 |
| (B,C) | 10 | 2 | 20 |
| (B,E) | 75 | 3 | 225 |
| (C,D) | 15 | 1 | 15 |
| (C,F) | 90 | 1 | 90 |
| (D,E) | 70 | 2 | 140 |
| | | TOTAL | 790 |



# Load Distance calculations for the two designs

| | | Current Design | | New Design | |
|---|---|---|---|---|---|
| **Centre** | **Load** | **Distance** | **LD Score** | **Distance** | **LD Score** |
| (A,B) | 20 | 2 | 40 | 1 | 20 |
| (A,D) | 20 | 1 | 20 | 1 | 20 |
| (A,F) | 80 | 3 | 240 | 3 | 240 |
| (B,C) | 10 | 2 | 20 | 1 | 10 |
| (B,E) | 75 | 3 | 225 | 1 | 75 |
| (C,D) | 15 | 1 | 15 | 3 | 45 |
| (C,F) | 90 | 1 | 90 | 1 | 90 |
| (D,E) | 70 | 2 | 140 | 1 | 70 |
| | | TOTAL | 790 | | 570 |

# Types of Flowcharts

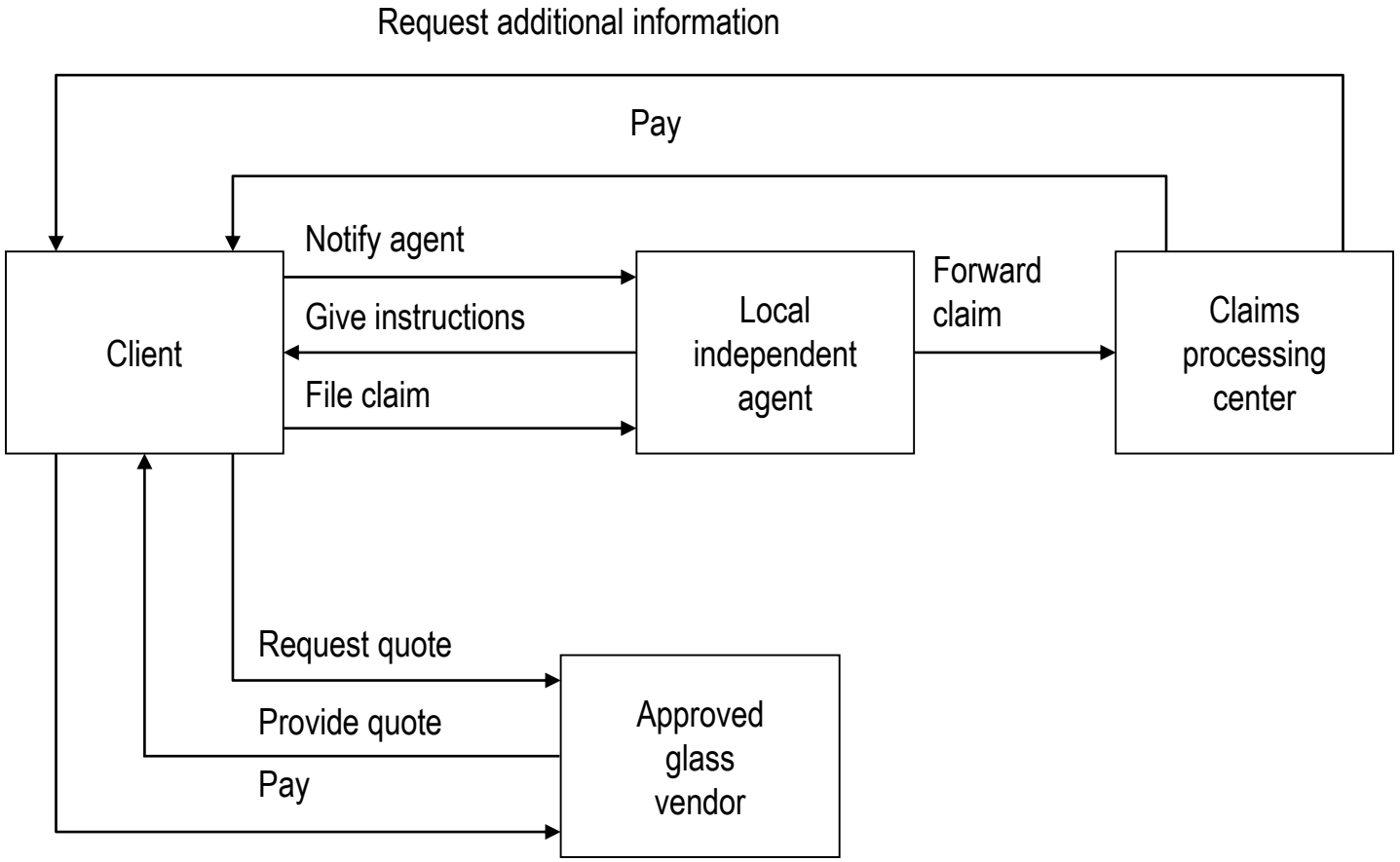
- Document:
  - Illustrates the flow of documents through an organisation
  - Useful for analysing internal control procedures.
- System:
  - Logical representation of system inputs, processes and outputs
  - Useful in systems analysis and design.
- Program:
  - Represent the logical sequence of program logic.

# Example – Claims Handling in a Large Insurance Company

- Pilot project – claims handling for replacement of automobile glass
- Springboard for later, more ambitious redesign efforts
- Set up procedure
  1. The CEO appoints an executive sponsor to lead the project
  2. Team members are handpicked by the CEO and the sponsor
  3. The team creates a flowchart of the existing process
- Under the existing process the client may have to wait 1-2 weeks before being able to replace the damaged auto glass

$\Rightarrow$ Goal – A radical overhaul and improvement of the process to shorten the client waiting time

# Flowchart of the existing claims process

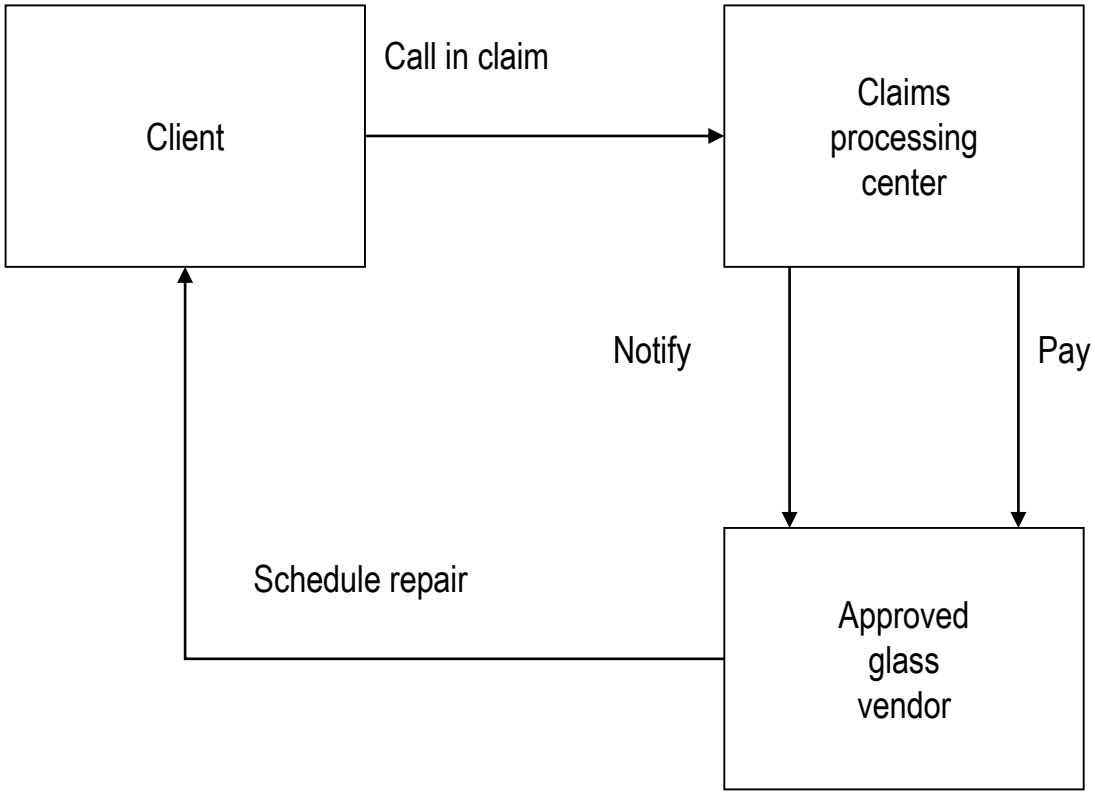


# Explanation of existing claims process

1. Client notifies a local agent that she wishes to file a claim. She is given a claims form and is told to obtain a cost estimate from a local glass vendor.
2. When the claims form is completed the local agent verifies the information and forwards the claim to a regional processing center.
3. The processing center logs the date and time of the claim's arrival. The data is entered into a computer-based system (for record keeping only) by a clerk. The claim is then placed in a hard copy file and passed on to a claims representative.
4. a) If the claims representative is satisfied with the claim it is passed along to several others in the processing chain and eventually a check is issued and sent to the client.

   b) If there are problems with the claim the representative mails it back to the client for necessary corrections.
5. When the client receives the check she can go to the local glass vendor and replace the glass.

# New Design Recommended by the Team



# Procedural changes to the new process

- The Claims representative is given final authority to approve the claim.
- Long term relationships with a limited number of glass vendors enables the insurance company to leverage its purchase power to pre-negotiate low prices.
  - $\Rightarrow$ Clients no longer have to collect estimates.
  - $\Rightarrow$ Vendors are certified for quality, price, reliability, etc.
- The Client now contacts the claims representative directly instead of going via a local agent.

# Structural changes to the new process

- A new 24 hour hotline enables the client to speak directly to a claims representative at the regional processing center.
- The claims representative gathers data over the phone, enters the data into the computer and resolves any issues on the spot. He tells the client to expect a phone call from a certain glass vendor to arrange the replacement.
- The claims information is immediately available for accounting via a LAN system and they can start processing the check and send it to the vendor.

# Benefits with the new redesigned process

- The client can have the glass replaced within 24 hours
  - As opposed to 10 days
- The client has less work to do
  - Only one phone call, no need for a cost estimate
- Problems are handled immediately when the claim is filed
- Problems with lost or mishandled claims virtually disappear
- Fewer people are involved in the process ⇒ lower op. costs
- Long term relationships with glass vendors
  - ⇒ Savings of 30-40% on paid claims due to special discounts
  - ⇒ Consolidated monthly payments ⇒ lower handling costs
  - ⇒ More consistent and reliable service
- Claims representative feels ownership of the process
  - ⇒ Does a better job

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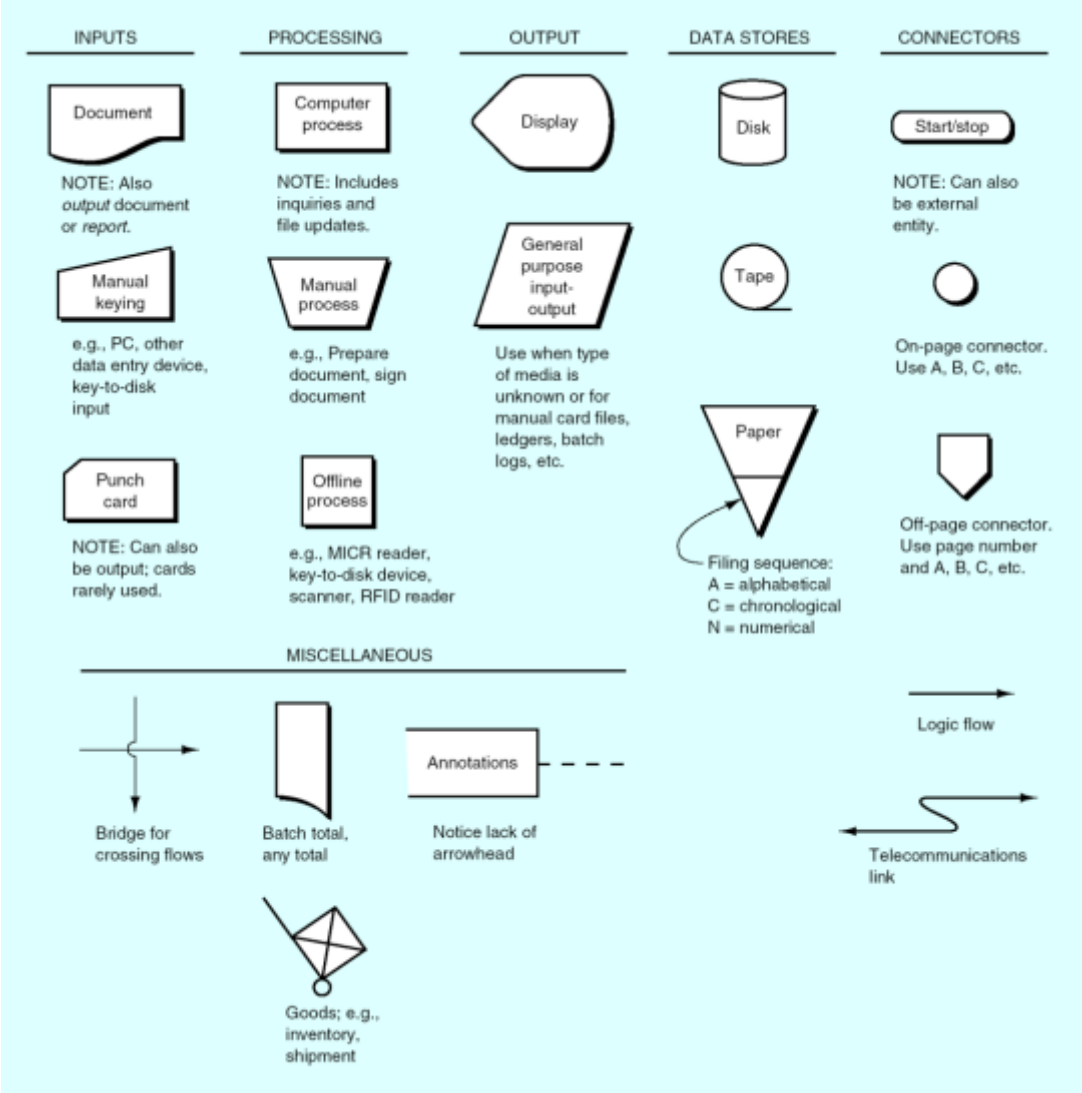
# Systems Flowcharts

- Systems flowchart: a graphical representation of a business process, including information processes (inputs, data processing, data storage, and outputs), as well as the related operations processes (people, equipment, organization, and work activities).
- Also known as “process flowcharts” and “business process flowcharts.”
- Depicts the sequence of activities performed as the business events flow through the process

**Essential Reading: Chapter 4 of Gelinas, Page 108 - 132**

# Standard Flowcharting Symbols

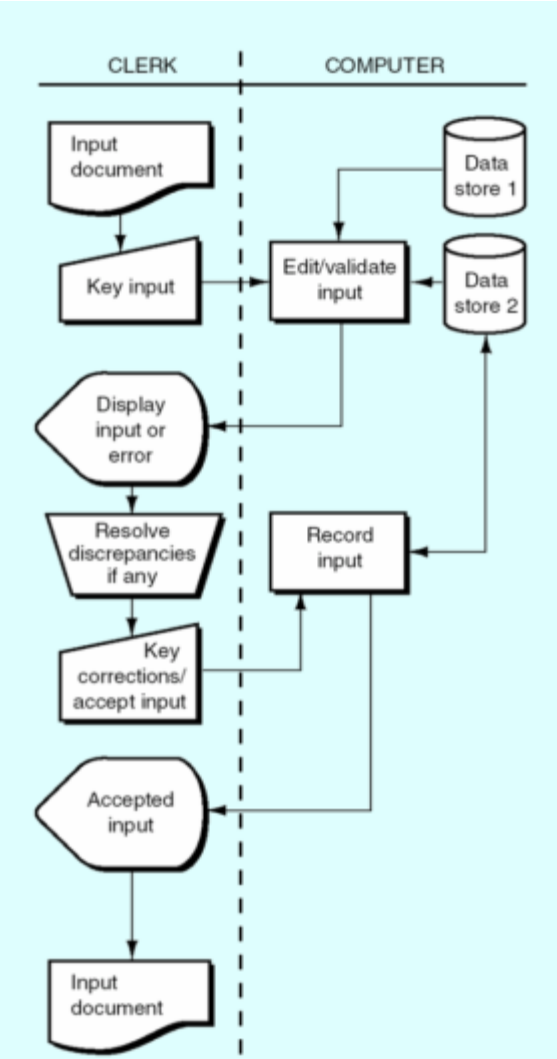


# Common System Flowcharting Routines

- The following slides show several common ways of showing processing using system flowcharting.
- Note the way the columns are set up to communicate the flow of activities between processing entities.

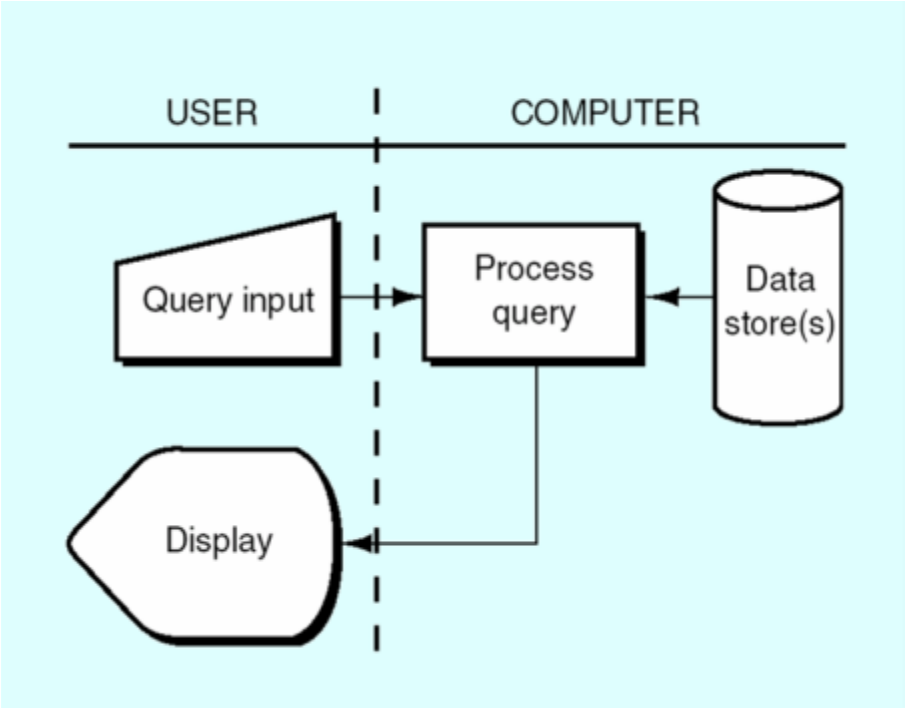
# Common System Flowcharting Routines (cont'd)

Enter document into computer via keyboard, edit input, record input.



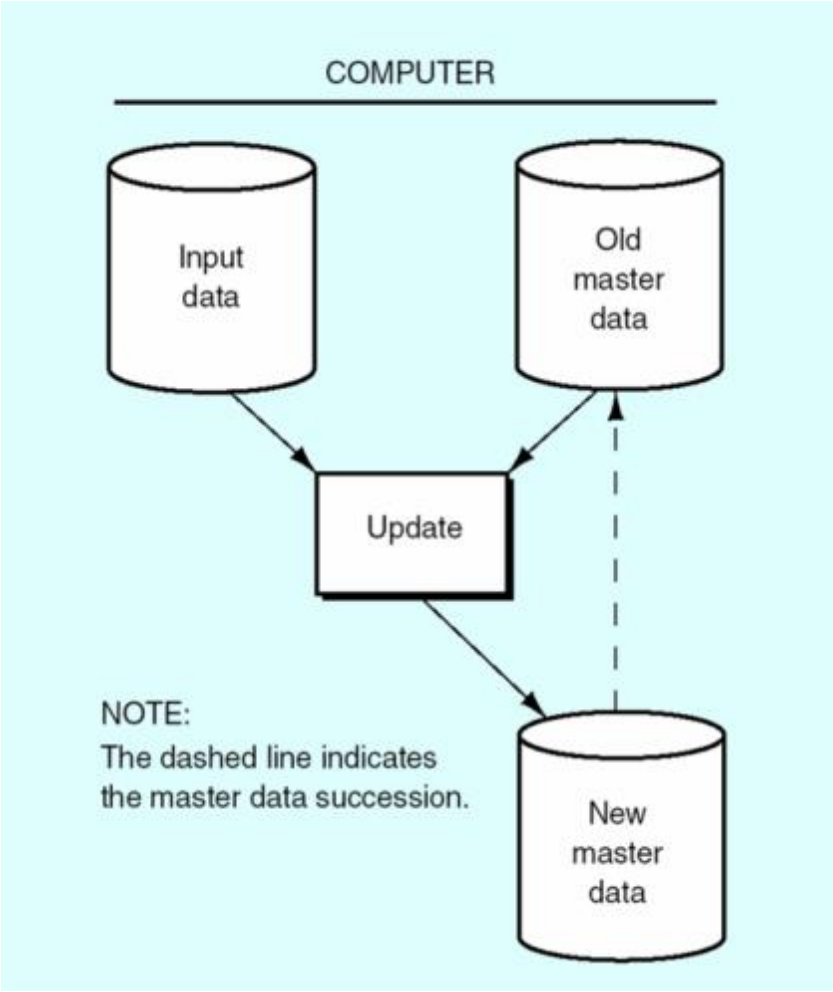
# Common System Flowcharting Routines (cont'd)

User queries the computer



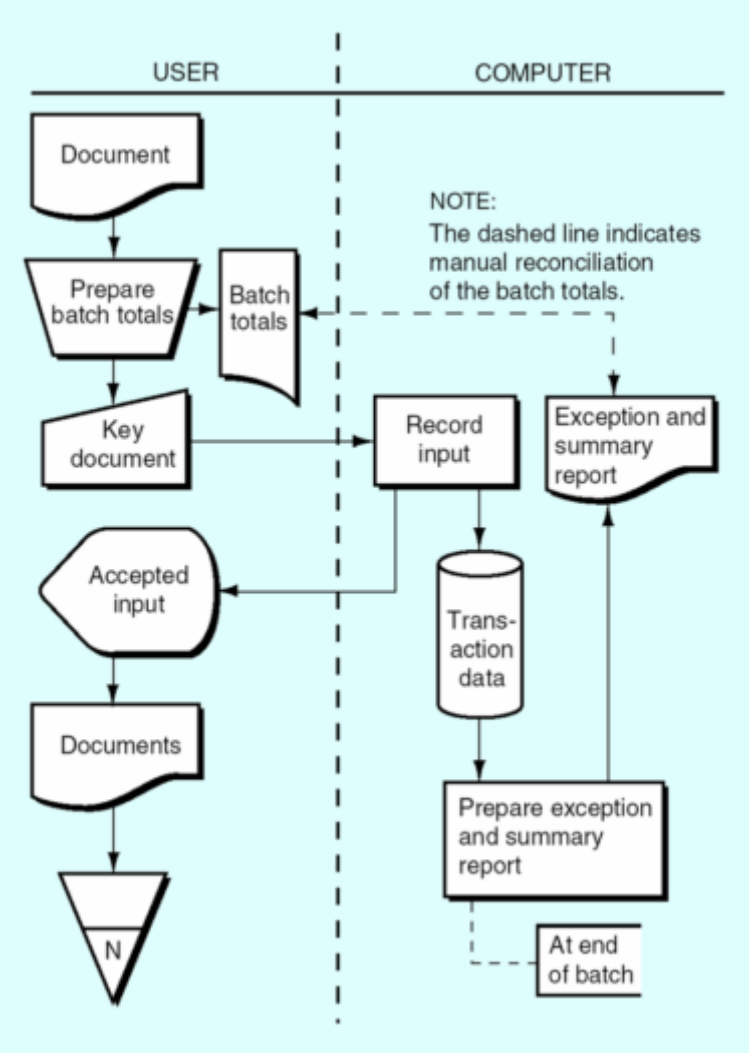
# Common System Flowcharting Routines (cont'd)

Update sequential data store



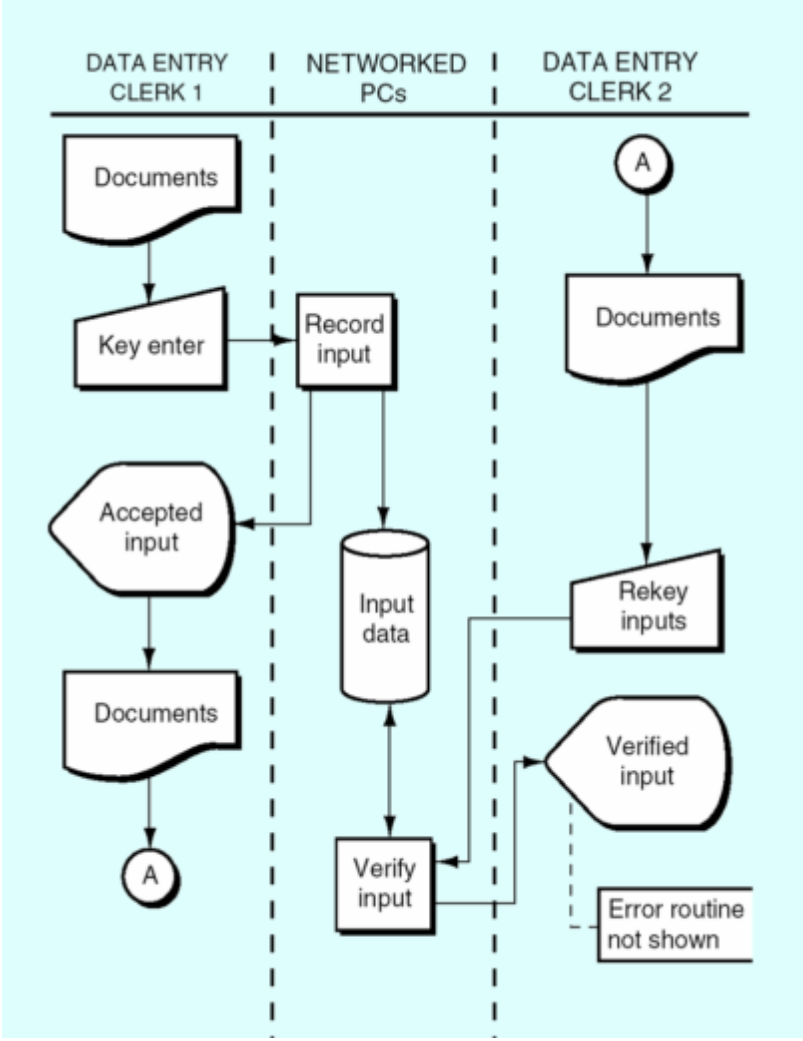
# Common System Flowcharting Routines (cont'd)

Preparation and later manual reconciliation of control totals.



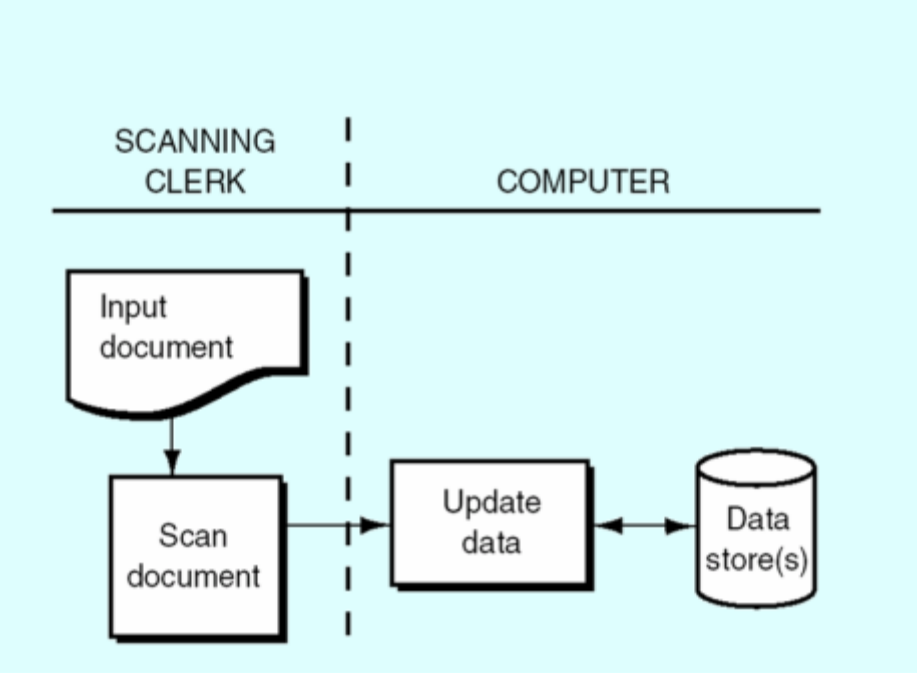
# Common System Flowcharting Routines (cont'd)

Key and verify inputs



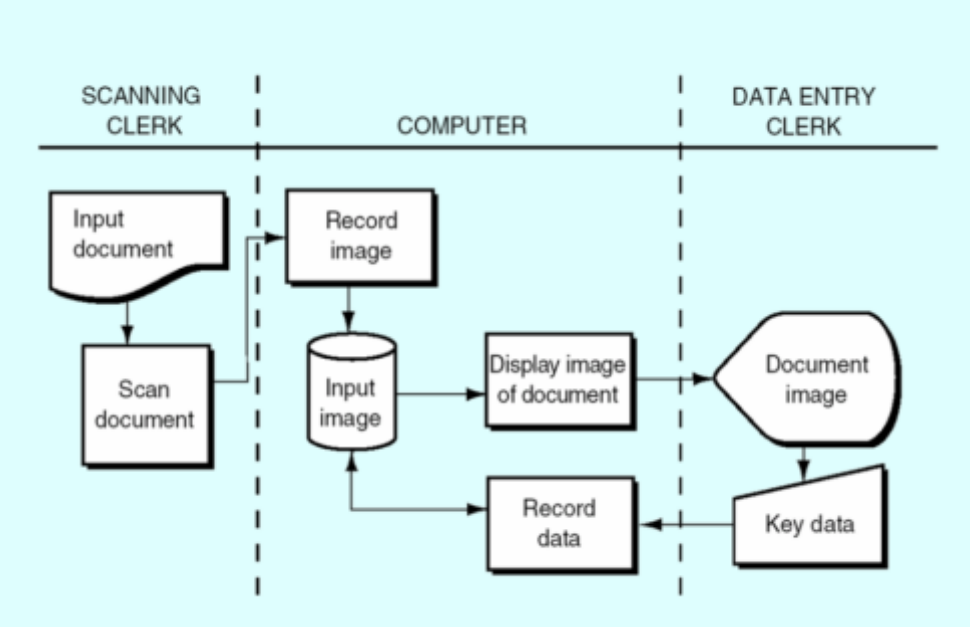
# Common System Flowcharting Routines (cont'd)

Enter document into computer using a scanner



# Common System Flowcharting Routines (cont'd)

Enter document into computer using scanner and manual keying



# Preparing Systems Flowcharts

1. Divide the flowchart into columns; one column for each internal entity and one for each external entity. Label each column.
2. Flowchart columns should be laid out so that the flowchart activities flow from left to right. But, minimize crossed lines and connectors.
3. Flowchart logic should flow from top to bottom and from left to right. For clarity, put arrows on all flow lines.

# Preparing Systems Flowcharts (cont'd)

4. Keep the flowchart on one page, if possible. With multiple pages use off-page connectors. 
5. Within each column, there must be at least one manual process, keying operation, or data store between documents. Do not directly connect documents within the same column.
6. When crossing organizational lines (one column to another), show a document at both ends of the flow line unless the connection is so short that the intent is unambiguous.

# Preparing Systems Flowcharts (cont'd)

7. Documents or reports printed in a computer facility should be shown in that facility's column first. You can then show the document or report going to the destination unit.
8. Documents or reports printed by a centralized computer facility on equipment located in another organizational unit should not be shown within the computer facility.

# Preparing Systems Flowcharts (cont'd)

9. Processing within an organizational unit on devices such as a PC, laptop, or computerized cash register should be shown within the unit or as a separate column next to that unit, but *not* in the central computer facility column.
10. Sequential processing steps (computerized or manual) with no delay between them (and resulting from the same input) can be shown as one process or as a sequence of processes.

# Preparing Systems Flowcharts (cont'd)

11. The only way to get data into or out of a computer data storage unit is through a computer processing rectangle or offline process square.
12. Manual process is not needed to show the sending of a document; sending should be apparent from the movement of the document.
13. Do not use manual processes to file documents; show documents going into files.

# Revisiting Webster, Inc Example

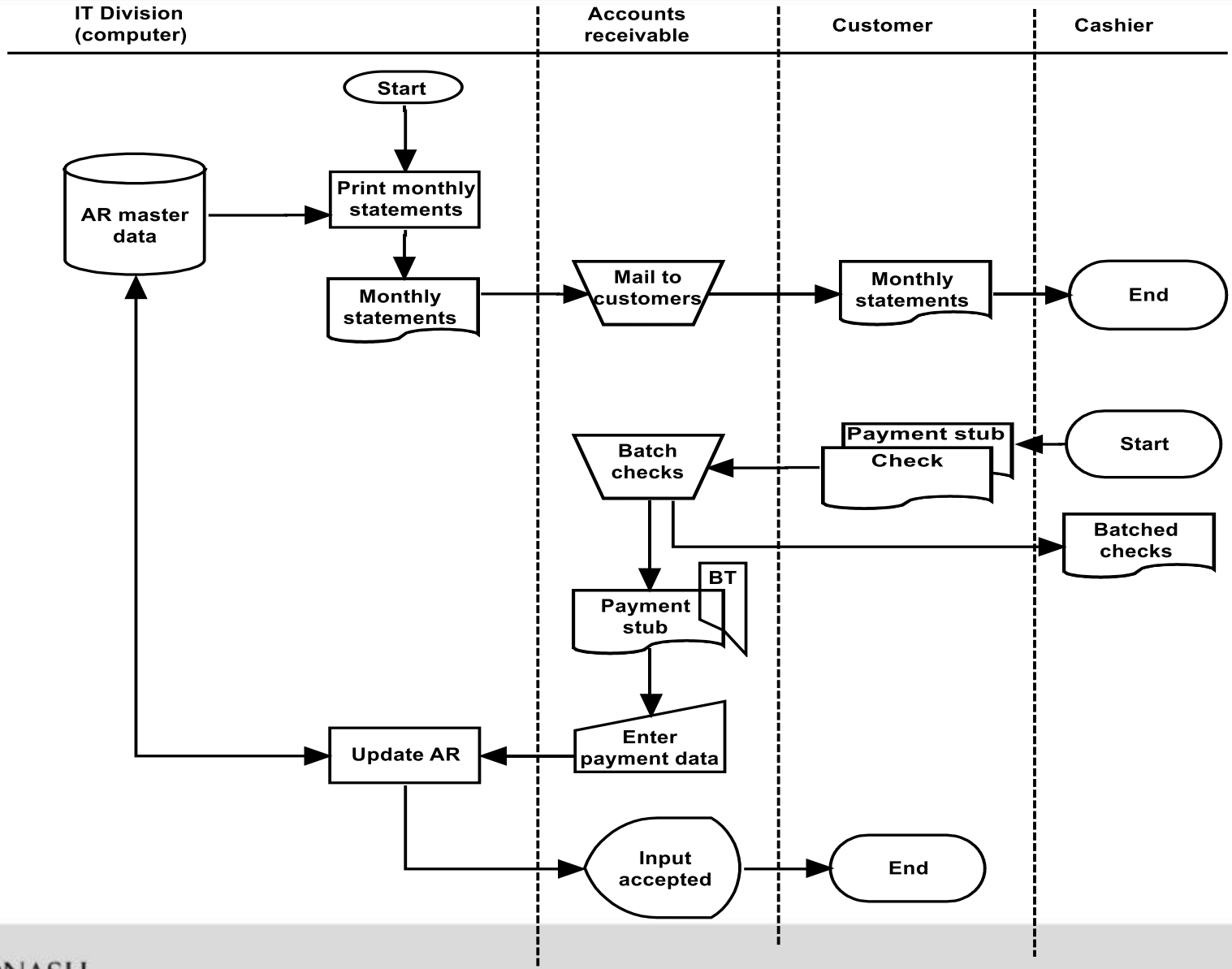
Webster, Inc. sells plumbing supplies to contractors in the southern region of the United States. Each month, the IT division at Webster prints monthly statements and sends them to the accounts receivable (AR) department, where a clerk mails them to the customers.

Webster's customers mail their payments back to Webster, where a clerk in AR batches the cheques and sends them to the cashier. The AR clerk then uses the payment stub to enter the payments into the computer, where the AR master data is updated to record the payment.

# Webster - Table of Entities and Activities

| Entities | Para | Activities |
|---|---|---|
| IT division | 1 | 1. Print statements. |
| | 1 | 2. Send statements to accounts receivable department. |
| Accounts receivable | 1 | 3. Mail statements to customers. |
| Customers | 2 | 4. Mail payments to Webster. |
| Accounts receivable | 2 | 5. Batch checks. |
| | 2 | 6. Send checks to cashier. |
| | 2 | 7. Enter payments. |
| Cashier | 2 | |
| Computer (IT division) | 2 | 8. Update accounts receivable master data. |

# Webster Systems Flowchart



# Summary

- Basic tools for business process design
- Process charts and process improvement
- Systems flowcharts

References


- Ulric J. Gelinas, Richard B. Dull, and Patrick R. Wheeler, *Accounting Information Systems 9e*, South-Western Cengage Learning, 2012: Chapter 4
- Marshall B. Romney, Paul J. Steinbart, Joseph M. Mula, Ray McNamara and Trevor Tonkin. Accounting Information Systems (First edition), Pearson Australia, 2013: Chapter 3
- Laguna & Marklund, Business Process Modelling, Simulation and Design, Second Edition, Chapter 1