RUTGERS

Rutgers Business School
Newark and New Brunswick

33:010:458
Accounting Information Systems

Dr. Peter R. Gillett

Associate Professor
Department of Accounting, Business Ethics and Information Systems
Rutgers Business School–Newark and New Brunswick

A.I.S. Class 9: Outline

- Orville Ornaments: Questions?
- REA Modeling - a formal approach
- Extended REA Ontology
- Group Work
- Designing the Data Repository Structure for RDBMS
- Implementing the Design
- Group Projects – Flowcharting

Orville Ornaments: Questions?

REA Modeling - a Formal Approach

Terminology for Events:

Murthy & Groomer	Denna	David	McCarthy	Gillett
Economic	Core	Economic	Economic	Economic
Non-economic	Support	Business	Commitment	Commitment
			---	Business
Information	Information	Information	Information	Information

REA Modeling - a Formal Approach

- Economic events increase or decrease economic resources
- **Resources are scarce, have utility and are under the control of an enterprise**
- Agents are those who participate in events

REA Modeling - a Formal Approach

- Economic exchanges are pairs of related events
- Duality relationship
  - In an economic exchange, one resource is incremented while another is decremented
  - **The dual events need not be simultaneous nor need one be a precursor to the other**

REA Modeling - a Formal Approach

- Synergy relationships
  - Multiple events that occur in conjunction with each other and result in the whole being greater than the sum of the parts

REA Modeling - a Formal Approach

- Identify each economic exchange
- Model each exchange using REA
- Perform view integration to consolidate exchange diagrams
- Verify that there are events to increment and decrement each resource
- Verify that every event participates in a duality relationship
- Integrate supporting business events

REA Modeling - a Formal Approach

- A more radical view of events is taken here:
  - only needed events should be added
  - they should be modeled in accordance with business realities rather than traditional accounting conventions
  - this view facilitates business process reengineering

REA Modeling - a Formal Approach

- Information processes are not recorded
- Database implementations tend to filter at the reporting stage whereas traditional accounting information systems have tended to filter at the recording stage

REA Modeling - a Formal Approach

- Key characteristics of REA Systems
  * Support all critical events
  * Store a detailed history of events
  * Store data in an integrated repository
  * Are able to retrieve and manipulate data to meet user needs
  * Process events as they occur
  * Use directed REA design and implementation
  * Prepare financial statements without journal entries and a general ledger

Event-Oriented Modeling

- Extended REA Ontology (Gillett 2003/6):
  - Economic Resources (R)
  - Significant Events
    - Economic Events (E)
    - Commitments (C)
    - Business Events
      - Instigation (I)
      - Facilitation (F)
      - Terminal (T)
  - Economic Agents (A)
    - Internal Agents
    - External Agents
  - Business Location (L)

Facilitation and Terminal events are best thought of as the beginning or end of economic events or commitments that we choose to record separately

Event-Oriented Modeling

- Extended REA Ontology (Gillett 2003/6):
  - Relationships
    - Duality (E – E)
      - Transfer
      - Transformation
    - Resource-flow (E – R)
      - Inflow
        - Take
        - Production
      - Outflow
        - Use (entirely)
        - Consumption (in small parts)
        - Give
    - Participation (E – A)
      - Inside
        - Accountability
        - Authorization
      - Outside
    - Site (E – L)

Event-Oriented Modeling

- Extended REA Ontology (Gillett 2003/6):
  - Relationships
    - Linkage (R – R)
      - Composition: Shirts are composed of fabric, thread, buttons, labels, etc.
      - Substitution: White Packing Tissue substitutes for Ivory Packing Tissue
    - Association (A – A)
      - Responsibility: Managers are responsible for Secretaries
      - Assignment: Salespersons are assigned to Customers in their region
      - Cooperation: One Vendor cooperates with another Vendor
    - Custody (A – R)
      - Cashier has custody of Petty Cash
    - Designation (A – R)
      - Customer designates a new Ship
    - Certification (A – R)
      - Vendors certified to supply specific Inventory – Approved Vendors List

Event-Oriented Modeling

- Extended REA Ontology (Gillett 2003/6):
  - * Relationships
    - Fulfills (C – E)
      - Contract: Shipment fulfills the Sales Order
      - Schedule: Production fulfills the Job Order
    - Reserves (C – R)
      - Sales Order reserves Finished Goods
    - Partners (C – A)
      - Customer partners the Sales Order
    - Reciprocal (C – C)
      - Materials Requisition is the reciprocal of the Production Order

We are recording the (mutual) commitment to the (non-cash) initial event in economic exchanges; strictly, commitment events are paired in reciprocal relationships.

Event-Oriented Modeling

- Extended REA Ontology (Gillett 2003/6):
  - Relationships
    - Instigates (I – C, I – E, I – F)
      - Requisition instigates Purchase Order
    - Facilitates (F – E, F – C)
      - Picking facilitates Shipping
    - Necessitates (E – T, C – T)
      - Receipt of goods necessitates Storage
    - Demands (I – R)
      - Requisition demands Inventory
    - Authorization (I – A)
      - Inventory Manager authorizes the Requisition
    - Involves (F – R), (T – R)
      - Marshals
        - » Picking marshals Inventory
    - Participation (F – A), (T – A)
      - Inside
        - » Accountability

Event-Oriented Modeling

- Economic Resource
  - Good, right, or service of value, under the control of a person
- Economic Event
  - Occurrence in time wherein ownership of an economic resource is transferred from one person to another
- Economic Agent
  - Persons and agencies who participate in the economic events of an enterprise or who are responsible for subordinates' participation

Event-Oriented Modeling

- Economic Exchange
  - * Type of a business transaction where the goal is an exchange of economic resources between two persons where both parties derive higher utility after the completed business transaction
    - Usually involves two economic events each incrementing or decrementing a different resource in a *duality* relationship

Event-Oriented Modeling

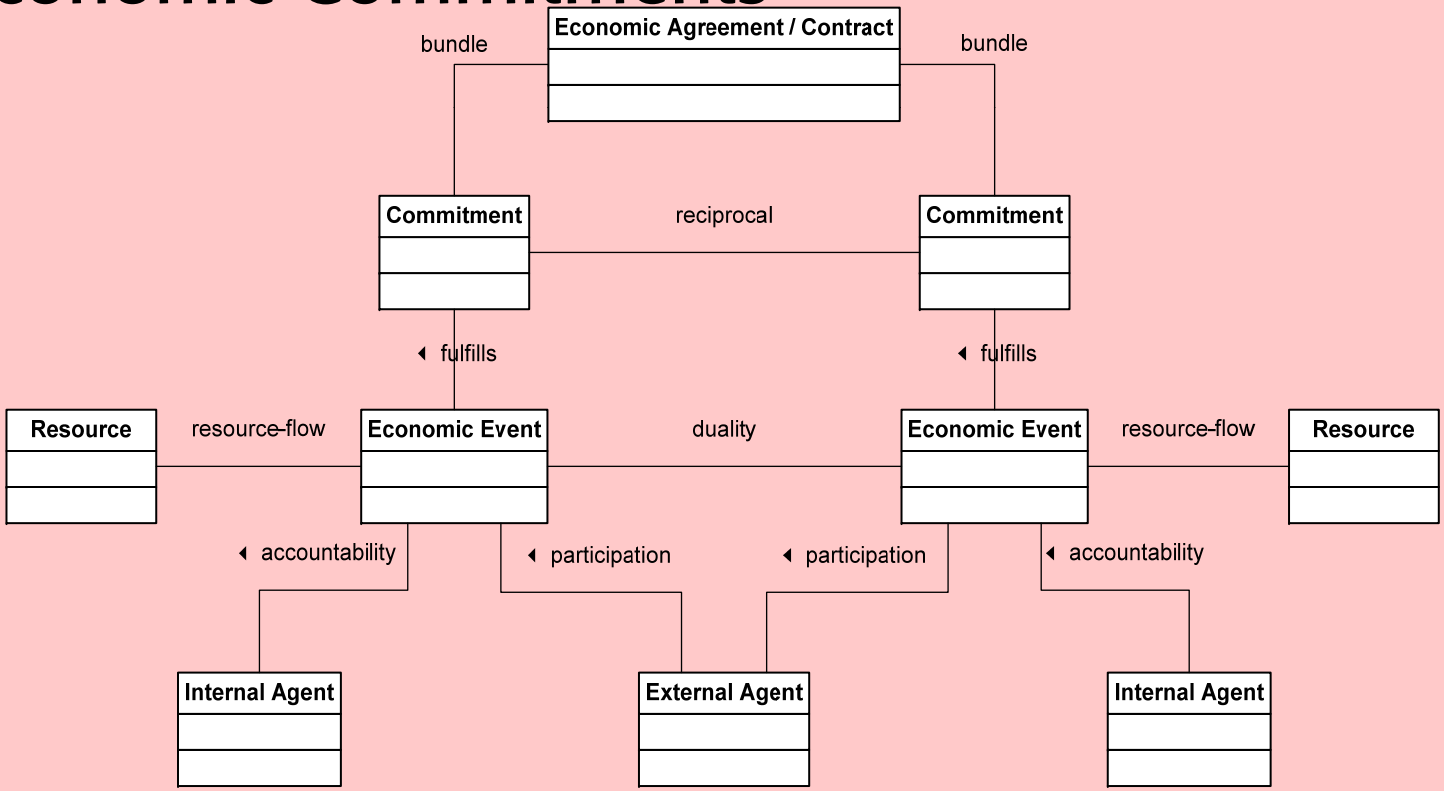
- Commitment
  - Making or accepting of a right, obligation, liability, or responsibility by a person that is capable of enforcement in the jurisdiction in which the commitment is made
- Economic commitment
  - Type of commitments by one person to transfer economic resources to another person at some specified point in the future
- Economic commitments may be *bundled* into
  - Economic agreements (incomplete, not subject to legal enforcement)
  - Economic contracts (complete, enforceable)
- We will often use informal *mutual commitments*
  - *E.g., Sales Order, Purchase Order*

Event-Oriented Modeling

- Economic Claims
  * Expectation of one person to receive a future inflow of economic resources from another person because of an economic exchange which is presently incomplete
    - A claim is *materialized* by an event in an economic exchange
    - It is *settled* by a requiting event in the economic exchange
      – e.g. Accounts Receivable

Event-Oriented Modeling

- Economic Commitments



Event-Oriented Modeling

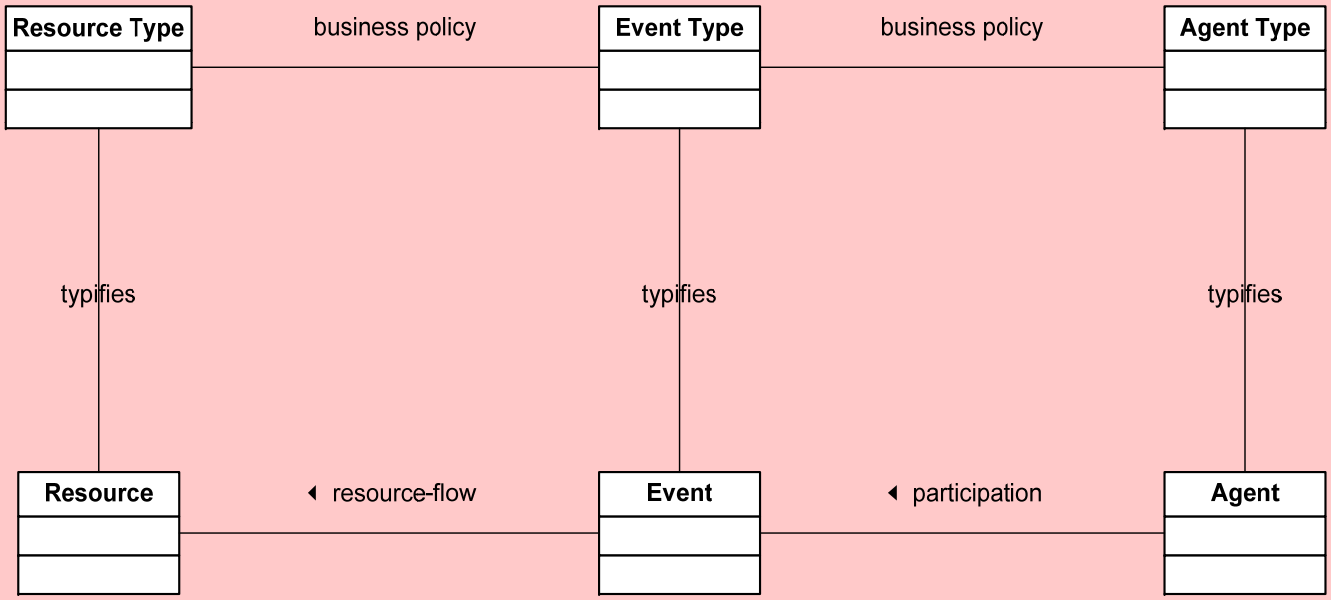
- For many kinds of resources, we want to monitor and control types, as we have discussed:
  - E.g., we may identify books by ISBN – this refers to books of a particular type (title, author, etc.), not to individual copies
- For other resources, we want to monitor and control individual items:
  - E.g., individual ships we are building for our customers
- Sometimes, we want a mixture of both approaches:
  - E.g., a customer orders an automobile of a particular type . . .
  - . . . but we deliver an specific automobile with a unique VIN
- These considerations lead us to add *typification*

Event-Oriented Modeling

- REA Ontology – Typification
  - Association between a concrete entity and the abstract specification of its grouped properties
  - The base classes of the REA Ontology are extended by the addition of related type classes, related to them by the relationship *typifies*
  - An entity type is a subset of all the possible instances of the entity:
    - Resource (R) – Automobile:
      Resource type (RT) – Automobile model
    - Event (E) – Order:
      Event type (ET) – Telephone Order
    - Agent (A) - Customer:
      Agent type (AT) – Business customer
  - Types may be useful to document *business policies* – i.e., what *should* happen rather than what *did* happen

Event-Oriented Modeling

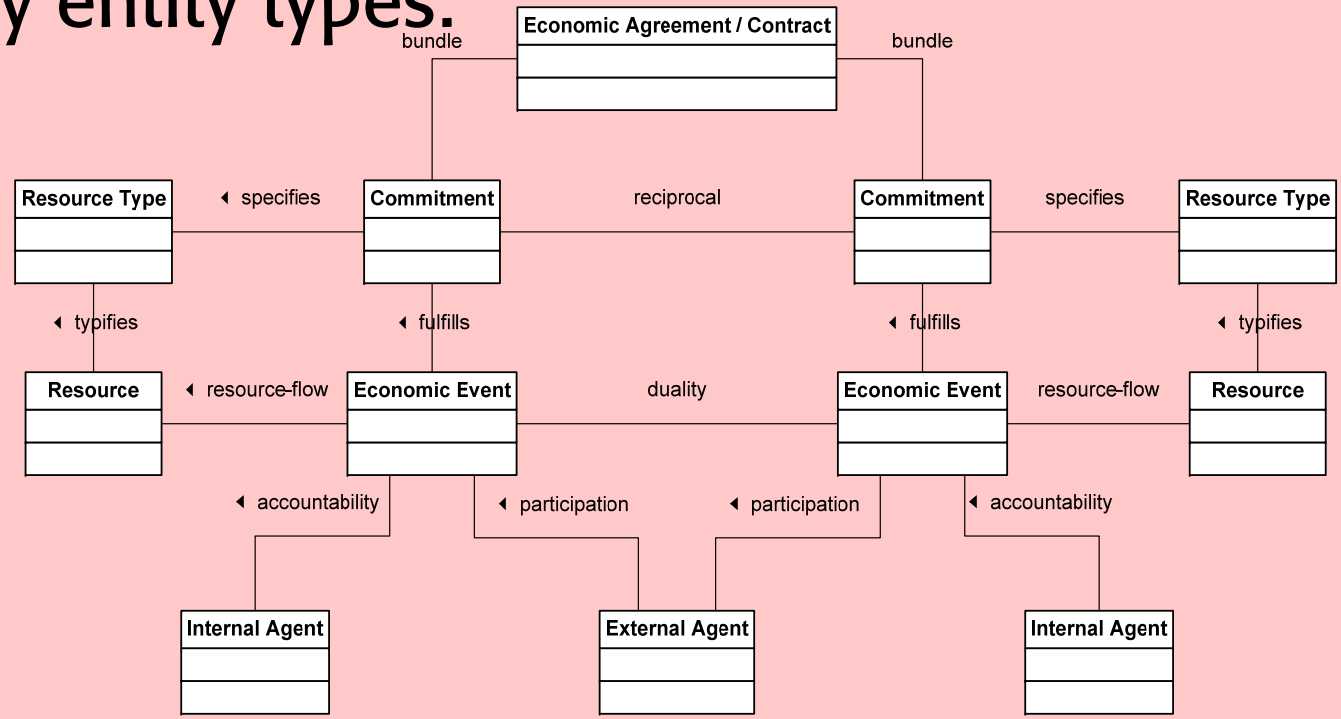
- Typification for Business Policies



* E.g., Only Business Customers may place telephone orders
* E.g., Telephone orders will not be accepted for sports cars

Event-Oriented Modeling

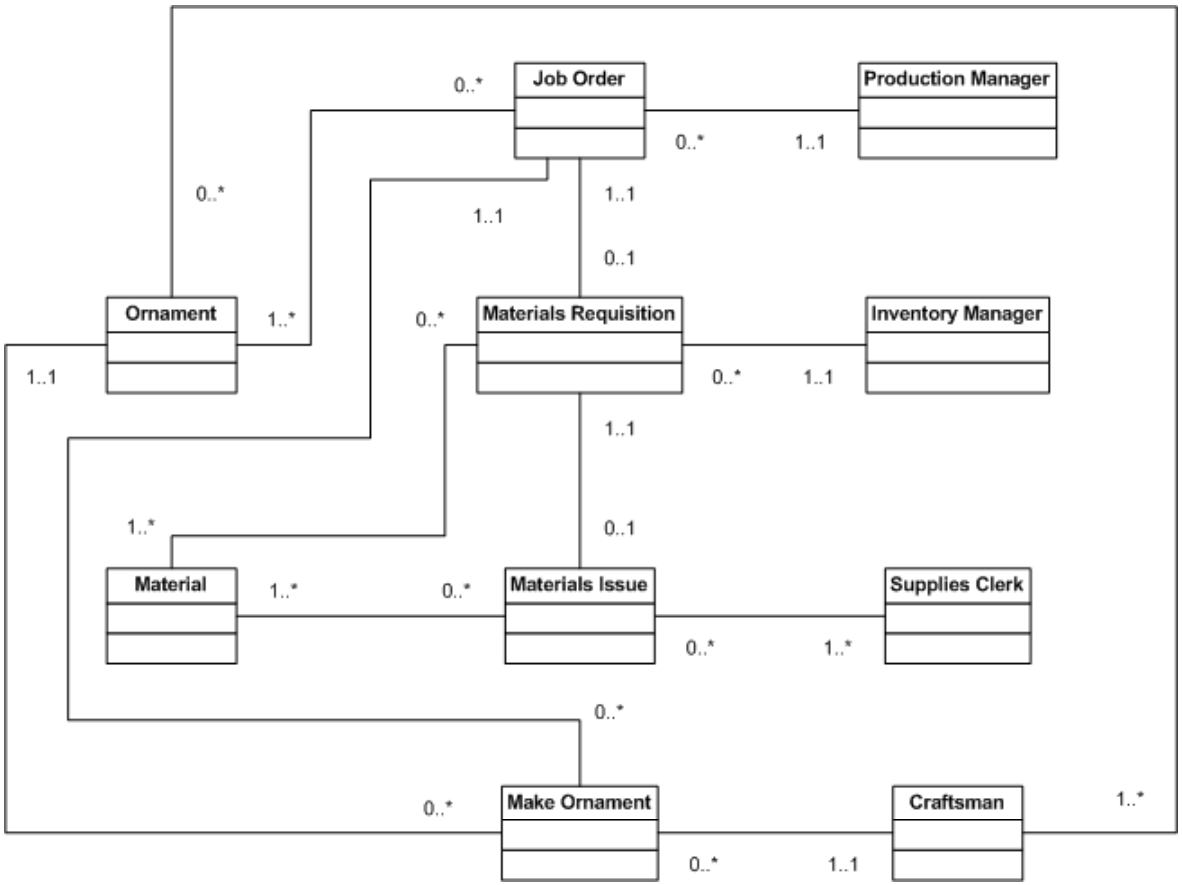
- Economic Commitments may, minimally, specify only entity types:



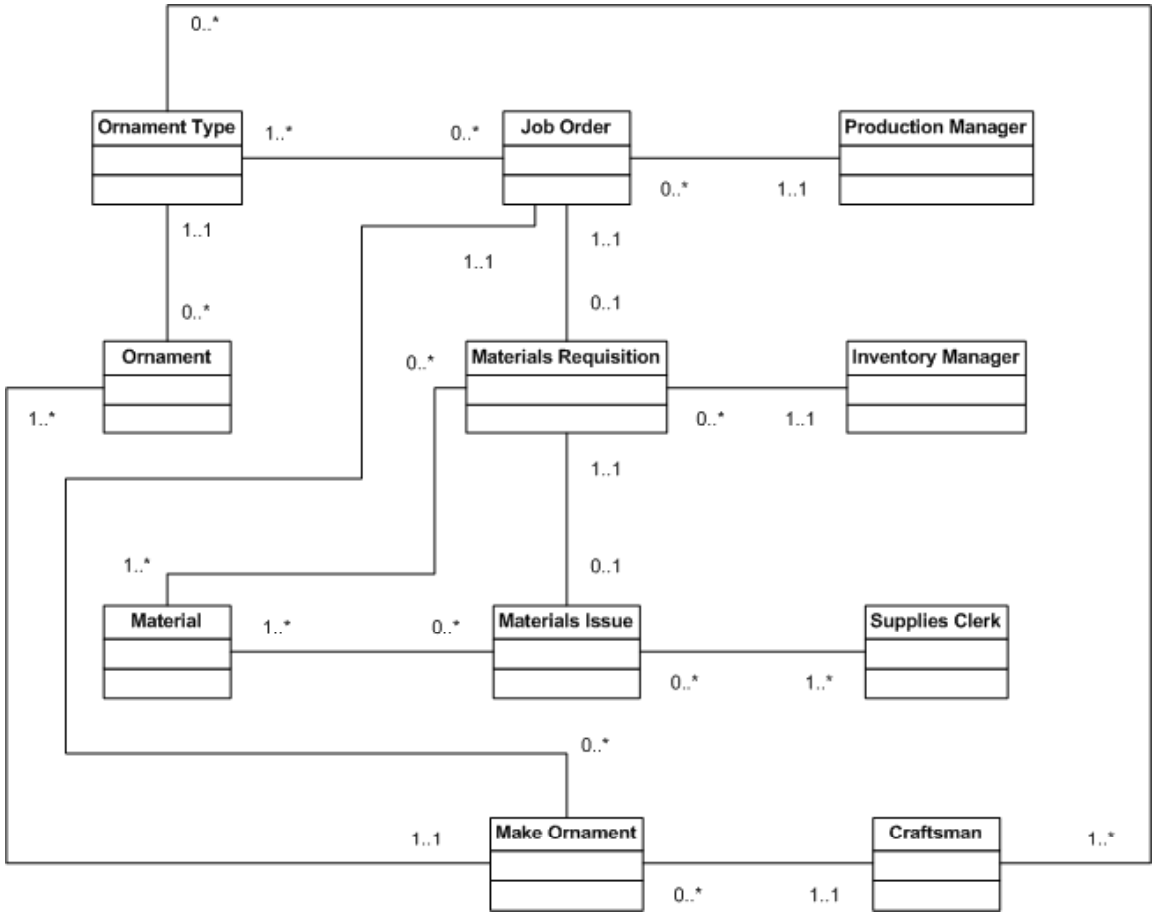
Orville Ornaments Revisited

- Imagine that Orville Ornaments become so proud of the work of their Craftsmen, and the price of their products rises so much, that they decide to track each individual ornament separately. How would THIS change the REA diagram?

Orville Ornaments Revisited – Old



Orville Ornaments Revisited – New



Group Work

- Working in your groups, please prepare an REA diagram in UML format for the Ash Accounting Client Services, Billings & Cash Collection Cycle

Ash Accounting CSB&CC Cycle

- Step 1: Identify the significant events
  - * Instigation — Accept Client
  - * Commitment — Agree Assignment
  - * Commitment — Budget Recurring Assignment
  - * Economic — Bill & Write Off Services
  - * Economic — Receive Fees
  - * Economic — Write Off fees

Ash Accounting CSB&CC Cycle

- Step 2: Identify the related resources
  - Service
  - Assignment
  - Time Worked
  - Cash Account

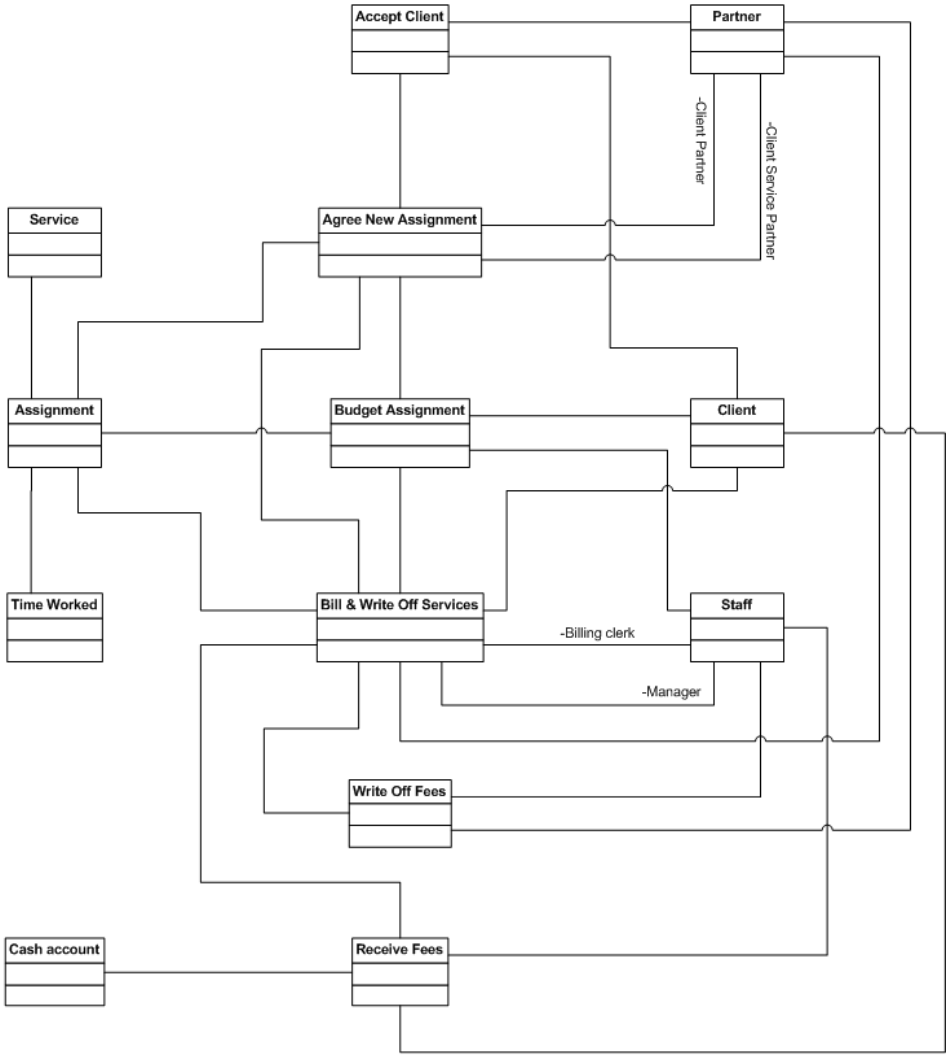
Ash Accounting CSB&CC Cycle

- Step 3: Identify the related internal and external agents
  * Partner
  * Manager
  * In-charge accountant
  * Staff
  * Billing clerk
  * Accounts receivable clerk
  * Client

Ash Accounting CSB&CC Cycle

- Step 4: Identify relationships between entities

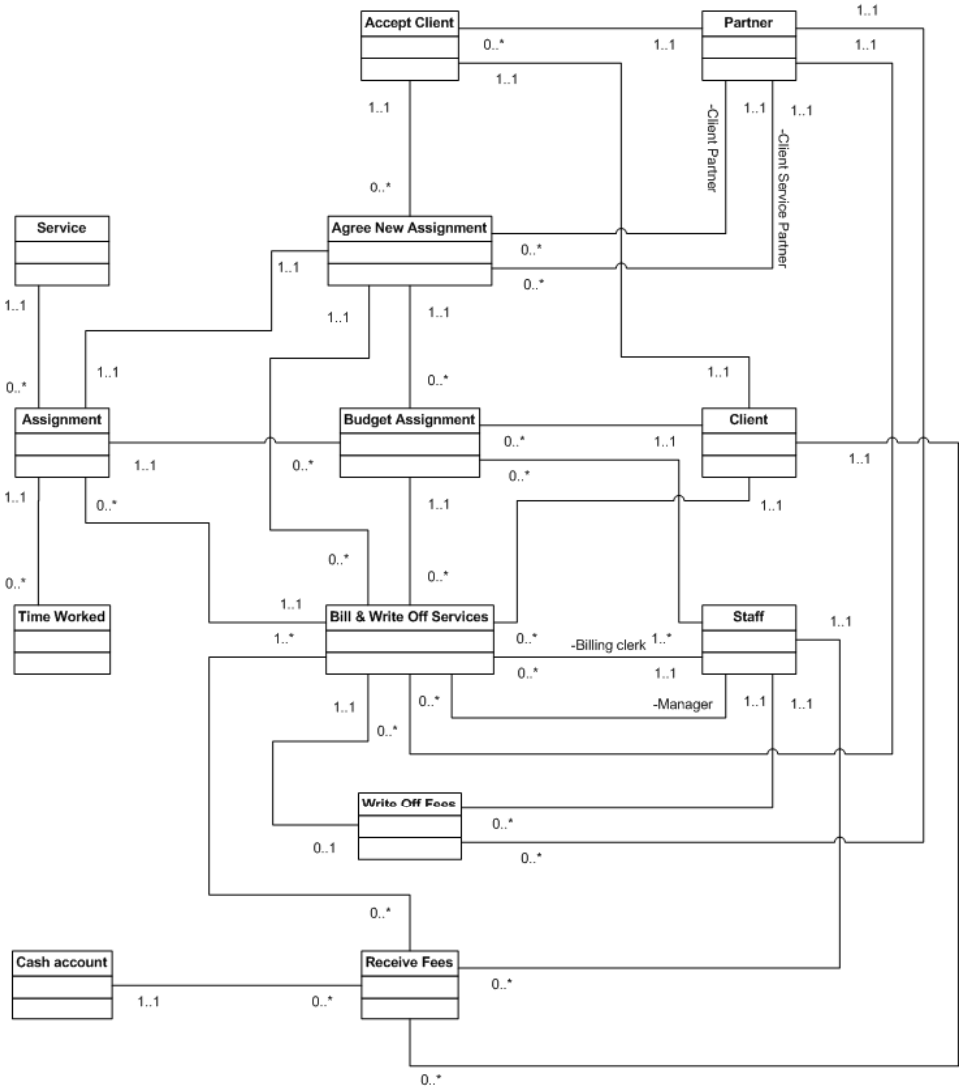
Accounting Information Systems



Ash Accounting CSB&CC Cycle

- Step 5: Specify the optionalities and cardinalities of the relationships

Accounting Information Systems

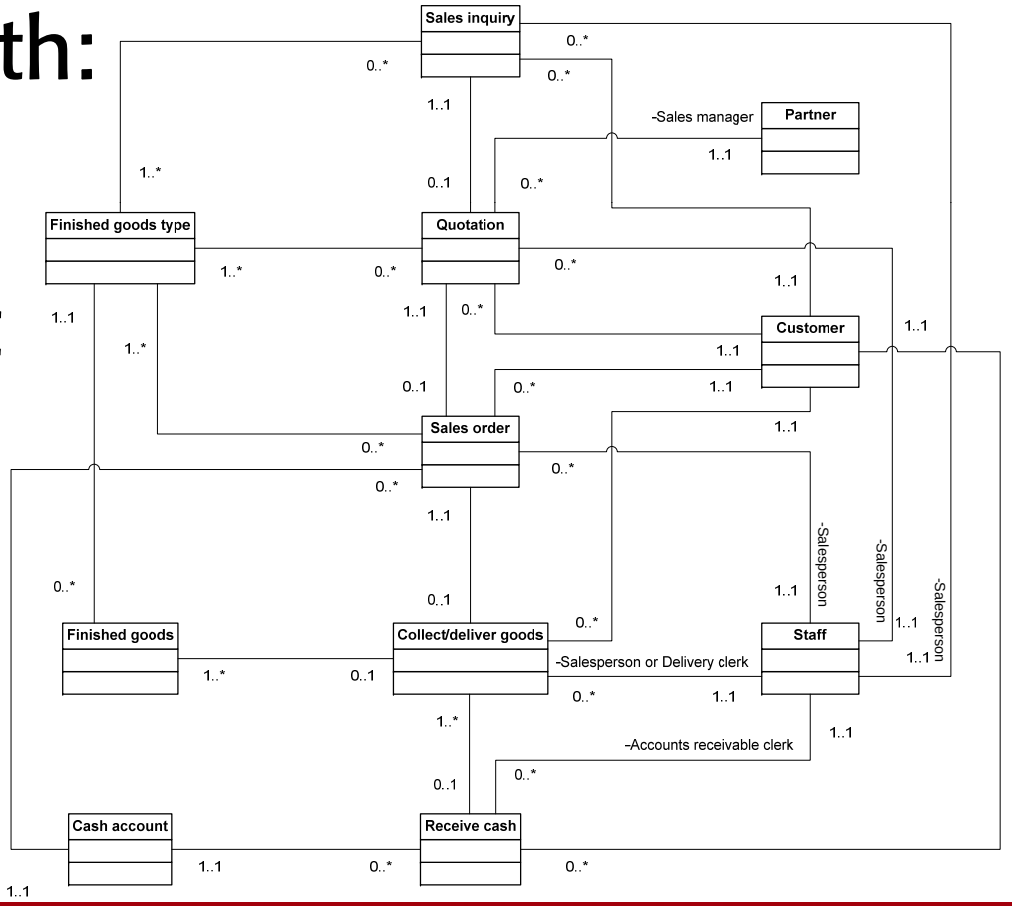


College Computing

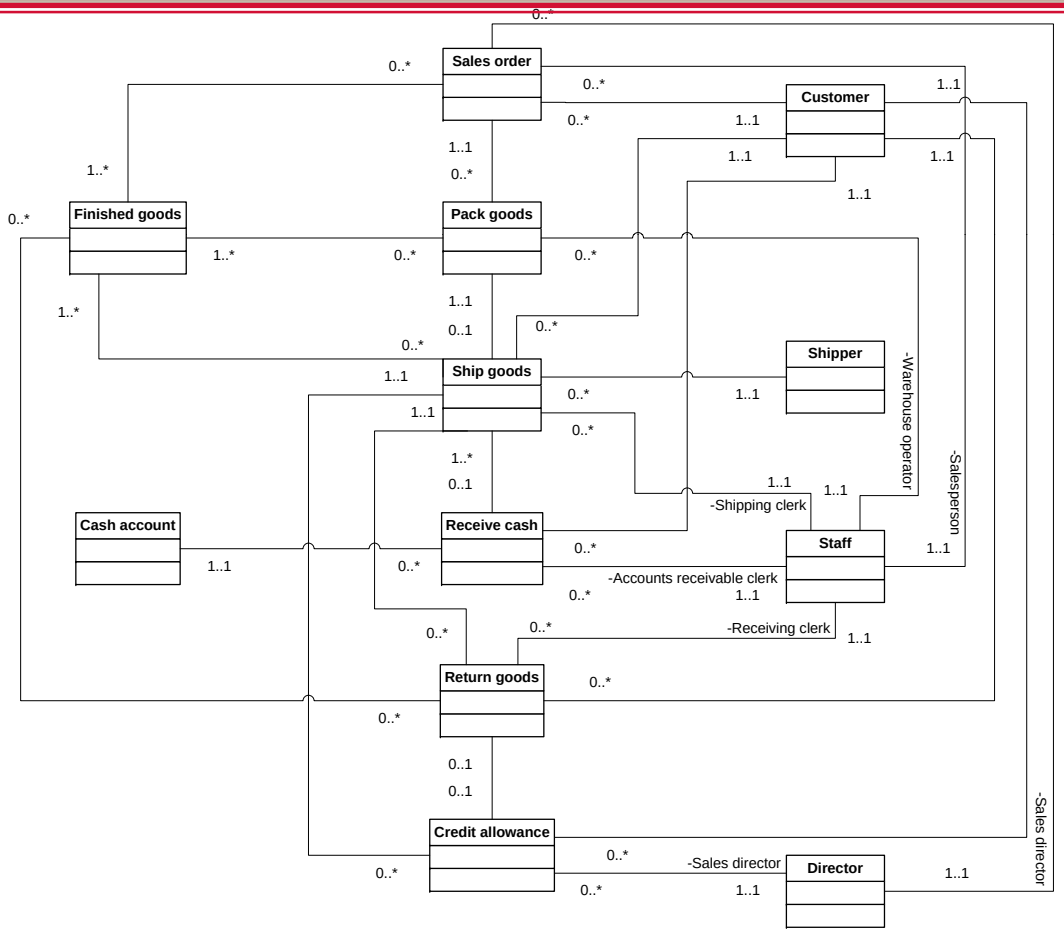
- Compare this with:

Note:
Instigation event
Resource type

What kind of event is "Quotation"?



Sheldon Shirts



Designing the Data Repository Structure for RDBMS

- There are three main issues involved in this step:
  * Identifying the required tables
  * Linking the tables
  * Specifying the attributes for the tables

Identifying Required Tables

- Every entity in the REA model will require a table with a primary key (subject to a possible decision to merge certain tables together during linking, or omit tables with only one row)
- In other words, there should normally be a table for every:
  * resource
  * event
  * agent

Identifying Required Tables

- Additional tables may be required to model certain types of links between entities (see next slide)
- Finally, tables may be required for reference purposes by the information system (e.g., tables of valid State Codes, Discount Codes, etc.)

Linking Tables - Choices

- Create separate Link table
  * will always work
  * may often be unnecessary
  * sometimes the only choice (e.g., M:M)
- Post foreign keys
- Combine tables
- All three choices would work for 1:1

Linking Tables

- 1:1 Links
  - collapse the two entities into a single table
    or
  - post the primary key of either table as a foreign key in the other
- 1:M and M:1 Links
  - post the primary key for the '1' table as a foreign key in the 'M' table
- M:M Links
  - create a new Link Table with the primary keys from the original tables forming a composite key; add any uniquely defined attributes

Linking Tables

- Except:
  - For optional entities
    - always treat as if their cardinality were M
    - i.e., treat both (0,1) and (0,*) entities as (0,*)
  - When modeling two events linked 1:1
    - post the key of the first event as a foreign key in the table for the second
  - When modeling two events linked1:M where the '1' event follows the 'M' event
    - treat the link as a M:M link – i.e., create an additional Link Table

Specifying Attributes

- Primary keys are identified when tables are formed
- Foreign keys are added in accordance with the rules for linking
- Other non-key attributes should be added based on the requirements identified at Step 6 of REA modeling

Example – Orville Ornaments

- Original Scheme
  - JobOrder Table
    (Job#, Date, StartDate, ScheduledCompletionDate, [ProductionManger#])
  - JobOrder-Ornament Link Table
    ([Job#], [Ornament#], QuantityRequired)
  - Ornament Table
    (Ornament#, Description, StorageBin#, StandardCost, SellingPrice)
  - MakeOrnament Table
    (Batch#, Date, [Craftsman#], [Ornament#], QuantityMade)
  - ProductionManager Table
    (ProductionManager#, Name, Address, Salary, etc.)
  - Craftsman Table
    (Craftsman#, Name, Address, Salary, etc.)

Example – Orville Ornaments

- Revised Scheme tracking individual Ornaments
  - JobOrder Table
    (Job#, Date, StartDate, ScheduledCompletionDate, [ProductionManger#])
  - JobOrder-OrnamentType Link Table
    ([Job#], [OrnamentType#], QuantityRequired)
  - OrnamentType Table
    (OrnamentType#, Description, StorageBin#, StandardCost, SellingPrice)
  - Ornament Table
    (Ornament#, [OrnamentType#], [Batch#])
  - MakeOrnament Table
    (Batch#, Date, [Craftsman#])
  - ProductionManager Table
    (ProductionManager#, Name, Address, Salary, etc.)
  - Craftsman Table
    (Craftsman#, Name, Address, Salary, etc.)

Implementing the Design

- Create the Access tables required by the design
- Designate the primary keys
- Establish relationships between tables
- Create forms to maintain the tables for each resource and agent
- Create (multi-table) forms for event recording processes
- Create queries to generate desired information
- Develop report formats for the desired reports
- Build a custom menu system

Group Projects - Flowcharting

- Parts of cycle omitted
- Process omitted entirely
- Non-existent process added
- Document omitted entirely
- Fictitious document produced
- Document appears from nowhere
- Document disappears without trace
- Document incorrectly named
- Document filed in incorrect sequence (A, C, or N)
- Documents not correctly filed together
- Document not correctly marked "Posted", "Paid" etc.
- Document copies not correctly and neatly stacked"
- Documents arriving or being sent at different times should not be shown together
- Incorrect or non-existent Job Titles used
- Lines "broken" and bent unnecessarily

Group Projects - Flowcharting

- Different parts of flowchart not properly connected to each other
- Postings to fictitious journals not maintained by this company
- Activities of key individuals or departments omitted entirely
- Non-existent employees or departments shown
- Wrong flowcharting symbol used
- Wrong connector (on-page, off-page) used
- Connector not correctly identified by name (off-page) or letter (on-page)
- Connector not consistently identified by name (off-page) or letter (on-page)
- Incorrect or missing arrows on lines
- Process incorrectly described
- Processes in incorrect sequence
- Copies of document omitted
- A single process cannot combine steps carried out at different time periods (e.g., ongoing processes and end-of-day processes)
- Extra copies of documents produced
- Copies of documents sent to wrong place
- Documents generally should be filed after they are used, not before

Group Projects - Flowcharting

- Journal Vouchers and Ledgers not correctly distinguished
- Confusion of General Ledger with Subsidiary Ledgers
- Wrong ledger updated
- Updated ledger omitted from diagram
- Names of individuals used instead of Job Titles
- Incorrect individual or department shown carrying our process
- Important annotations omitted
- Annotations incorrect
- Flowchart covers steps NOT part of the cycles to be documented
- Inconsistent size or shading of symbols
- Filing symbol not correctly drawn
- Lines nor perpendicular or parallel to each other
- Dotted lines used incorrectly
- Spelling errors in procedures, document names, ledgers, individuals, departments, etc.
- Any instance of visual "messiness" that makes the document ugly or hard to decipher

NEXT WEEK

- In a change to the published Timetable, we will study Chapter 10 on MONDAY of next week and Chapter 9 on Wednesday.
- This will mean that the readings and Quiz due dates for next week are inter-changed
- So the Chapter 10 Quiz is due on MONDAY!