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Database Systems
Lecture 3

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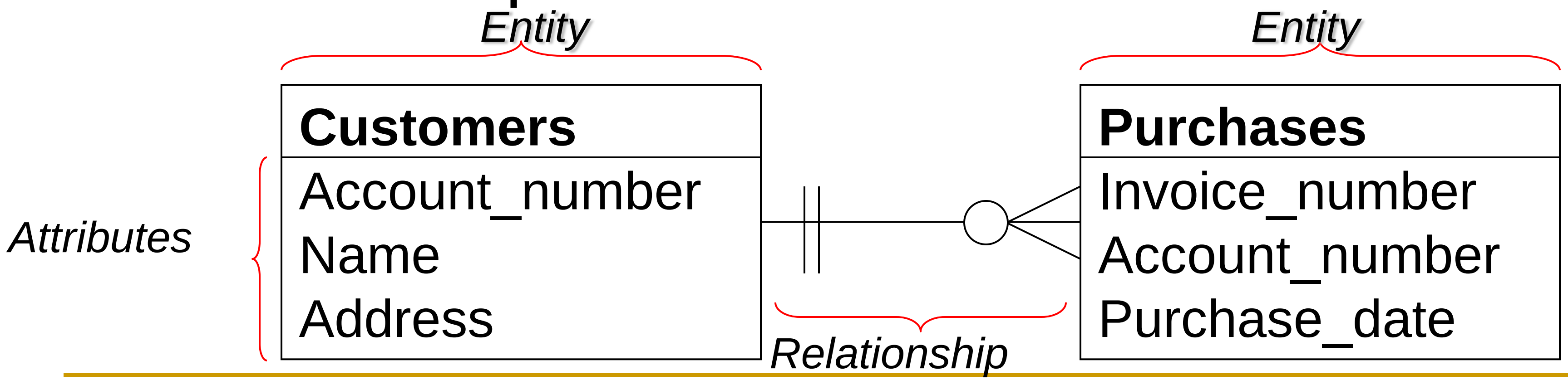
Lecture 3

Data Flow Diagrams, Advantages of the Database Approach

Organizing Data

- Entity - distinct object (i.e., person, place, thing, concept or event)
- Attribute - describes some aspect of the entity (object)
  - Property of the entity
- Relationship - association between entities



Entity

Entity

Customers

Account_number

Name

Address

Purchases

Invoice_number

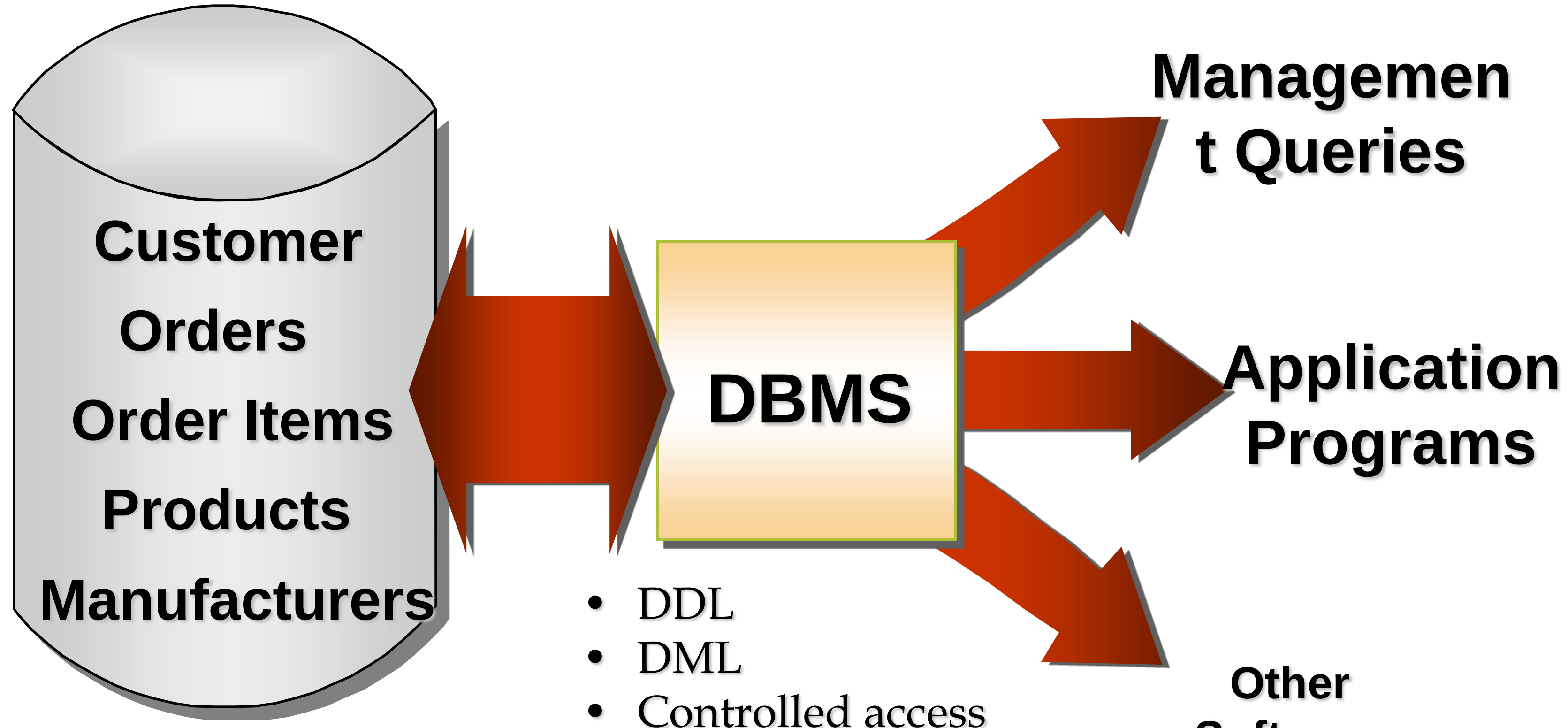
Account_number

Purchase_date

Attributes

Relationship

Stereos to Go Database



Customer

Orders

Order Items

Products

Manufacturers

DBMS

Managemen t Queries

Application Programs

Other Software

- DDL
- DML
- Controlled access

Central Repository (Organizational resource)

Single Access Point

Multitude of Applications

Components of a Database Environment

- Hardware
- Software: DBMS, application program and query software
- Data: Organized in a schema, partitioned into subschemas
- Procedures: Govern the design, access and use of the database
- People: Administrators (DA, DBA), designers (logical and physical), application developers and users (novice and *high-powered*)

Advantages of the Database Approach

- Control of data redundancy
- Data consistency
- Greater informational gain, *more information from the same amount of data*
- Sharing data, *organizational resource (i.e., shared resource)*
- Improved data integrity, *validity and consistency*
- Improved access and security
- Enforcement of standards

Advantages of the Database Approach

- Economy of scale, *centralization and consolidation*
- Balancing of conflicting requirements, *DBA oversees data and data definitions*
- Improved data accessibility and responsiveness
- Increased productivity
- Improved maintenance through data independence
- Increased concurrency
- Improved backup and recovery services

Disadvantages of the Database Approach

- Complexity
- Size

Dedication of resources including technology and people infrastructures

- Cost of DBMS
- Additional hardware costs
- Cost of conversion
- Performance
- Higher impact of failure
- In a production environment, processing can be *slow*

Creating Data Flow Diagrams

Steps:

1. Create a list of activities
2. Construct Context Level DFD
   (identifies external entities and processes)
3. Construct Level 0 DFD
   (identifies manageable sub process)
4. Construct Level 1- n DFD
   (identifies actual data flows and data stores)
5. Check against rules of DFD

DFD Naming Guidelines

- External Entity → Noun
- Data Flow → Names of data
- Process → verb phrase
  - a system name
  - a subsystem name
- Data Store → Noun

Creating Data Flow Diagrams

Lemonade Stand Example

Creating Data Flow Diagrams

Example

The operations of a simple lemonade stand will be used to demonstrate the creation of dataflow diagrams.

Steps:

1. Create a list of activities
   - Old way: no Use-Case Diagram
   - New way: use Use-Case Diagram
2. Construct Context Level DFD
   (identifies sources and sink)
3. Construct Level 0 DFD
   (identifies manageable sub processes)
4. Construct Level 1- n DFD
   (identifies actual data flows and data stores)

Creating Data Flow Diagrams

Example

Think through the activities that take place at a lemonade stand.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment
Produce Product
Store Product

Creating Data Flow Diagrams

Example

Also think of the additional activities needed to support the basic activities.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment
Produce Product
Store Product
Order Raw Materials
Pay for Raw Materials
Pay for Labor

Creating Data Flow Diagrams

Example

Group these activities in some logical fashion, possibly functional areas.

1. Create a list of activities

Customer Order
Serve Product
Collect Payment

Produce Product
Store Product

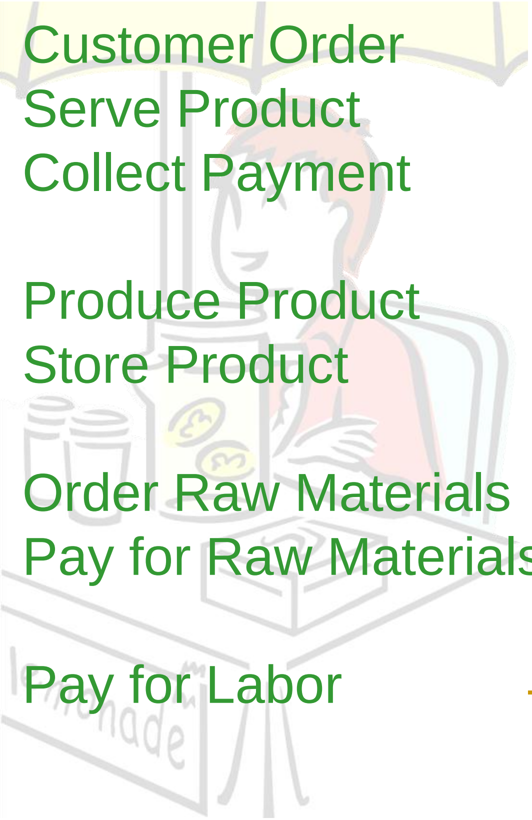
Order Raw Materials
Pay for Raw Materials

Pay for Labor

Creating Data Flow Diagrams

Example

Create a context level diagram identifying the sources and sinks (users).



Customer Order
Serve Product
Collect Payment

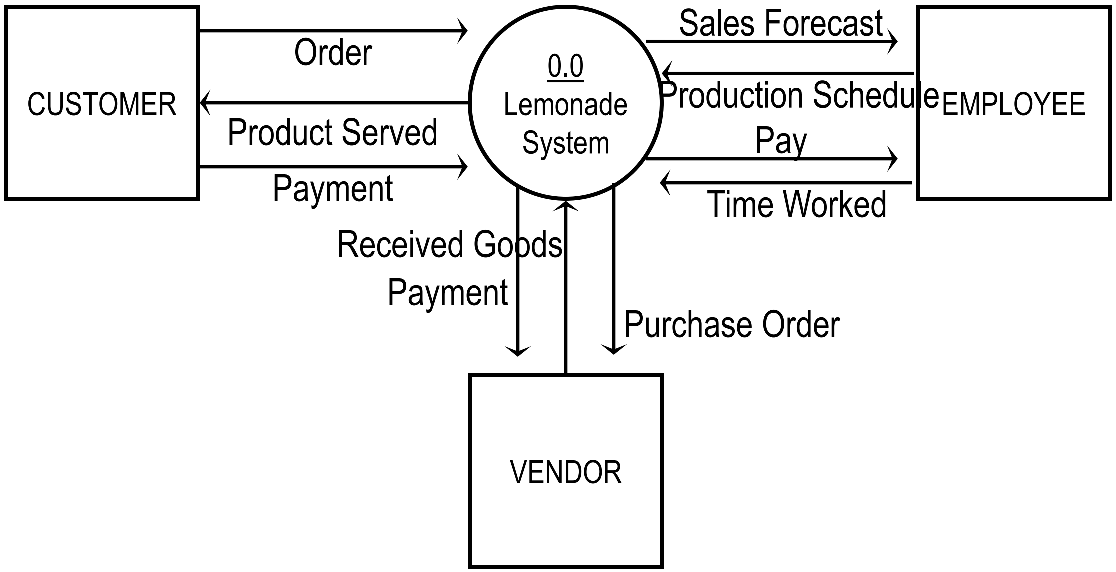
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

2. Construct Context Level DFD (identifies sources and sink)

Context Level DFD



CUSTOMER

Order

Product Served

Payment

0.0
Lemonade System

Sales Forecast

Production Schedule

Pay

Time Worked

EMPLOYEE

Received Goods

Payment

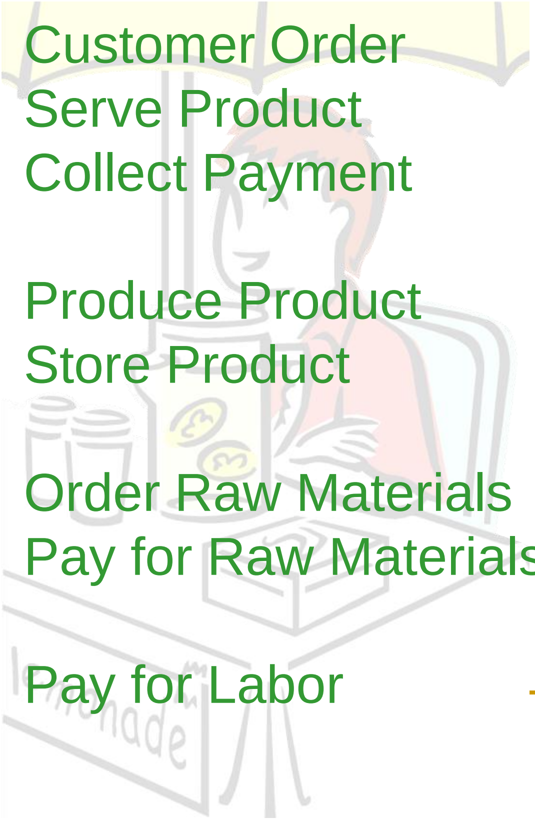
Purchase Order

VENDOR

Creating Data Flow Diagrams

Example

Create a level 0 diagram identifying the logical subsystems that may exist.



Customer Order
Serve Product
Collect Payment

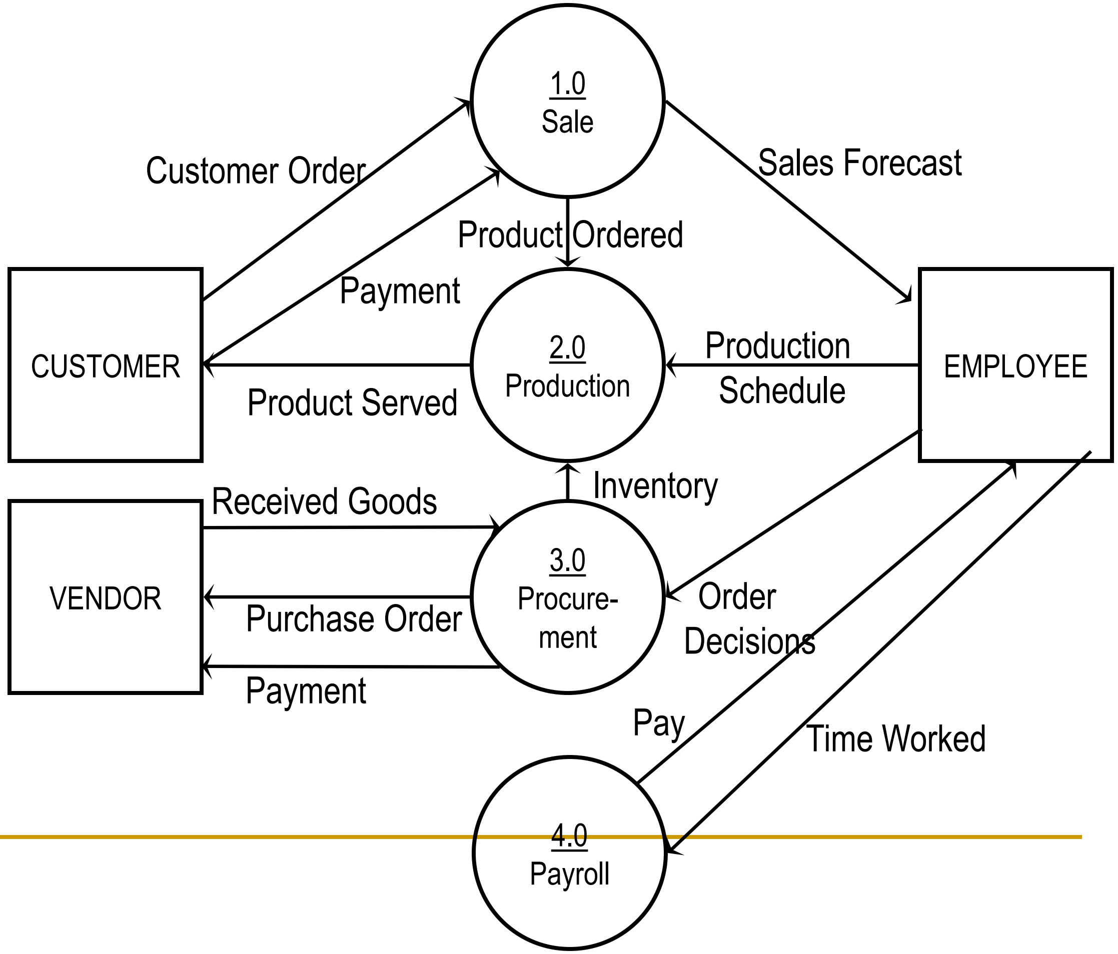
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

3. Construct Level 0 DFD (identifies manageable sub processes)

Level 0 DFD



Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.

Customer Order
Serve Product
Collect Payment

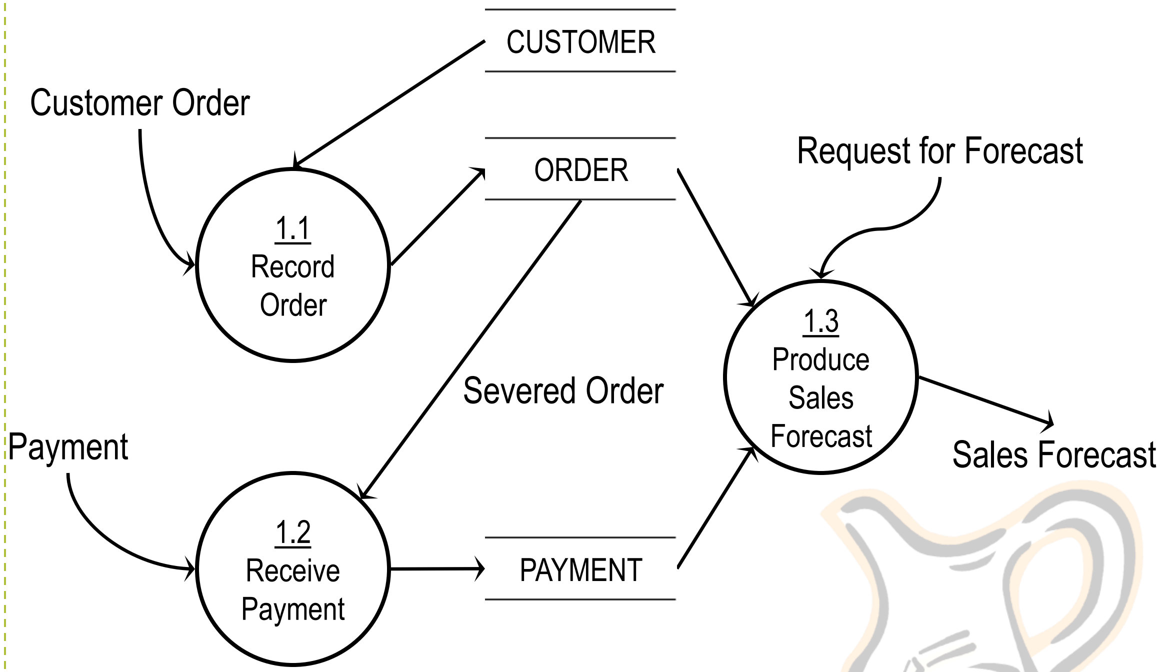
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1- n DFD
(identifies actual data flows and data stores)

Level 1 DFD



CUSTOMER

Customer Order

ORDER

Request for Forecast

1.1
Record
Order

1.3
Produce
Sales
Forecast

Severed Order

Payment

Sales Forecast

1.2
Receive
Payment

PAYMENT

Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.

Customer Order
Serve Product
Collect Payment

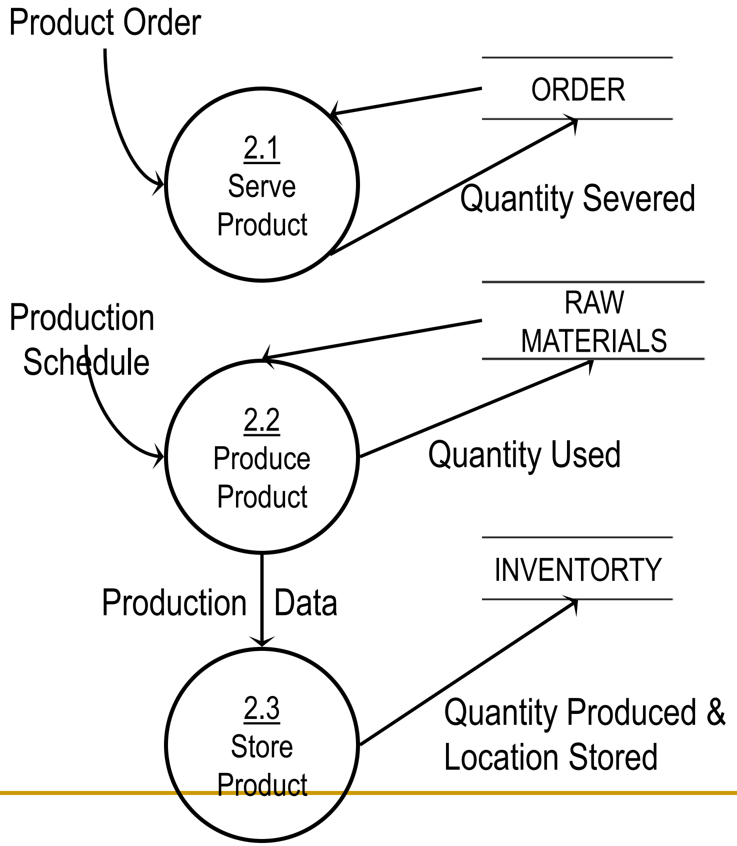
Produce Product
Store Product

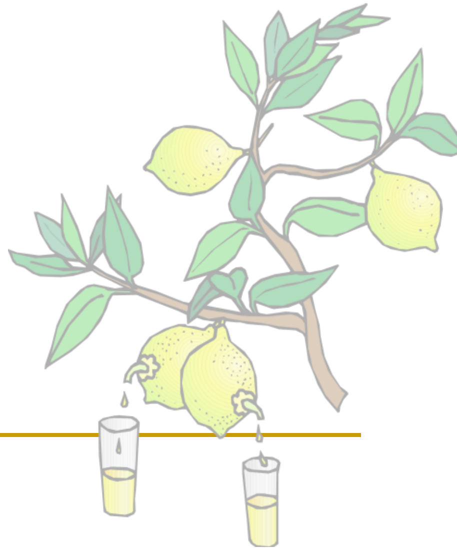
Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1 (continued)

Level 1 DFD





Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.

Customer Order
Serve Product
Collect Payment

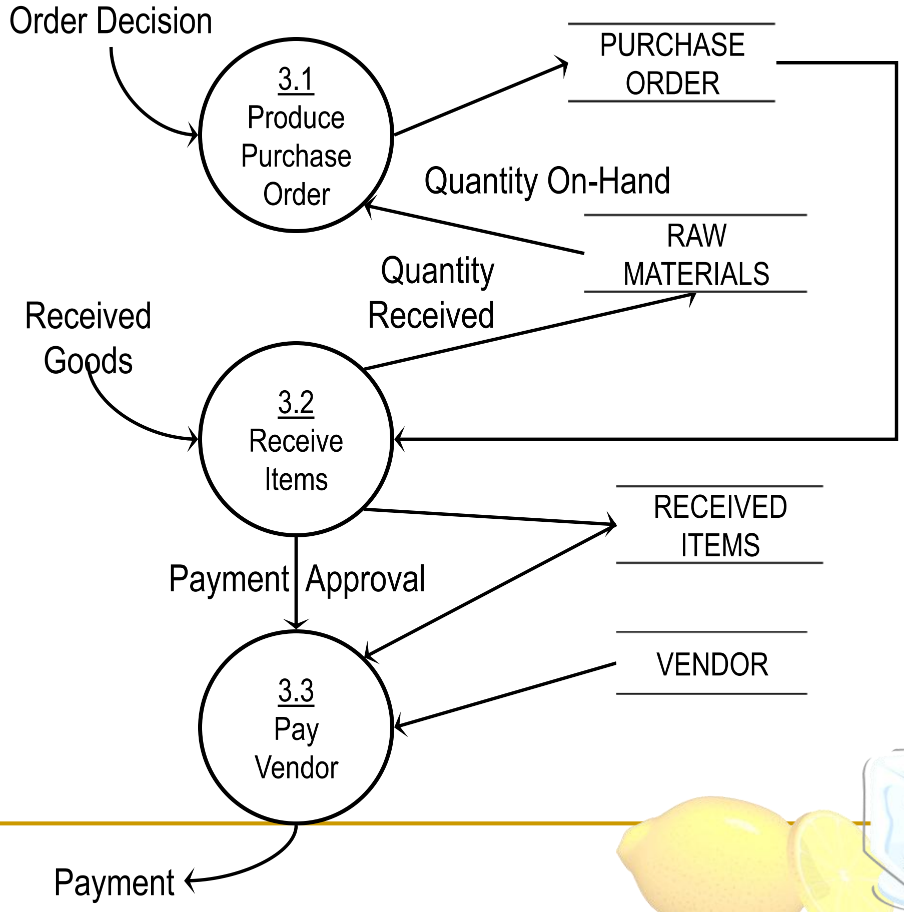
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1 (continued)

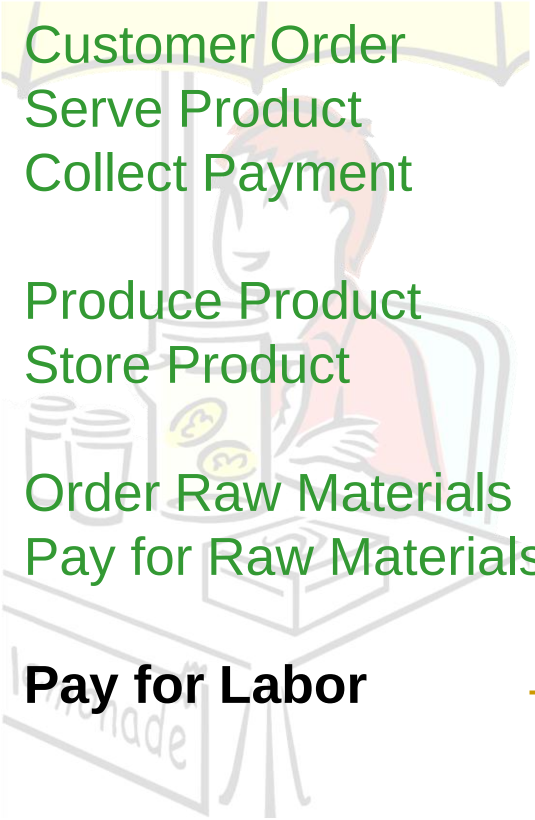
Level 1 DFD



Creating Data Flow Diagrams

Example

Create a level 1 decomposing the processes in level 0 and identifying data stores.



Customer Order
Serve Product
Collect Payment

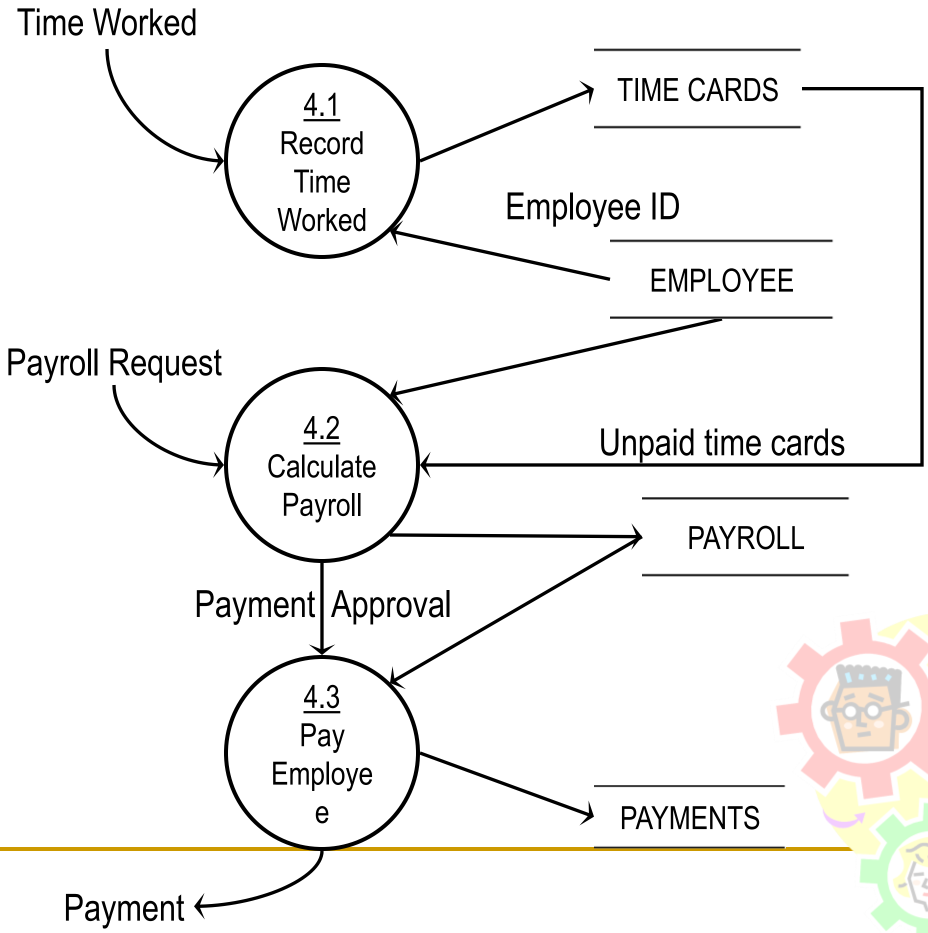
Produce Product
Store Product

Order Raw Materials
Pay for Raw Materials

Pay for Labor

4. Construct Level 1 (continued)

Level 1 DFD



Time Worked

4.1
Record Time Worked

TIME CARDS

Employee ID

EMPLOYEE

Payroll Request

4.2
Calculate Payroll

Unpaid time cards

PAYROLL

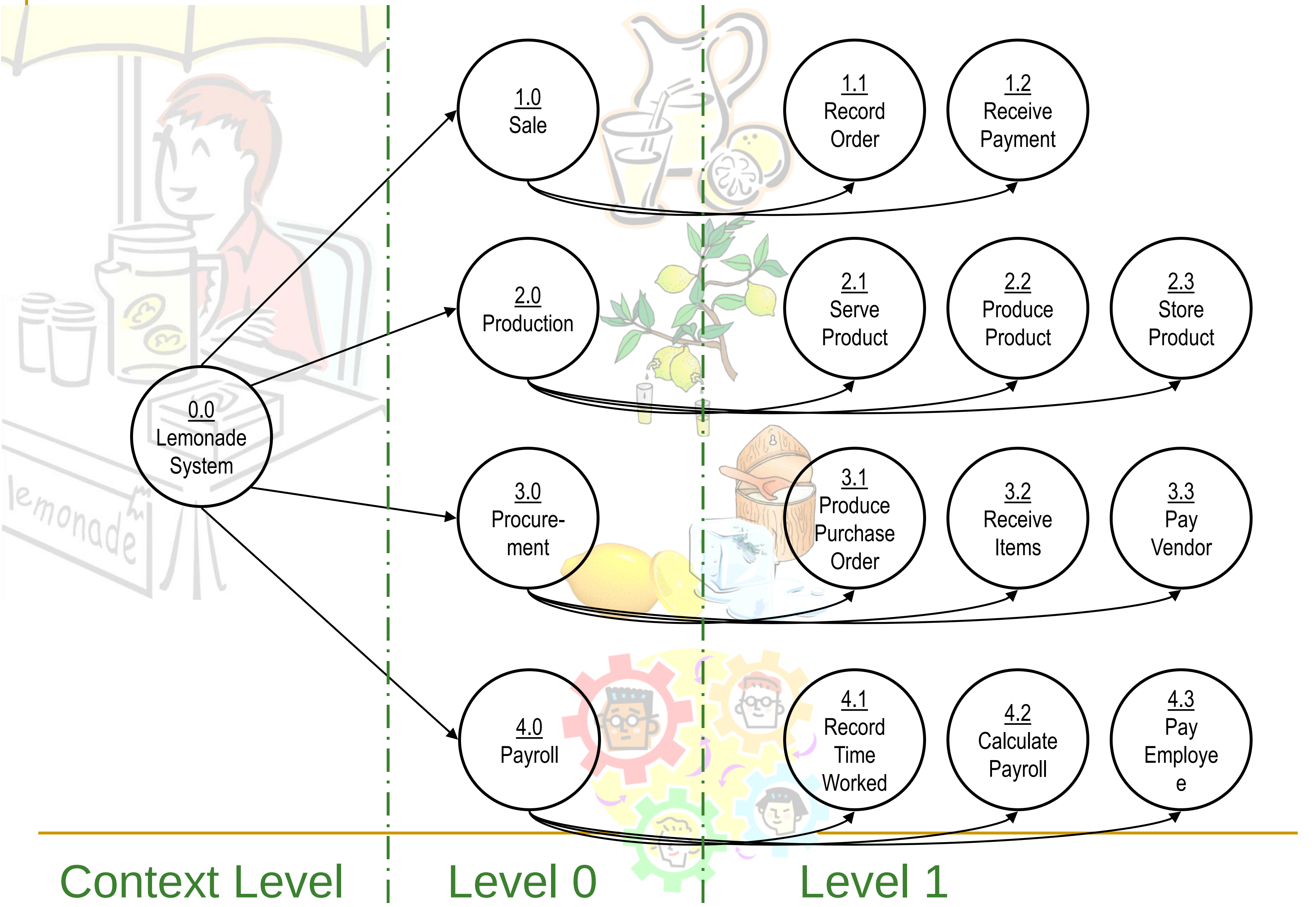
Payment Approval

4.3
Pay Employe e

PAYMENTS

Payment

Process Decomposition



0.0
Lemonade System
1.0
Sale
2.0
Production
3.0
Procure-ment
4.0
Payroll
1.1
Record Order
1.2
Receive Payment
2.1
Serve Product
2.2
Produce Product
2.3
Store Product
3.1
Produce Purchase Order
3.2
Receive Items
3.3
Pay Vendor
4.1
Record Time Worked
4.2
Calculate Payroll
4.3
Pay Employe e
lemonade
Context Level
Level 0
Level 1