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Current Topics in  
Accounting Research

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## OVERVIEW

- Some Ontological Issues
- Literature Review for Ethics in Accounting
- Homework 3
- Accounting Ontologies & Design Science
- Assignments for Week 5

## Some Ontological Issues

- Partridge (2002) points out that neither Bunge's not Sowa's work (on which the Wand/Weber and REA ontologies, respectively, are based) is in the philosophical mainstream
- There is no significant focus on key philosophical concerns such as identity and mereology
- The distinction between internal and external agents fails to be objective (because it takes a specific party's point of view – related to the focus on epistemology rather than ontology)

## Some Ontological Issues

- Considered as a taxonomy, the REA Ontology has already proved extremely fruitful as a pedagogical tool
- However, if we want the REA Ontology to provide a theoretical underpinning for our work, it needs:
  - ★ Contain more than mere taxonomy
  - ★ Be consistent with a wider philosophical approach
    - But which?

## Some Ontological Issues

- Traditionally, ontology has considered the things to whose existence a given theory commits us
  - ★ W.V.O. Quine's notion of "ontological commitment"
- They are not only taxonomized, but include at the top level the "major categories of existence"
  - ★ An idea introduced by Aristotle
- Sowa's approach is categorical in this sense

## Some Ontological Issues

- Aristotle's categories included:
  - ★ Substance
  - ★ Quantity
  - ★ Quality
  - ★ Relation
  - ★ Place
  - ★ Time
  - ★ Position
  - ★ State
  - ★ Action
  - ★ Affection

## Some Ontological Issues

- There have been many attempts to update this. For example, Grossmann (1983):
  - ★ Individuals
  - ★ Properties
  - ★ Relations
  - ★ Classes
  - ★ Structures
  - ★ Quantifiers
  - ★ Facts
  - ★ Negatives

## Some Ontological Issues

- Of particular interest in such a categorical analysis is the definition of facts
- In 20<sup>th</sup> century philosophy, facts have often been identified with 'states of affairs' – insofar as they are distinguished, there is dispute as to whether there can be states of affairs that are not the case
- Armstrong (1997), for example, considers states of affairs to be the fundamental category of reality
- Other contemporary approaches (e.g., Bacon, 1995) suggest that the fundamental category of reality is 'tropes': instances or bits of a property or relation, such as 'Peter's confusion'
- On the other hand, some philosophers identify 'events' as states of affairs of a certain sort
  - ★ Kim and Goldman treats events as time-referenced states-of affairs
  - ★ Davidson considers events as spatio-temporally located singular entities
  - ★ Chisholm considers events as contingent basic states-of affairs (not individuated by time)
  - ★ Bennett treats events as tropes
- Can there be negative events (the dog not barking in the night, for example)?

## Some Ontological Issues

- If we define 'significant events' within the REA ontology in accordance with an established view of events in a more general ontology, we can take advantage of whatever principles of identity, mereology, etc. come with it
- If we adopt 'significant events' as primitive within our domain ontology, then it is our responsibility to explain how two descriptions can be determined to refer to the same event, how events are individuated, what it means for one event to be part of another, and so on
  - ★ Other relations between events may also be valuable: for example, what can we say about an event preceding another, or causing another?
- Of course, my focus here on events is not meant to suggest that there are not also philosophical issues to be resolved with regard to economic resources, and agents
- In addition, REA reifies certain relations between business entities, such as stock-flows, etc., and this introduces a new set of issues
- Another view of the particular events that we are interested in suggest that they may be identified with changes of states

## Some Ontological Issues

- How will we reconcile our theoretical (ontological) approach with our pedagogical practice?
- 'Significant event'
  - ★ Significant
    - We want to plan, execute, control or evaluate
  - ★ Event
    - Step in a business process
- Epistemologically, it makes sense to *discover* 'significant events' in this way
- But ontologically, it may be preferable to define a business process as a sort of sequence of regulated linked events

## Some Ontological Issues

- All this may seem both abstract and abstruse – and considered purely as an intended theoretical underpinning, perhaps it is
- At a very practical level, however, many of us are familiar with the difficulties students face when first trying to determine from a narrative what ‘significant’ events have taken place – and their distress on being told that while it may be correct to say that three significant events have occurred, it would not be incorrect to say there were five, or two – but perhaps less useful for our purposes of planning, executing, controlling or evaluating

## Some Ontological Issues

- Unrelated to REA, Shafer, Gillett and Scherl (2000) proposed a Logic of Events, a mathematical theory that incorporates axioms for both refinement of events and a temporal ordering of events (and their interaction)
- Among other things, such a theory explicitly specifies how events can be created from other events

# Some Ontological Issues

- Consider, for example:
  - ★ Ship Goods
  
  - ★ Pick goods
  - ★ Pack boxes
  - ★ Hand boxes off to shipping agent
  
- Which is correct?
  - ★ Both!
  
- Pick goods, Pack boxes, Hand off: each *refines* Ship goods
- Pack boxes *requires* Pick goods
  
- Etc.

## Some Ontological Issues

- An issue that should be addressed in an ontological analysis is whether or not our 'significant events' are to be considered extended in time, or as instantaneous events that 'occur', consistently with how we record them at a particular moment

## Some Ontological Issues

- Finally, we should consider whether or not we prefer a parsimonious or a profligate ontology:
  - ★ If we admit ancillary events into our ontology, typification will give us instigation events, facilitation events, and termination events
  - ★ Conversely, if we admit instigation events, facilitation events, and termination events into our ontology, generalization will give us 'business' events
  - ★ Alternatively, we may prefer to assert that our ontology includes all types of significant events we are able to identify
    - In this case, typification and generalization will not be principles for generating 'defined types' but a kind of relation between existing types

## Some Ontological Issues

- Philosophically, there is a great deal more work to be done . . . .
- Practically, we propose extensions to the REA ontology, based on the widely accepted concept of significant business events and experience of using the REA methodology as a pedagogical tool to teach the design of accounting information systems:
  - ★ A significant event is any step in a business process that management wants to plan, execute, control or evaluate

## Literature Review

- Two “teams”
- Format paper and bibliography for The Accounting Review
- Use EndNote for bibliography
- Identify all papers relating to Ethics in Accounting, including Auditing, Accounting Education, etc.
- Analyze and Summarize

# Literature Review

- Team 1

- Deirdre
- Fang-Chun
- Yong Bum

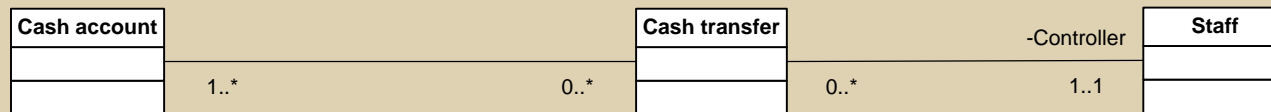
- Team 2

- Amy
- Pyung Kyung

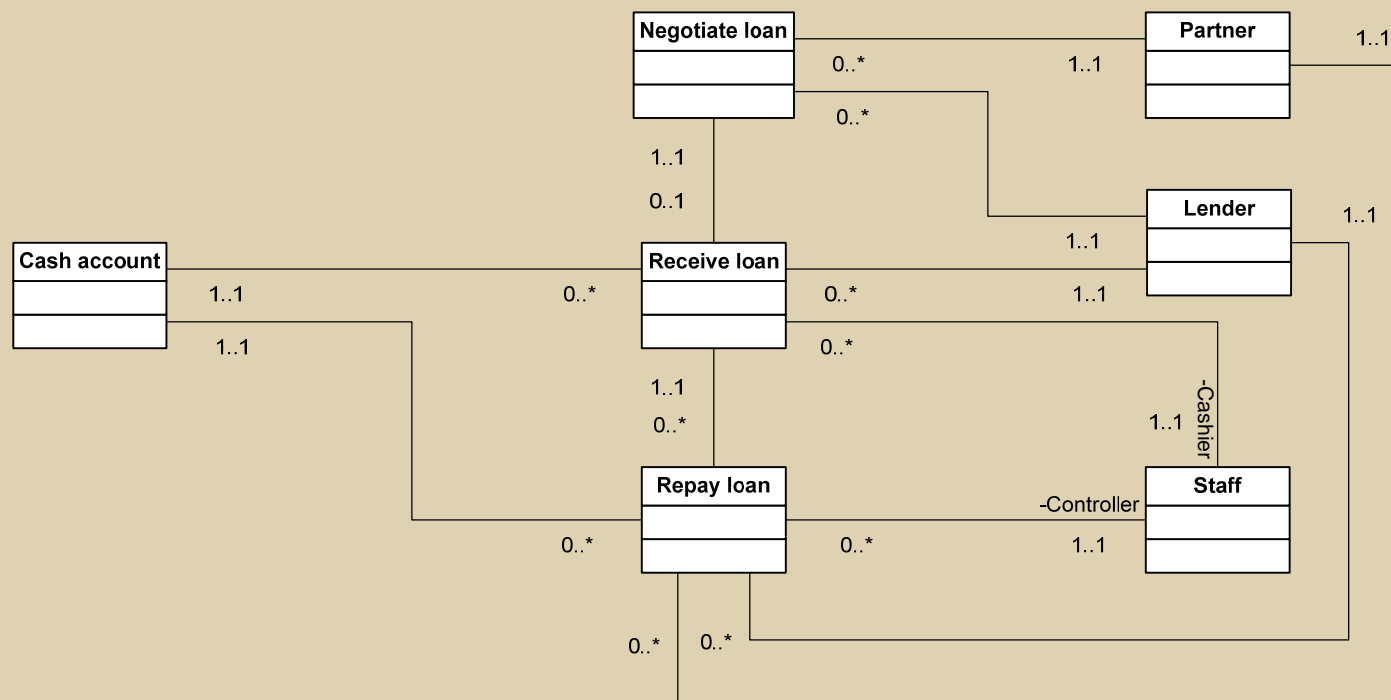
## Homework 3

- Prepare UML diagrams, and Data Repository Structures for:
  - ★ Cash Transfers
  - ★ Loans
  - ★ Services
  - ★ Production
  - ★ Human Resource Management
- Submit as a WORD document via the Digital Drop Box - I recommend, but do not require, VISIO 2003

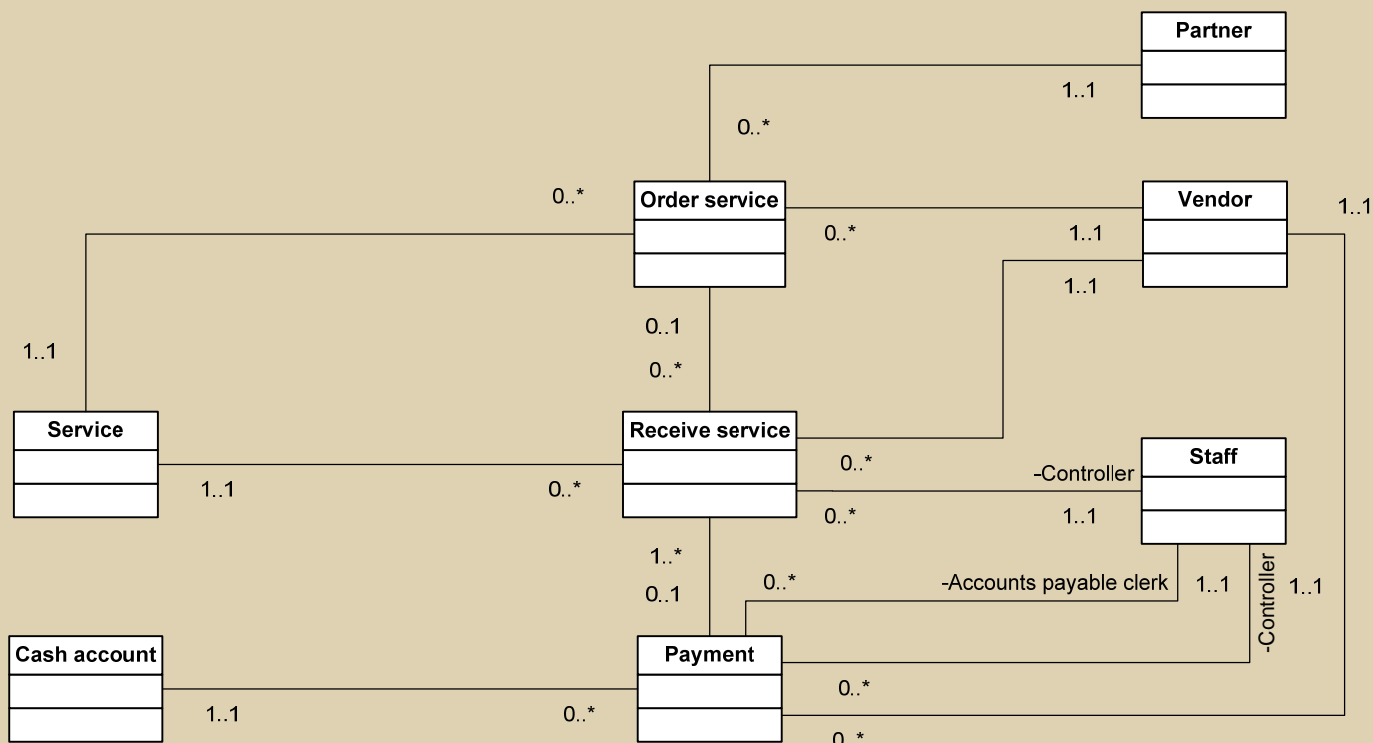
# Homework 3 – Cash Transfers



# Homework 3 – Loans



# Homework 3 – Services



## Homework 3 – Services

- OrderService (PurchaseOrder#, PurchaseOrderDate, [Service#], [Partner#], [Vendor#], CostEstimate)
- ReceiveService (ReceiveService#, ReceiveServiceStartDate, ReceiveServiceEndDate, [Service#], [Staff#], [Vendor#], VendorInvoice#, VendorInvoiceTax, VendorInvoiceAmount, PaymentDueDate)
- ServicePayment (ServicePayment#, ServicePaymentDate, [Staff#], [AuthorizationStaff#], [Vendor#], [CashAccount#], Check#)
- Service (Service#, ServiceDescription)
- CashAccount (CashAccount#, CashAccountName, CashAccountDescription, BankName, BankAccount#)

## Homework 3 – Services

- Vendor (Vendor#, VendorName, VendorAddress, VendorCity, [VendorStateCode], VendorZipCode, VendorTelephone, VendorContactName)
- Partner (Partner#, PartnerLastName, PartnerFirstName, PartnerMiddleInitial, PartnerSocialSecurity#, PartnerAddress, PartnerCity, [PartnerStateCode], PartnerZipCode, PartnerTelephone#, PartnerJobTitle, PartnerAnnualSalary, [PartnerPayPeriodCode], [PartnerMaritalStatusCode], [PartnerNJRateCode], PartnerTaxExemptions, PartnerNJTaxExemptions)
- Staff (Staff#, StaffLastName, StaffFirstName, StaffMiddleInitial, StaffSocialSecurity#, StaffAddress, StaffCity, [StaffStateCode], StaffZipCode, StaffTelephone#, StaffJobTitle, StaffAnnualSalary, [StaffPayPeriodCode], [StaffMaritalStatusCode], [StaffNJRateCode], StaffTaxExemptions, StaffNJTaxExemptions)
- OrderService-ReceiveService ([PurchaseOrder#], [ReceiveService#])
- ReceiveService-ServicePayment ([ReceiveService#], [ServicePayment#], AmountPaid)
- State (StateCode, StateName, StateSalesTaxRate)
- ZipCode (ZipKey, ZipCode, ZipCity, ZipState)



## Homework 3 – Production

- ScheduleProduction (Schedule#, ScheduleDate, [Partner#])
- JobOrder (Job#, JobDate, [Schedule#], [Partner#], [FinishedGoods#], ScheduledJobStartDate)
- IssueRawMaterials (IssueRawMaterials#, IssueDate, [Job#], [Partner#])
- AssembleComputer (Assembly#, AssemblyCompletionDate, [Partner#])
- InstallSoftware (Installation#, InstallationCompletionDate, [Assembly#], [Partner#])
- Test (Test#, TestCompletionDate, [Installation#], [Partner#], [FinishedGoods#])
- RawMaterials (RawMaterials#, RawMaterialsDescription, [RawMaterialsCategory#], RawMaterialsUnits, RawMaterialsBin#, RawMaterialsReorderLevel, RawMaterialsStandardCost)
- TimeWorked ([TimeSheet#], [Job#], [Activity#], Hours)
- FixedAsset (FixedAsset#, [ReceiveFixedAsset#], [FixedAssetCategoryCode], FixedAssetDescription, [FixedAssetLocationCode], FixedAssetCost)
- FinishedGoods (FinishedGoods#, [FinishedGoodsType#], FinishedGoodsDescription, Motherboard, Processor, Memory, VideoMemory, HardDrive, DVD/CD, USBPorts, FloppyDisk, Monitor, PowerSupply, Case, Keyboard, Mouse, FinishedGoodsStandardCost, FinishedGoodsSellingPrice, [Customer#], [Schedule#], ScheduledProductionQuantity, ScheduledProductionStartDate, ScheduledProductionCompletionDate)

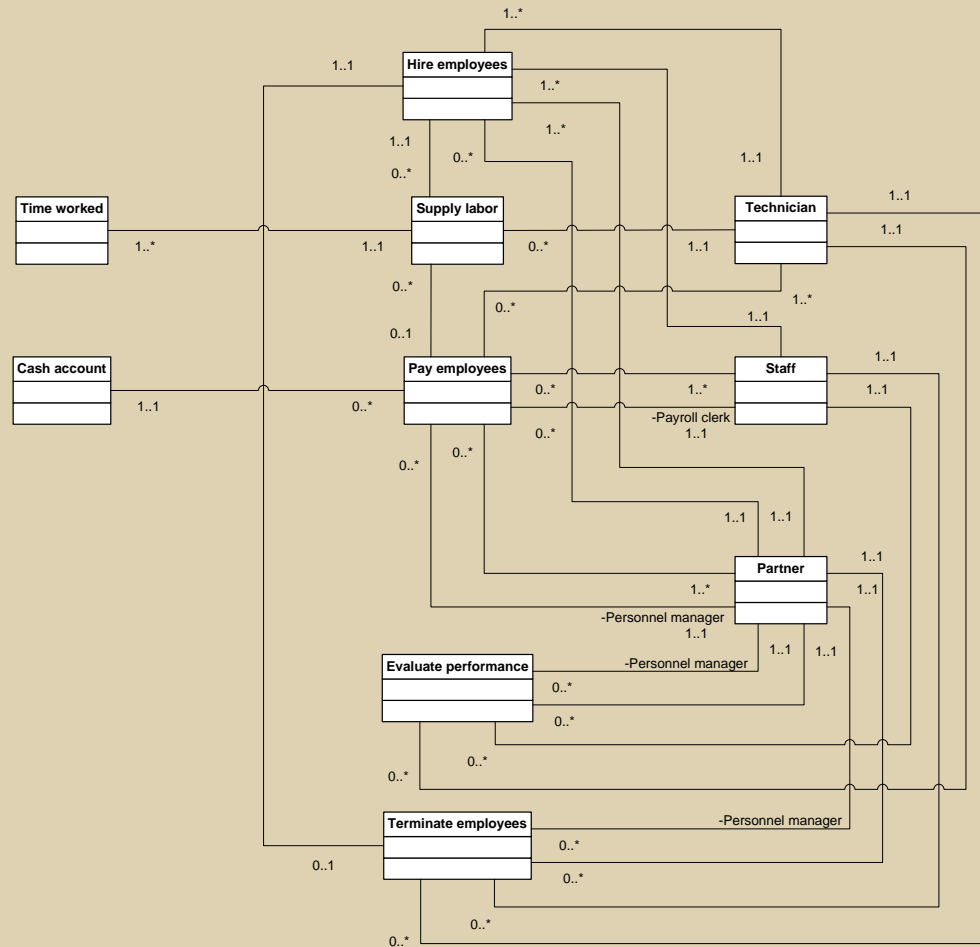
## Homework 3 – Production

- Partner (Partner#, PartnerLastName, PartnerFirstName, PartnerMiddleInitial, PartnerSocialSecurity#, PartnerAddress, PartnerCity, [PartnerStateCode], PartnerZipCode, PartnerTelephone#, PartnerJobTitle, PartnerAnnualSalary, [PartnerPayPeriodCode], [PartnerMaritalStatusCode], [PartnerNJRateCode], PartnerTaxExemptions, PartnerNJTaxExemptions)
- Technician (Technician#, TechnicianLastName, TechnicianFirstName, TechnicianMiddleInitial, TechnicianSocialSecurity#, TechnicianAddress, TechnicianCity, [TechnicianStateCode], TechnicianZipCode, TechnicianTelephone#, TechnicianHourlyWage, [TechnicianPayPeriodCode], [TechnicianMaritalStatusCode], [TechnicianNJRateCode], TechnicianTaxExemptions, TechnicianNJTaxExemptions)
- Customer (Customer#, CustomerName, CustomerAddress, CustomerCity, [CustomerStateCode], CustomerZipCode, CustomerTelephone, CustomerContactName)

# Homework 3 – Production

- JobOrder-RawMaterials ([Job#], [RawMaterials#], QuantityRequired)
- JobOrder-FixedAsset ([Job#], [FixedAsset#])
- JobOrder-Technician ([Job#], [Technician#])
- IssueRawMaterials-AssembleComputer ([IssueRawMaterials #], [Assembly#])
- IssueRawMaterials-RawMaterials (([IssueRawMaterials #], [RawMaterials#], QuantityIssued)
- AssembleComputer-TimeWorked ([Assembly#], [TimeSheet#], [Job#], [Activity#])
- AssembleComputer-FixedAsset ([Assembly#], [FixedAsset#])
- InstallSoftware-TimeWorked ([Installation#], [TimeSheet#], [Job#], [Activity#])
- InstallSoftware-FixedAssets ([Installation#], [FixedAsset#])
- Test-TimeWorked ([Test#], [TimeSheet#], [Job#], [Activity#])
- Test-FixedAsset ([Test#], [FixedAsset#])
- FinishedGoodsType (FinishedGoodsType#, FinishedGoodsTypeCategory, FinishedGoodsTypeDescription)
- RawMaterialsCategory (RawMaterialsCategory#, RawMaterialsCategory)
- ProductionActivity (Activity#, ActivityDescription)
- State (StateCode, StateName, StateSalesTaxRate)
- ZipCode (ZipKey, ZipCode, ZipCity, ZipState)

# Homework 3 – Human Resources



# Homework 3 – Human Resources

- HireTechnician (Hire#, Date, [Partner#], [Employee#], AvailabilityDetails, StartDate)
- HireStaff (Hire#, Date, [Partner#], Employee #, AvailabilityDetails, StartDate)
- HirePartner (Hire#, Date, [Partner#], [Employee#], AvailabilityDetails, StartDate)
- SupplyLabor (TimeSheet#, TimeSheetDate, [Technician#], [Partner#])
- PayTechnicians (TechnicianPayroll#, PayrollDate, [Staff#], [Partner#], [CashAccount#])
- PayStaff (StaffPayroll#, PayrollDate, [Staff#], [Partner#], [CashAccount#])
- PayPartners (PartnerPayroll#, PayrollDate, [Staff#], [Partner#], [CashAccount#])
- EvaluateTechnicianPerformance (Evaluation#, Date, [Partner#], [Employee#], EvaluationDetails)
- EvaluateStaffPerformance (Evaluation#, Date, [Partner#], [Employee#], EvaluationDetails)
- EvaluatePartnerPerformance (Evaluation#, Date, [Partner#], [Employee#], EvaluationDetails)
- TerminateTechnician (Termination#, Date, [Hire#], [Partner#], [Employee #], ReasonForLeaving, LeaveDate)
- TerminateStaff (Termination#, Date, [Hire#], [Partner#], [Employee #], ReasonForLeaving, LeaveDate)
- TerminatePartner (Termination#, Date, [Hire#], [Partner#], [Employee #], ReasonForLeaving, LeaveDate)

# Homework 3 – Human Resources

- TimeWorked ([TimeSheet#], [Job#], [Activity#], Hours)
- CashAccount (CashAccount#, CashAccountName, CashAccountDescription, BankName, BankAccount#)
- Partner (Partner#, PartnerLastName, PartnerFirstName, PartnerMiddleInitial, PartnerSocialSecurity#, PartnerAddress, PartnerCity, [PartnerStateCode], PartnerZipCode, PartnerTelephone#, PartnerJobTitle, PartnerAnnualSalary, [PartnerPayPeriodCode], [PartnerMaritalStatusCode], [PartnerNJRateCode], PartnerTaxExemptions, PartnerNJTaxExemptions)
- Staff (Staff#, StaffLastName, StaffFirstName, StaffMiddleInitial, StaffSocialSecurity#, StaffAddress, StaffCity, [StaffStateCode], StaffZipCode, StaffTelephone#, StaffJobTitle, StaffAnnualSalary, [StaffPayPeriodCode], [StaffMaritalStatusCode], [StaffNJRateCode], StaffTaxExemptions, StaffNJTaxExemptions)
- Technician (Technician#, TechnicianLastName, TechnicianFirstName, TechnicianMiddleInitial, TechnicianSocialSecurity#, TechnicianAddress, TechnicianCity, [TechnicianStateCode], TechnicianZipCode, TechnicianTelephone#, TechnicianHourlyWage, [TechnicianPayPeriodCode], [TechnicianMaritalStatusCode], [TechnicianNJRateCode], TechnicianTaxExemptions, TechnicianNJTaxExemptions)

# Homework 3 – Human Resources

- SupplyLabor-PayTechnician ([TimeSheet#], [Payroll#])
- PayTechnicians-Technician ([TechnicianPayroll#], [Technician#], Check#, GrossPay, FederalTax, StateTax, FICA, Medicare)
- PayStaff-Staff ([StaffPayroll#], [Staff#], Check#, GrossPay, FederalTax, StateTax, FICA, Medicare)
- PayPartners-Partner ([PartnerPayroll#], [Partner#], Check#, GrossPay, FederalTax, StateTax, FICA, Medicare)
- ProductionActivity (Activity#, ActivityDescription)
- PayPeriod (PayPeriodCode, PayPeriod, FederalSingleExemptionAmount, NJSingleExemptionAmount))
- MaritalStatus (MaritalStatusCode, MaritalStatus)
- NJRate (NJRateCode, NJRate)
- FederalTax ([PayPeriodCode], [MaritalStatusCode], LowerLimit, UpperLimit, Base, Percentage)
- NJTax ([PayPeriodCode], [NJRateCode], LowerLimit, UpperLimit, Base, Percentage)
- FICATax (Year, WageLimit, Percentage)
- MedicareTax (Year, Percentage)
- State (StateCode, StateName, StateSalesTaxRate)
- ZipCode (ZipKey, ZipCode, ZipCity, ZipState)

# Accounting Ontologies & Design Science

- **Amy:** ISO/IEC 15944-4:2006 Information Technology - Business Agreement Semantic Descriptive Techniques -- Part 4: Business Transaction Scenarios – Accounting and Economic Ontology.
- **Fang-chun:** Partridge, Christopher. 2002. "Shifting the Ontological Foundations of Accounting's Conceptual Scheme".
- **Amy:** Wand, Yair and Ron Weber. 1990. "An Ontological Model of an Information System" IEEE Transactions on Software Engineering (Vol. 16, No. 11): pp. 1282-1292.
- **Deirdre:** Weber, Ron. 2002. "Ontological Issues in Accounting Information Systems." In *Researching Accounting as an Information Systems Discipline*. American Accounting Association, pp. 13-33.
- **Pyungkyung:** Vandenbossche, P. E. A. and J. C. Wortmann. 2006. "Why Accounting Data Models from Research are not Incorporated in ERP Systems". Paper presented at the 2nd International REA Technology Workshop, June 25, 2006.
- **Yongbum:** March, S.T. and G. F. Smith. 1995. "Design and Natural Science Research on Information Technology" *Decision Support Systems* (Vol. 15): pp. 251-266.
- **Pyungkyung:** David, Julie S., G. Gerard, and William E. McCarthy. 2002. "Design Science: An REA Perspective on the Future of AIS." In *Researching Accounting as an Information Systems Discipline*. American Accounting Association, pp. 35-63.
- **Fang-chun** : 2007. Design Research in Information Systems. Web Site.
- **Deirdre:** Dunn, Cheryl and Sev Grabski. 2002. Empirical Research in Semantically Modeled Accounting Systems" In *Researching Accounting as an Information Systems Discipline*. American Accounting Association, pp. 157-180.
- **Yongbum:** Hruby, Pavel. 2002. "Universal Enterprise Model: Business Pattern Language." Microsoft Business Solutions, Denmark.

# REA Ontology and Design Science

- What is the REA Ontology?
- By what standards and how can ontologies be assessed?
- What are the strengths and weaknesses of REA as an ontology?
- How can REA be improved ontologically
- How can REA be improved in practice?
- Are there (better) alternatives to REA? What are they? How are they better?

# REA Ontology and Design Science

- What is Design Science?
- Is Design Science Research?
- Is work on REA Ontology Accounting Research?
- How can REA and alternative Ontologies help us understand Accounting?
- How can REA and alternative Ontologies help us understand Accounting Information Systems?

## REA Ontology and Design Science

- How is REA usefully extended to document what ought to happen, what did happen, and what we plan to have happen?

## REA Ontology and Design Science

- What researchable questions are there in the areas of REA, REA Ontology, Design Science, Accounting Theory and Business/Economic/Accounting Ontologies?

## Assignments for Week 5

- **Yongbum:** Shortcliffe, E., and B. G. Buchanan. 1975. "A Model of Inexact Reasoning in Medicine" *Mathematical Biosciences* (Vol. 23).
- **Pyungkyung:** Duda, R. O., P. E. Hart, and N. J. Nilsson. 1976. "Subjective Bayesian Methods for Rule-Based Inference Systems" *Proceedings National Computer Conference (AFIPS)* 15.
- Gillett, Peter. R. 1993. "Automated Dynamic Audit Programme Tailoring: An Expert System Approach" *Auditing: A Journal of Practice and Theory*. (Vol. 12, Supplement): pp. 173-193.
- **Fang-chun :** Shafer, Glenn. and Rajendra. P. Srivastava. 1990. "The Bayesian and Belief-Function Formalisms - A General Perspective for Auditing" *Auditing: A Journal of Practice and Theory*.
- **Amy:** Srivastava, Rajendra. P. and Glenn. Shafer. 1992. "Belief\_Function Formulas for Audit Risk" *The Accounting Review* (Vol. 67, No. 2).
- **Deirdre:** Rajendra. P. Srivastava. 1995. "A General Scheme for Aggregating Evidence in Auditing: Propagation of Beliefs in Networks." In *Artificial Intelligence in Accounting and Auditing*. Markus Wiener Publishers.