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Accounting Information Systems

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A.I.S. Class 8: Outline

- Flowcharts for automated Purchases
- REA Modeling Revisited
- UML 2.0 & VISIO
- Group Work: Problem 9 Solution
- Group Work: Problem 10 Solution
- Unresolved Issues ?
- Next Class

Group Work

- Narrative and flowcharts in the Chapter 1 Appendix for automated Purchases

Business Processes and Events

- We distinguish events forming parts of business processes from information processes
- Information processes
  * record data about business events
  * maintain data
  * report useful information to decision makers

Business Processes and Events

- Business events
  - selecting a supplier
  - transporting and distributing goods
  - providing services
  - receiving payment
- Information events
  - recording customer orders
  - issuing invoices
  - adding new suppliers to master files
  - printing customer statements
- Decision events
  - selecting a new product line to develop
  - deciding to raise prices

Business Processes and Events

- Business processes may be linked in two ways
  - by sharing common resources
  - by an event in one process triggering an event in another process
- Decision processes may trigger
  - Business events
  - Information processes

Event-Oriented Modeling

- The Semantic Modeling Principle
  - Data in an information system should model the structure of the relevant categories of reality in its application domain

Event-Oriented Modeling

- Applies Semantic Modeling specifically to accounting information systems
- Provides a way of identifying the relevant entities for EER diagrams
- The entities (or objects) of interest are the events in the business processes, and the resources, agents involved
- We generally do not model the information or decision processes or events

Event-Oriented Modeling

- REA Ontology:
  - Economic Resources (R)
  - Events
    - Economic Events (E)
    - Commitments (C)
    - Business Events (B)
      - Instigation (I)
      - Facilitation (F)
      - Terminal (T)
  - Economic Agents
    - Internal Agents (A)
    - External Agents (A)

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

- REA Ontology:
  - 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
      - Outside
    - Others . . . (more next class)

Event-Oriented Modeling

- REA Ontology:
  - Congruent events
    - Congruency occurs when both events in an exchange happen simultaneously in time and space
      - E.g., Cash Sales
        - » Selling a movie ticket
        - » Receiving payment for a movie ticket
        - » Cinemas do NOT maintain Accounts Receivable!

REA Modeling Steps

1. Identify the significant events
2. Identify the related resources
3. Identify the related internal and external agents
4. Identify relationships between entities
5. Specify the optionalities and cardinalities of the relationships
6. Identify the attributes of the REA entities

. . . . . .

7. Identify the information processes

- -

8. Design the data repository structure

- -

9. Implement the design

UML 2.0

- Unified Modeling Language
- Developed from combination of competing methods for designing object-oriented systems, from 1995 onwards
- Flexible system works with other methodologies (e.g., for RDBMS design)
- UML 2.0 standard adopted June 2003 (current version 2.1.2)

UML 2.0

- 13 diagrams:
  - Structural
    - Class diagram
    - Object diagram
    - Composite Structure diagram
    - Deployment diagram
    - Component diagram
    - Package diagram
  - Behavioral
    - Activity diagram
    - Use diagram
    - State Machine diagram
  - Interaction
    - Overview diagram
    - Sequence diagram
    - Communication diagram
    - Timing diagram

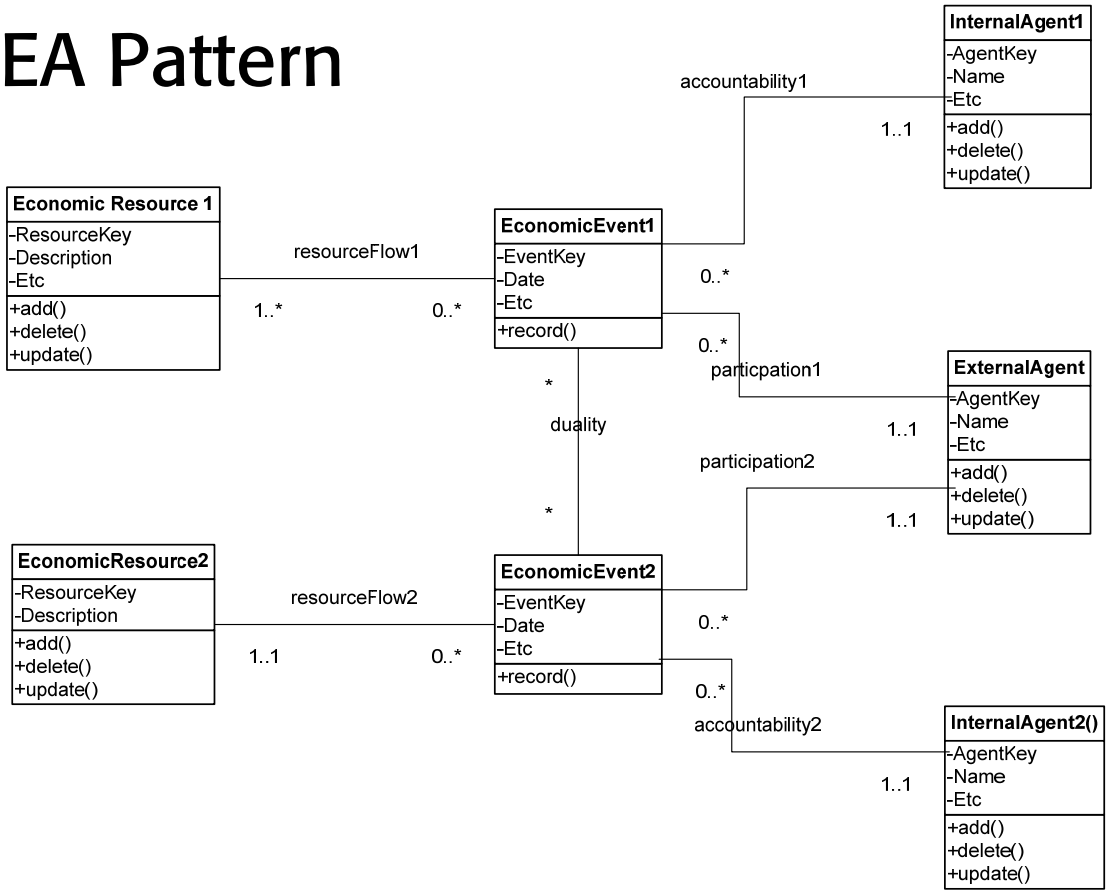
UML Class Diagram (Static Structure)

- We may sometimes omit the names of the relationships when our understanding would not thereby be impaired
- We show optionalities and cardinalities in the form *optionality .. cardinality*
  e.g. 0 ..1 0 .. * 1 ..1 1 .. *
- We will generally use lists (data dictionaries) instead of showing attributes on diagrams

- Show primary keys underlined and foreign keys in [ ] when required
  - N.B. NOT required on REA diagrams

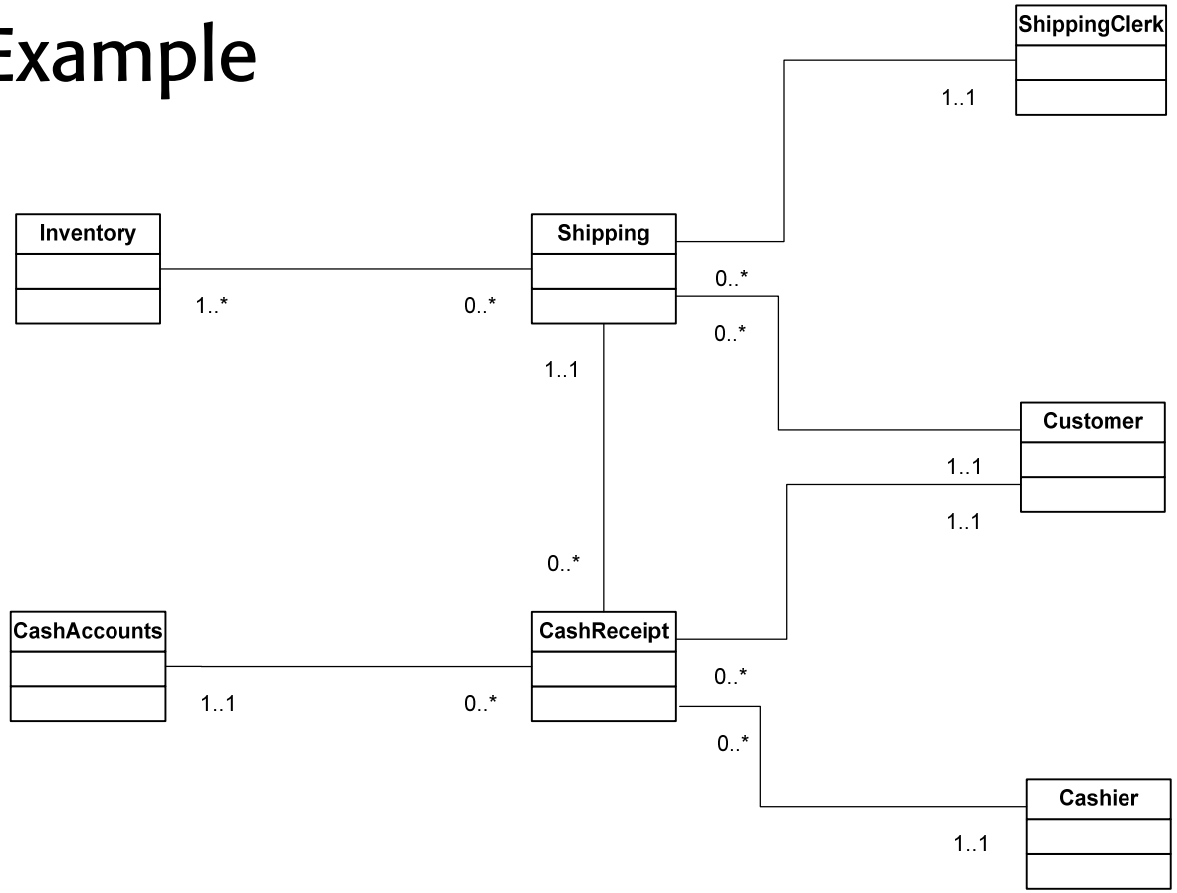
UML Class Diagram (Static Structure)

- Core REA Pattern



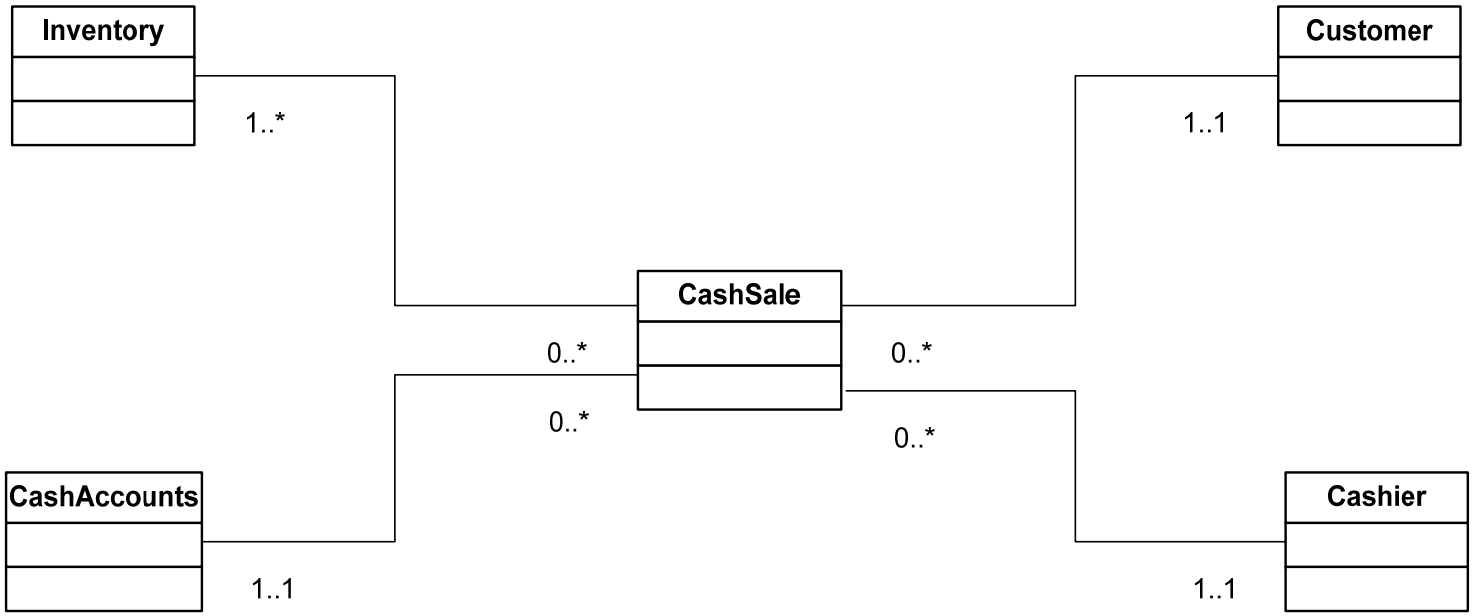
UML Class Diagram (Static Structure)

- REA Example



UML Class Diagram (Static Structure)

- REA Example – Congruent events



REA Modeling

- N.B:
  - Official format:
    - optionalities, cardinalities and attributes
  - Textbook format:
    - omit attributes
  - UML format:
    - omit attributes, omit names of relations, use 0 ..* etc. for optionalities and cardinalities

UML 2.0

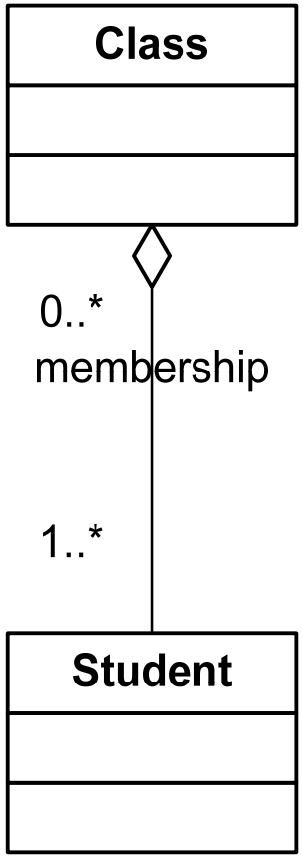
- Unified Modeling Language
  - Associations
    - N-ary associations e.g. binary associations
    - (Aggregation) *(officially removed from UML 2.0?)*
    - Composition
    - Generalization
    - Reflexive associations

UML 2.0

- Association

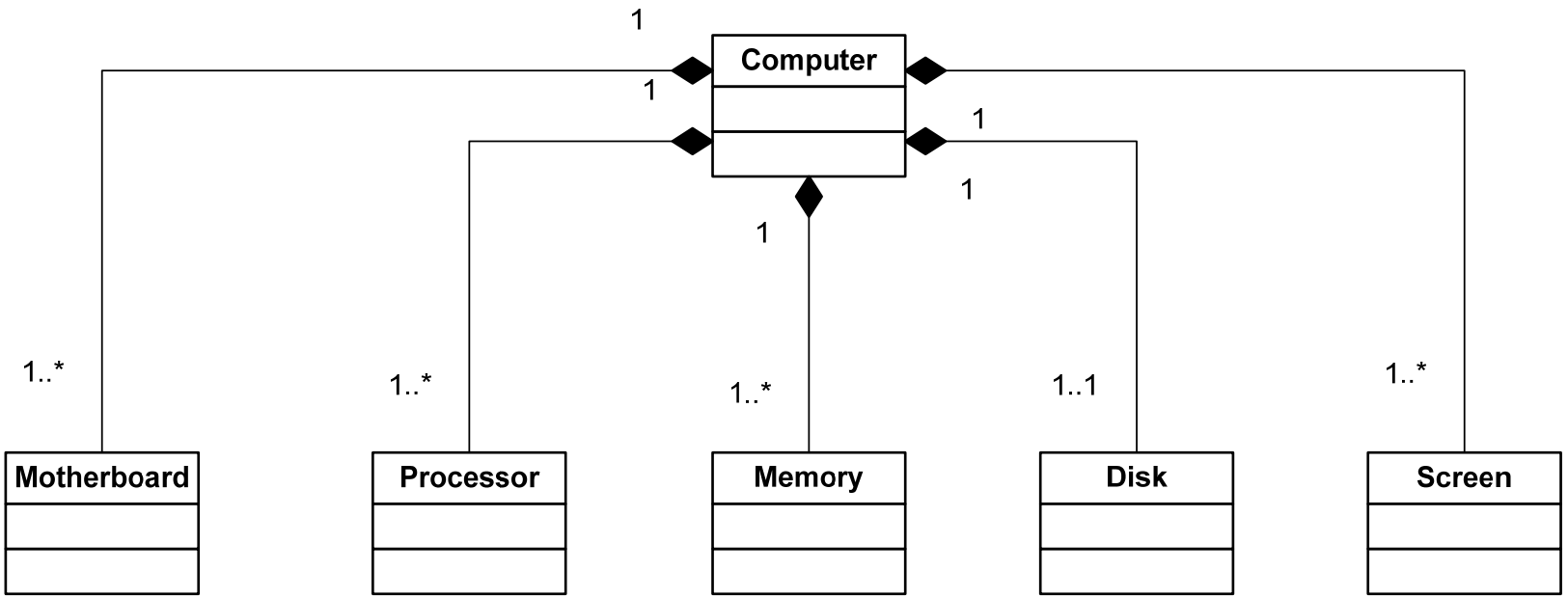
UML 2.0

- Aggregation



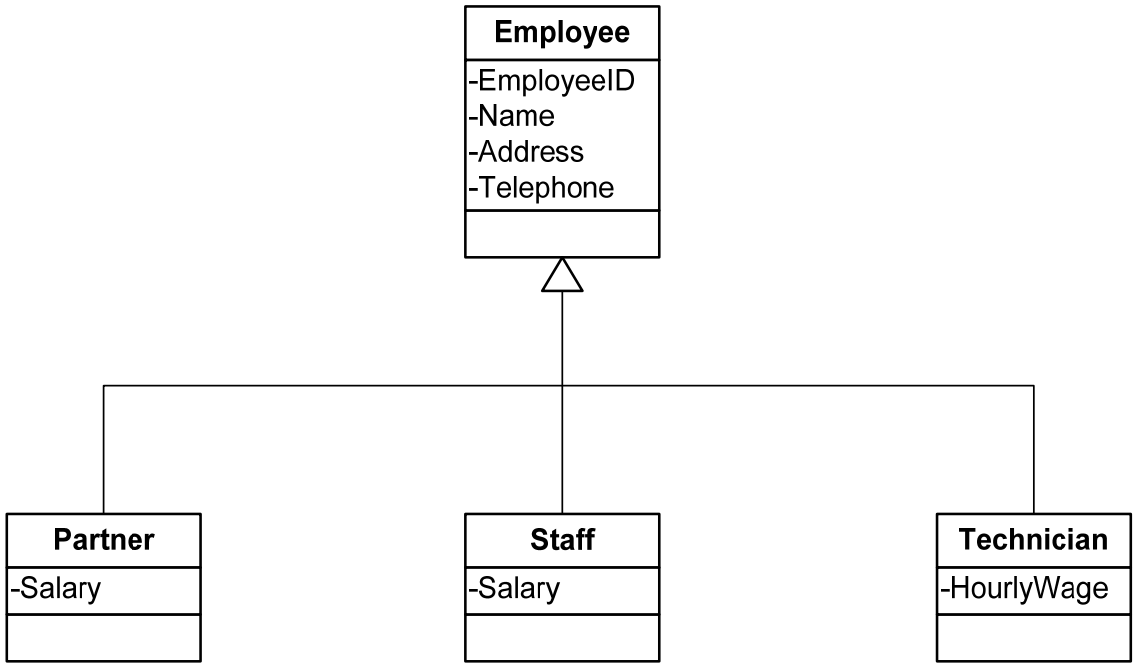
UML 2.0

- Composition



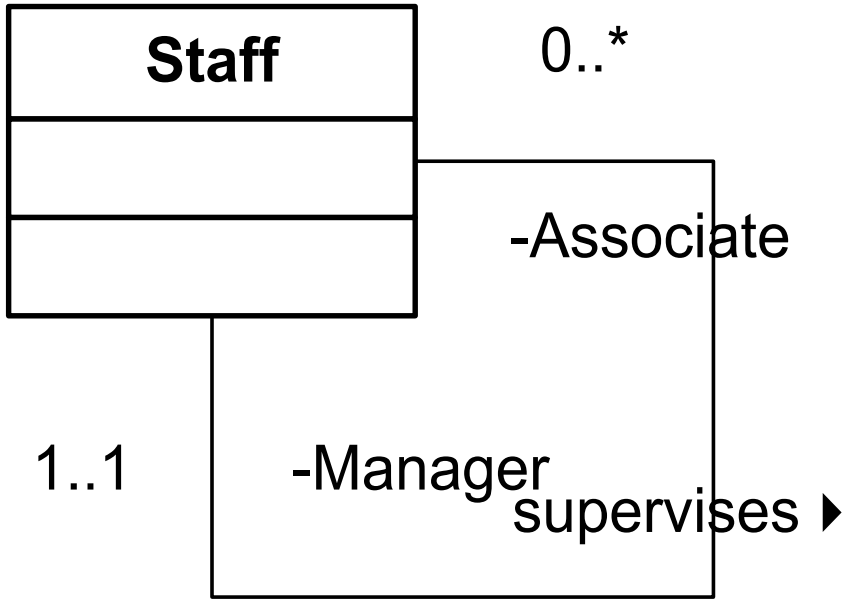
UML 2.0

- Generalization



UML 2.0

- Reflexive



UML & Visio

- UML 2.0
  - Optionalities & Cardinalities (EER) are called Multiplicities (UML)
    - 1 (abbreviates 1..1 – we will NOT use)
    - * (abbreviates 0..* – we will NOT use – default)
    - 0..1
    - 0..*
    - 1..1
    - 1..*
  - "Roles" are now called "association end names"

UML & Visio

- VISIO
  - File, New, Software
  - UML Model Diagram (US units)
  - UML Static Structure
  - You will initially need only two symbols
    - Class
    - Binary Association
  - After you have drawn the first association
    - Right click
    - Shape Display Options
    - End Options
      - Deselect "First end name" and "Second end name"
      - Select the two options at the bottom of the screen
  - To change association properties, double-click
  - To relocate multiplicities, right click and select Format, Text, Text Block

UML & Visio

- VISIO
  - * EER Diagrams (ERD)
    - Visio 2000 contained Templates for a variety of different ERD notations (yes, there are many variants . . .)
    - Visio 2002 removed most of them, including the ones we want to use . . .
    - Visio 2003 failed to put them back as expected . . .
    - We can "improvise" by using the Basic Flowchart (US units) template
      - Use the "Process" symbol for Entities
      - Use the "Decision" symbol for Relationships
      - Draw Dynamic Connectors FROM Relationship diamonds TO Entities
      - Change the line endings as necessary (last icon on toolbar)
  - * DFDs
    - Use the Data Flow Diagram (US units) template under Flowcharts

Step 7: Information Processes

- What information processes are required?
  - A recording process for each event
  - A maintenance process for each other entity
  - A reporting process for each required report

Group Work for Chapter 8 (1)

- What are the events?
  - Reserving videos?
  - Renting videos?
    - Checking out videos?
    - Paying for videos?
    - Processing rentals?
    - Giving videos?
    - Giving rental receipts?
  - Late charges?
    - Returning videos late?
    - Paying late fees?
  - Verifying customers?

Group Work for Chapter 8 (1)

- Problem 9 Solution - see Handouts

Group Work for Chapter 8 (2)

- Problem 10
  - Work through the 9 REA steps in sequence
  - Use UML Class Diagram

Chapter 8 Problem 10 Solution

- Step 1: Identify the significant events
  - Submit Proposals
  - Check Proposals
  - Approve Proposals
  - Return Rejected Proposals

Chapter 8 Problem 10 Solution

- Step 2: Identify the related resources
  - Equipment
  - Chemicals
  - Proposals

Chapter 8 Problem 10 Solution

- Step 3: Identify the related internal and external agents
  - Directors
  - Scientists
  - *Secretary/Clerk (someone must check the proposals!)*

Chapter 8 Problem 10 Solution

- Step 4: Identify relationships between entities

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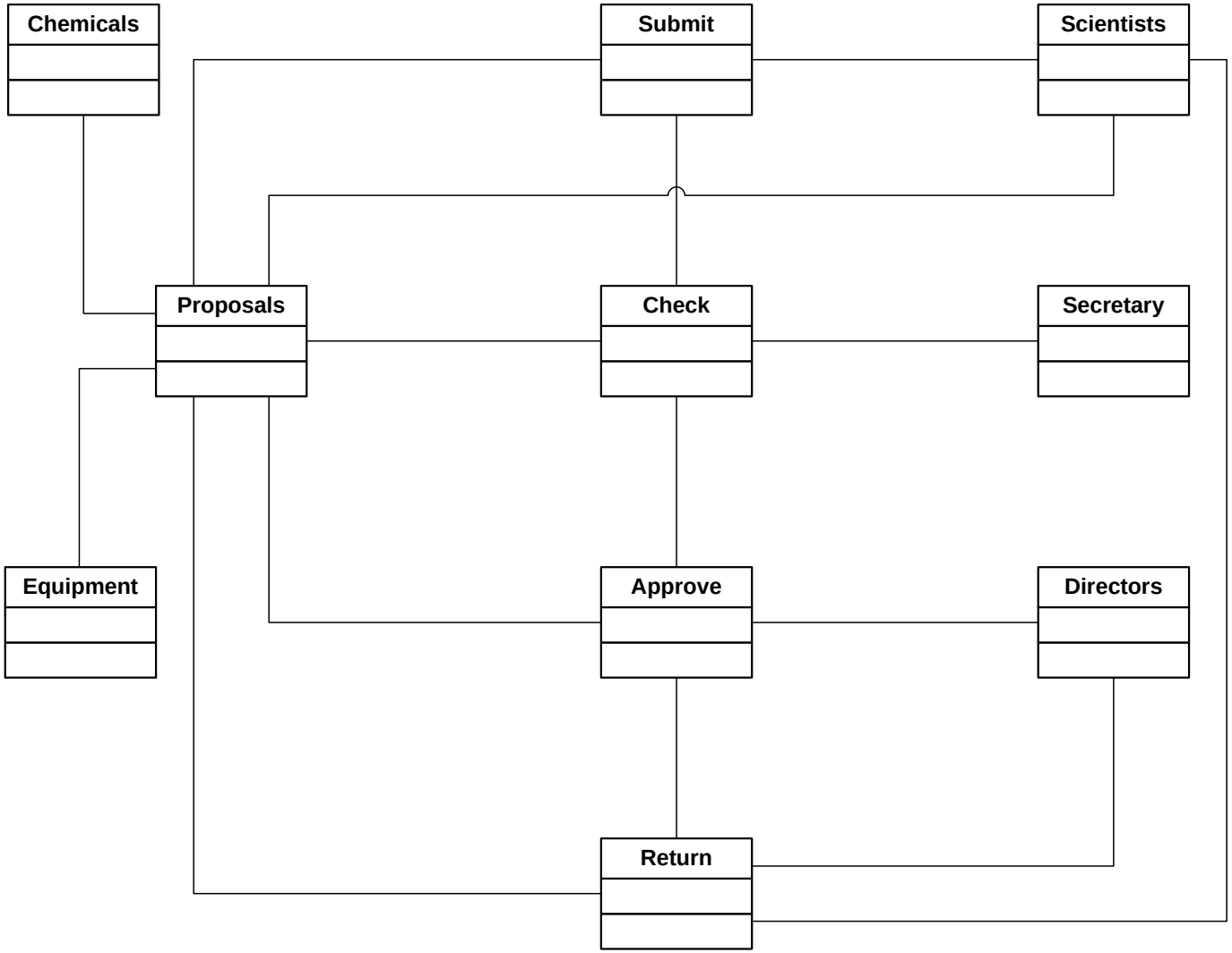

Chapter 8 Problem 10 Solution

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

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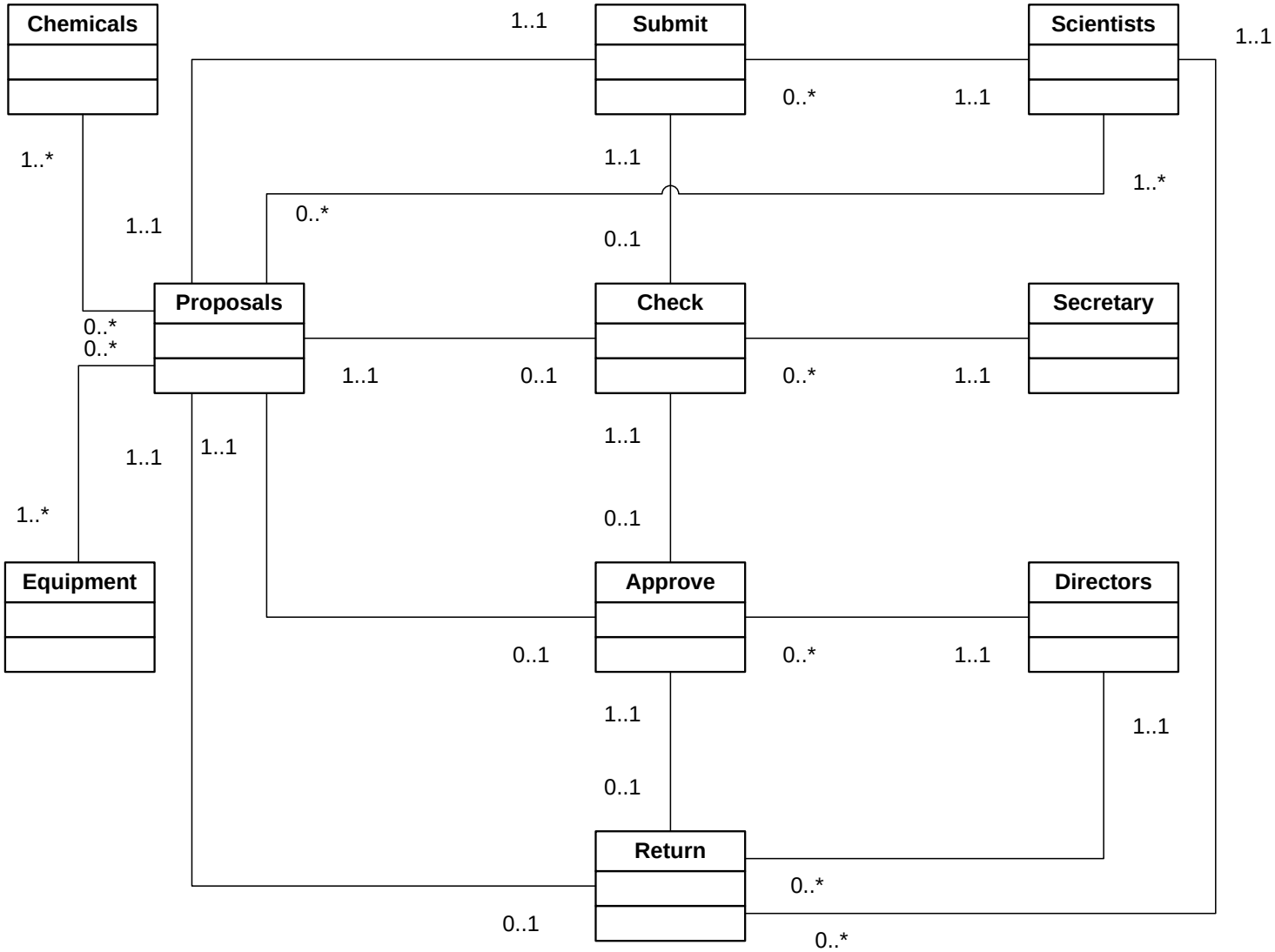
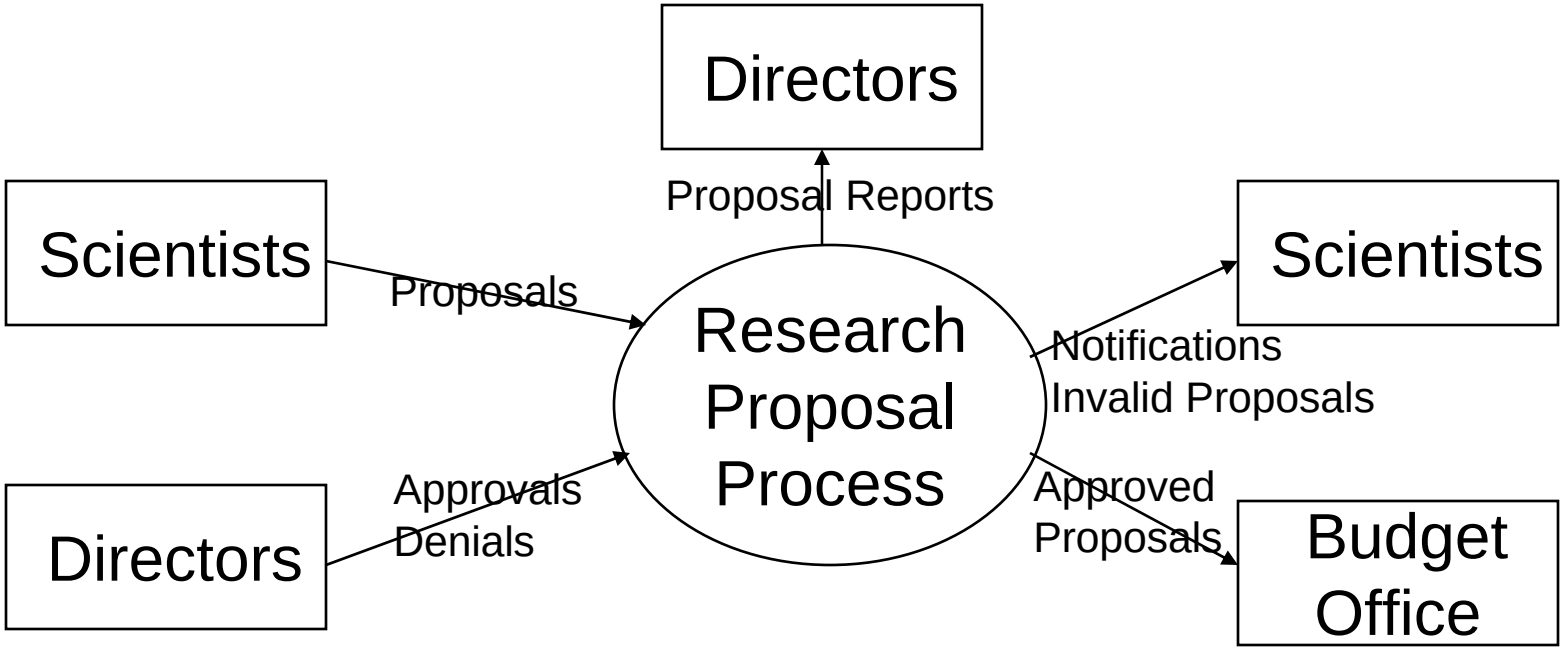


Chapter 8 Problem 10 Solution

- Step 6: Identify the attributes of the REA entities *(not required for this problem)*
  - e.g., Proposal
    - Proposal #
    - Scientist Preparing
    - {Scientist Working}
    - {Equipment Requested}
    - {Equipment Used}
    - {Procedures, Chemicals Requested}
    - {Procedures, Chemicals Used}

Chapter 8 Problem 10 Solution

- Step 7: Identify the information processes
  - Context Diagram



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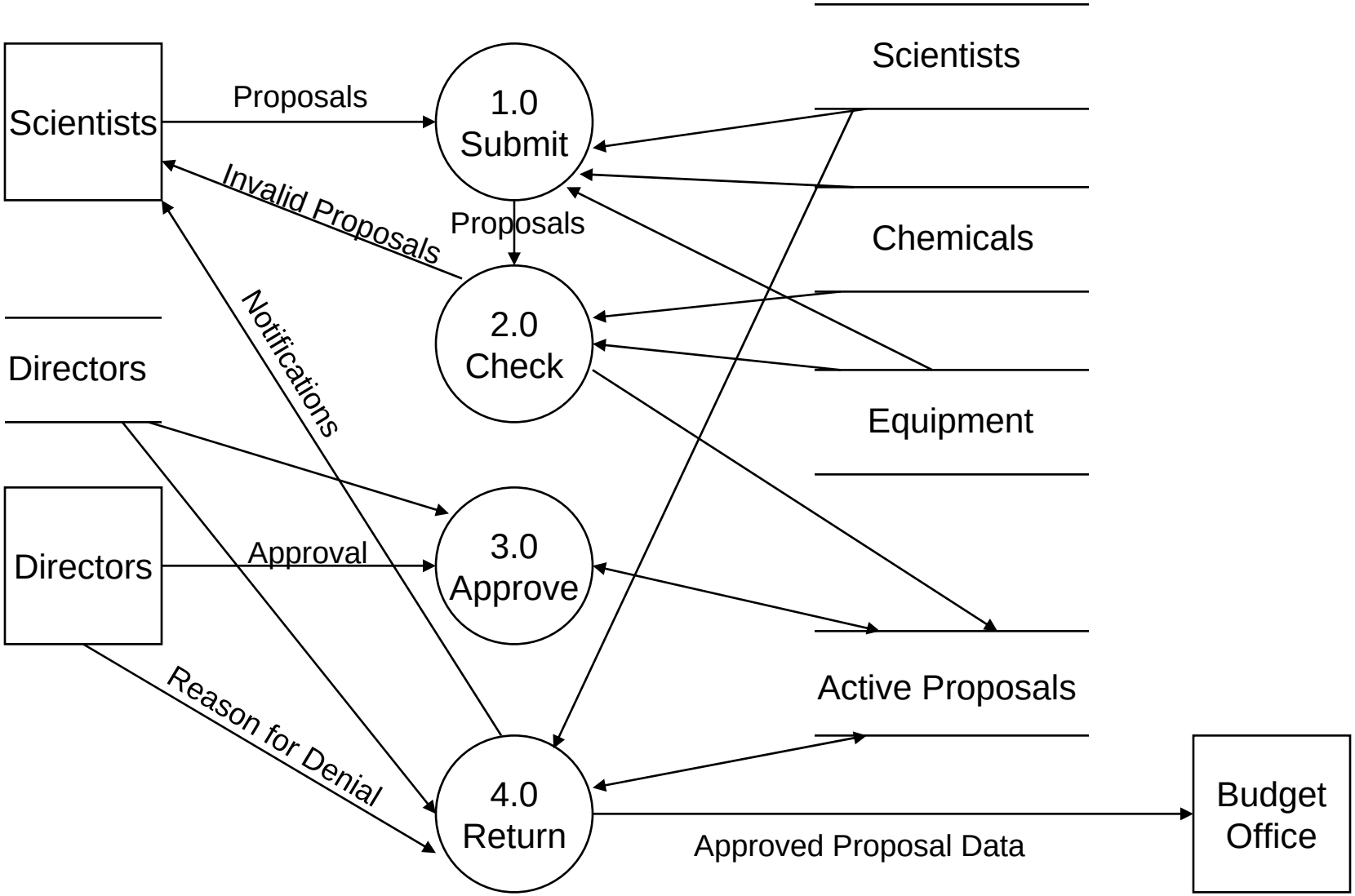
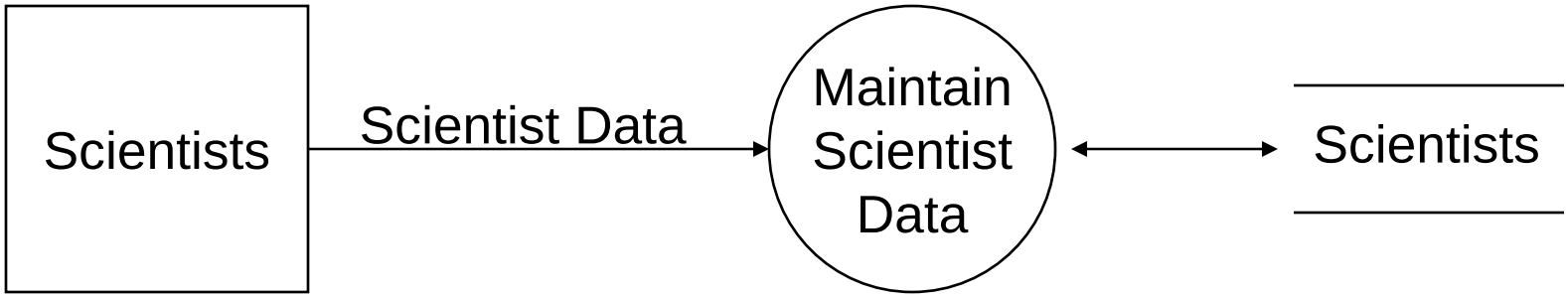


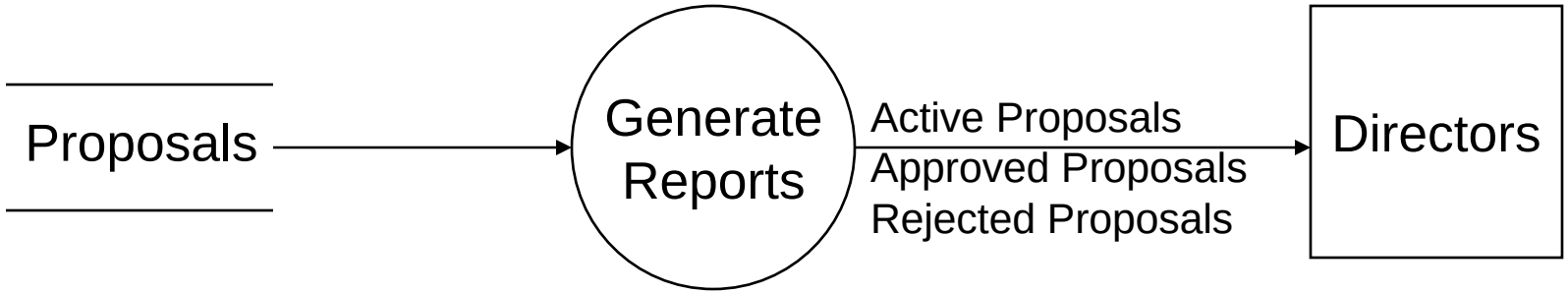
Chapter 8 Problem 10 Solution

- Step 7: Identify the information processes
  - DFDs are also required for maintenance processes for all non-event entities e.g.



Chapter 8 Problem 10 Solution

- Step 7: Identify the information processes
  - DFDs are also required for reporting processes for all reports not included in the main DFD e.g.



Benefits of REA (so far)

- Identifies the entities for EER modeling
- Identifies the required processes so that model integration is automatic
- Leads to tables already in 3NF (to be discussed in Chapter 9)

Unresolved Issues ?

- Be aware that Chapters 12 & 13 address the Sales and Purchases cycles
- Even though we won't get to these chapters for some time, it is O.K. to read ahead and look for ideas that may help with Sheldon Shirts

Unresolved Issues ?

- You must use a (large – 2½" minimum) ring binder to submit future stages of the Group Project
- Obtain a proper set of file dividers
- File the Group Logs FIRST
- File Stage 1 in Section 1 – include ALL cycles
- File Stage 2 in Section 2 etc

Three "Events" . . .

- Please remember to download from Blackboard (Course Documents – Supplemental Materials), print, read, and bring to class next time, the document:

  Three "Events" That Define an REA Methodology

Extended REA Ontology

- A document "Extended REA Ontology" is now available from Blackboard (Course Materials – Resources).
  Please download it, print it, and bring it to the next class.
- Bring Sheldon Shirts write-up to next class, too.