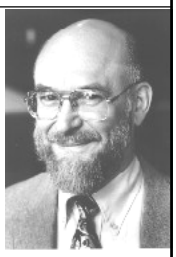
NORMA – Suggestions for Improvement

GEINTRO

ORM 2008, Monterrey, Mexico



Evaluation & Enhancements for NORMA

Student User Suggestions

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and College of Continuing Education
University of Minnesota

Advanced Database Design - x431, 4131(CCE)

431START

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1. Introduction
2. ER / Relational Data Modeling
3. Normalization
4. Modeling & Data Modeling
   - What, Why, How; Taxonomy of Schemes
5. Object Role Modeling (ORM)
6. ORM Constraints
7. Sub/Super Types
8. Data Model Presentation
9. Data Modeling Projects
10. ORM => Relational Mapping
11. Business Rules
12. Conceptual Query Language (on ORM)

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Carlson School of Management
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NORMA – Suggestions for Improvement

The Course

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- Both undergraduate and graduate students
- Several working IS professionals
- Given a series of progressively more difficult data modeling assignments
- Done using NORMA
- Self-reported average time of 20 hours total.
  - Longest time ~5 times the shortest time!
- Instructor provided *Usage Notes* for NORMA
  - Succinct, comprehensive, step by step, – vs. Lab Notes
- Student Feedback Memo at end of course
  - Good points, problems, suggestions for improvement
- Use of NORMA required; Memo part of course grade.
  - work to completion; overcoming problems
  - not an option to give up using NORMA
  - motivated to think critically and creatively

This Paper

NORMA

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- Based on the Student Feedback Memos
- Influenced and augmented by the instructor
- Unstructured compilation of responses
- Topics & comments self-selected, not prescribed
- Hence no meaningful metrics
- Focus on suggestions for improvement
- Aimed at the developer/vendor
- Some suggestions of interest to data modeling tools in general, not just NORMA

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The Goal

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- For ORM to penetrate data modeling practice world wide
- Requires a supporting modeling tool that is:
  - Industrial strength for enterprise modeling
  - Greater functionality in ORM model presentation
    - Simplification, abstractions, partitioning, reporting,...
  - Easy to use
  - Intuitive for the novice
  - Efficient for the experienced modeler
  - Well documented
  - Website to get answers to questions, solutions to problems, and to submit suggestions for improvement
- NORMA still falls short of these requirements

Good Points – Compliments

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- Most students liked and enjoyed using NORMA
- Frequently mentioned:
  - Relatively independent of Visual Studio
  - User Interface – intuitive and easy to use
  - Verbalization – most often mentioned
    - Very helpful in building a correct ORM model
      Immediate verification that diagram says what was intended
  - Relational table view – helps to build a correct ORM model
  - Fact Editor – makes it easier to create a diagram
  - Sample populations – using real data
  - Optional display of 'fork' notation for uniqueness
    - More visually intuitive representation of multiplicity

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Problems & Suggested Improvements

NORMA

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TOPIC AREAS:

1. User Interface
2. Documentation & Help
3. Operating Environment & Error Handling
4. Model Construction & Manipulation
5. Constraints
6. Exporting & Copying Diagrams
7. Sample Population Data
8. Verbalization
9. Reports
10. Diagram Presentation – Abstractions
11. Relational Table View
12. Database Generation

1. User Interface

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- Needs to be consistent, uniform, intuitive
  - People won't usually read the documentation first
  - Many examples of inconsistency reported; covered under other topics

SUGGESTIONS:

- Develop and document guidelines for menus, navigation, mouse clicking, etc.
  - Need explicit standards to guide developers
- Grey out drop-down menu choices which do not apply to NORMA (most don't)
- Managing tool bars and windows – placement, hiding
  - Much functionality, but confusing for the beginner

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2. Documentation & Help

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- Many comments on availability and quality
  - Most online help (in the system and on the web) does not relate to NORMA
  - Students gave up; recommended not using
- Types of documentation needed:
  - Release Notes – fixes, known problems, planned fixes
  - Tutorial with hands-on exercises (in Lab Notes)
  - User Reference Manual with architectural overview and with table of contents and index to aid lookup
  - > available online, with 'how to' and examples
- Explain that selecting a reference mode also selects a default data type which designer should check and perhaps change.

3. Operating Environment

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- Running as a plug-in to Visual Studio
  - A significant barrier to adopting NORMA
  - May be very useful for the developer
  - But little value added for the data modeler
  - Many undesirable consequences for the user
  - Most menu options & online help apply to VS, not NORMA

SUGGESTIONS:

- Decouple NORMA from Visual Studio
  - At least from the user's perspective
- Click on an _.ORM file to start up NORMA

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3'd. Error Handling

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- Help users prevent and correct errors

SUGGESTIONS:

- Document (tell the user up front), for example:
  - Reference mode required on every entity object type, not on value object types, and optional on subtypes
  - Every predicate requires at least one reading
  - Every predicate requires a uniqueness constraint, except for unary predicate
- For each error:
  - Show where occurs in diagram or properties window
  - Provide explanation and possible corrective actions
  - Jump to online help for a short tutorial and examples of how to do it right

4. Model Construction & Manipulation

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- 'Deleted' object reappears in object window pane or in the table diagram
- Readings deleted only from Readings window, stray readings remain after deleting a predicate
- Could not add a value object type for tool box, must first add entity object type and then change its properties

SUGGESTIONS:

- Clarify the dialog on remove from diagram only vs. delete from underlying repository
- Add a reference mode for Date/Time
- Show all relevant properties in the Prop.Window (e.g., uniqueness, mandatory, readings) and allow changes from there

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5. Constraints

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- Inconsistent user interface is most evident in the treatment of constraints
  - e.g. To change some, must delete and recreate
- Adding a frequency constraint on a unary predicate, the system converts to binary, then sets a minimum of 2
- Difficult to select a role, and in the right sequence

SUGGESTIONS:

- Add, change, or delete all constraints in the same way
- Perhaps have a separate constraints window as with the properties window, and allow changes from there
- Add a frequency constraint on an object population

6. Exporting & Copying Diagrams

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- Several students never discovered 'Copy Image' or knew what it meant
  - CTRL-C not work; screen shots not useful
- A copied image pasted into PowerPoint displayed OK, but big blobs appear on printing
  - One student discovered: ungroup the image and find some short line segments defined with a line width of ~100 points! Redefine with a line width of 1 or 2.

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7. Sample Population Data

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- Entering sample data is tedious, moving between mouse and keyboard
- System not always pickup data previously entered

SUGGESTIONS:

- Allow use of TAB and ENTER keys on input
- Data entered for one predicate, available for use on other predicates, e.g., ternary, objectified, or subtypes.
- Allow input of sample data values for objects alone then use when entering data for a predicate
- Allow import/export from/to tables in Excel, Access, Word...

8. Verbalization

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- Some verbalizations are quite convoluted and not easy to understand.

SUGGESTIONS: Some examples:

- With “at most one” it is easy to miss “zero or one”
- For a ternary ring fact type, to the verbalization “Any object, object, object combination can occur only once,” add “in that particular order”
- When defining a reflexive relationship, prompt the designer to apply ring constraints

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9. Reports

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- Reporting on an ORM diagram was less than adequate; VisioEA was more comprehensive

SUGGESTIONS:

- Enable/explain how to generate a report with all the relevant or desired model information for all objects, fact types, constraints, notes, sample data values, physical data types, etc.
- Allow user to tailor the output
- Offer similar reporting for a relational table view

10. Diagram Presentation – Abstractions

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WHEREAS:

- Abstract presentation of a data model is only needed for people, not the system
- People have limited cognitive ability
- We expect business users (people) to understand and validate a data model
- NORMA offers few abstraction capabilities
  - Partitioning a large diagram into multiple pages
  - Context window – focusing on one object

THEREFORE:

- We (the professional data modeling community with our data modeling tools) must help people comprehend a data model

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Abstraction

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- Model is an abstract re▪presentation of some real-world domain of interest
- Abstraction means "hiding detail" (NOT "Generalization" which is only one abstraction strategy)
- To handle complexity in large data model diagrams

Forms of Re▪Presentation

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Given a (data) model (semantics):

- Narrative (Descriptive)
  - \+ RICH semantics - expressed in free form English (or other language)
  - – Informal - still incomplete, imprecise, ambiguous
  - – Not machinable (processable by computer system)
- Graphical Diagram
  - \+ People can more readily understand
  - \+ Can be more concise and more precise
  - – Difficult for people to comprehend large models
  - – Not easily machinable -- primarily for people
- Verbal - elementary fact sentences, expressed in pseudo English
  - \+ People can readily understand
  - ° Derivable from underlying model if follow certain naming rules
  - – Verbose (if presented all at once!)
- Formal - expressed in some formal language (e.g., DDL)
  - \+ MACHINABLE
  - – Limited semantics are expressible
  - – Not easily understood by people

STRATEGY: Diagram(s) + Verbalization + Narrative (Supp) -> Formal

Modeling: is Choosing...

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REALITY is Infinite, Complex, Multidimensional, Detailed.

- so we must *CHOOSE*:

- SCOPE / Boundary
  - where to look
- FOCUS
  - what to look for
- DEPTH / Resolution
  - how much to look for

... based upon our *PURPOSE*

Presenting the Data Model

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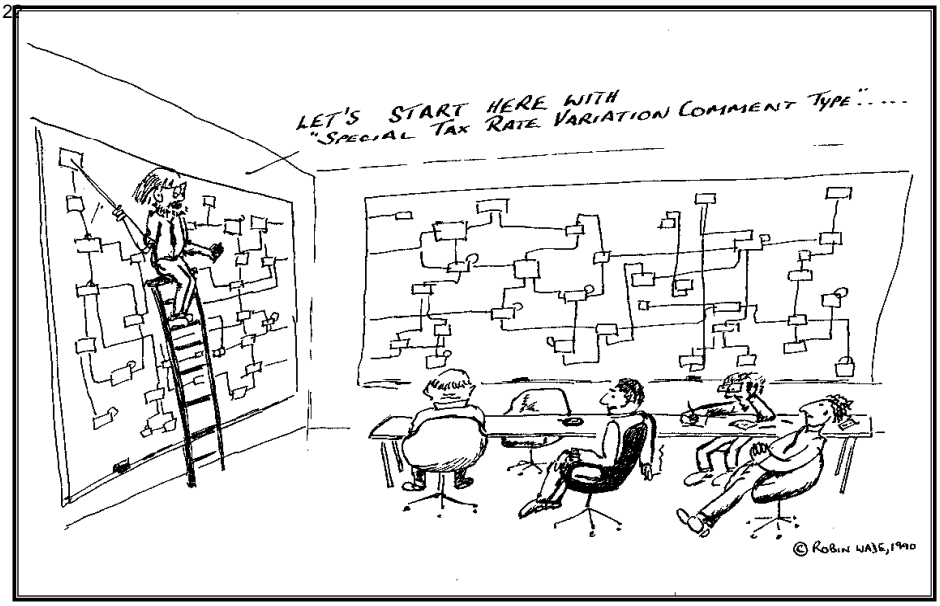

Strategies to Aid Human Comprehension

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- Promote understanding of the whole, the big picture
- Focus attention; Suppress detail; highlight the important; reflect semantic importance

Help dealing with bigness and complexity:

1. Differentiation, Encoding (surrogates), Layout
2. Abstraction / Simplification
   - reducing the information presented at one time
   a. SCOPE - PARTITIONING -- looking at *part* (FENCE)
      - grouping –> classification –> decomposition –> hierarchy
   b. DEPTH -- looking at *less*; suppress detail
3. Focus - display local detail in its global context (POINT)
   - viewing without, and with ***distortion***
4. Navigation - over a given model presentation
   - windowing - single, multiple (tiled, overlapping)
   - scrolling, panning, zooming, searching

Graphic Retinal Variables

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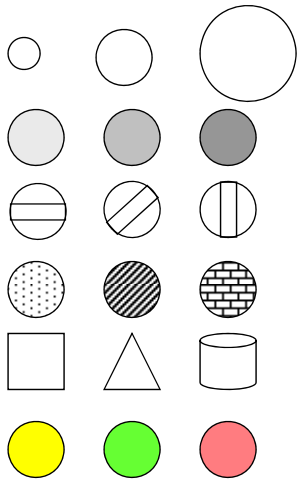
Jacques Bertin, *Semiology of Graphics*, 1983.

GRAPHIC OBJECTS can differ by:

- size
- value (intensity)
- orientation
- texture
- shape
- color



It is NOISE if the differences are not meaningful.

Examples of Using Graphic Variables

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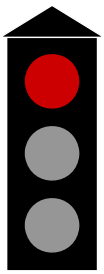
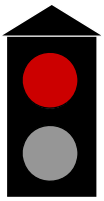
Traffic signals

Using Color & Position:



In some countries:



Consider:

Shape & Position:

Shape only:

Text:

Dan Moody's "Shark" Diagram

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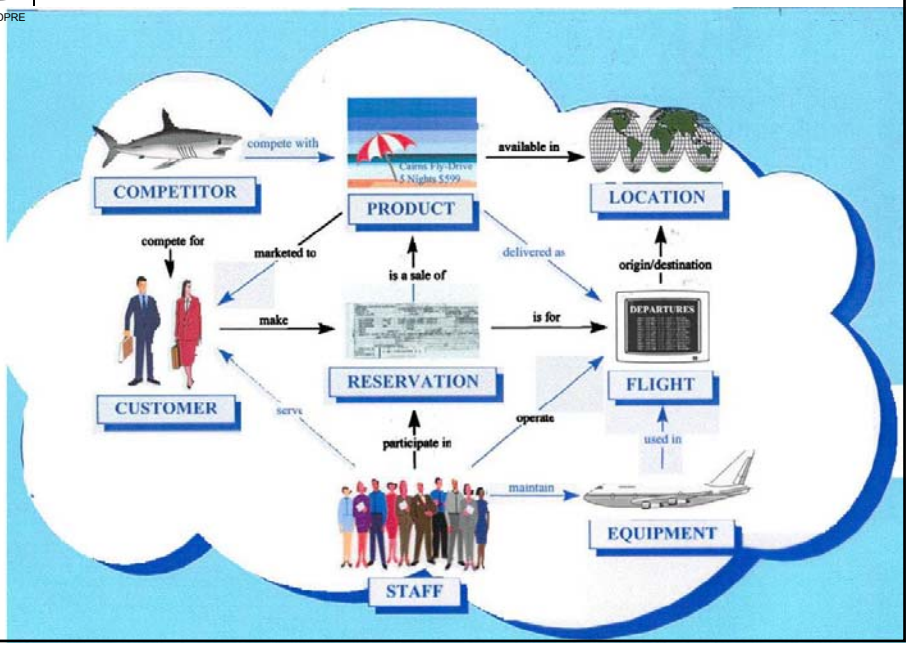

Relationship Characteristics

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- Use of graphics to depict characteristics

SCHEME	Optional - (0)	Dependent (at least one)	Exclusive - (at most one)	Many (M)	...
ER (Chen)	(default)	weak entity	1	M	
Oracle (Barker)	- - - - -	————	———[	——<[	
IE (Finkelstein)	]—o— (at the 'other' end)	]—+—	—+[	———<[	
IDEF1X (Bruce,ERwin)	Z	P	Z	P	Default= 0..M
UML (lower..upper)	0..	1..	..1	..M	1 (exactly)
ORM (Everest)	default, or —o[	—●[	———[	———<[	

3-valued logic provides increased semantics

e.g. Mandatory = ● optional = o else unknown/unspecified

At most one: —[many: —<[unknown/unspecified: —?[

Sample Data Model (Excelerator 1.9)

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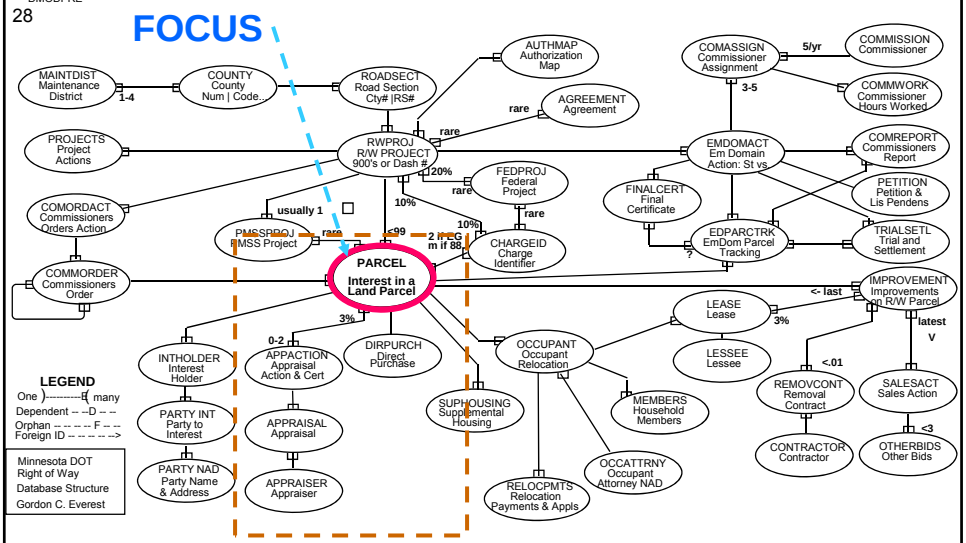

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2.a SCOPE - Partitioning

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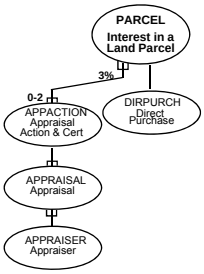
- Fencing off a part of the Diagram:
  - Often helpful to have some overlap of the partitions



2.b DEPTH - Levels of Abstraction

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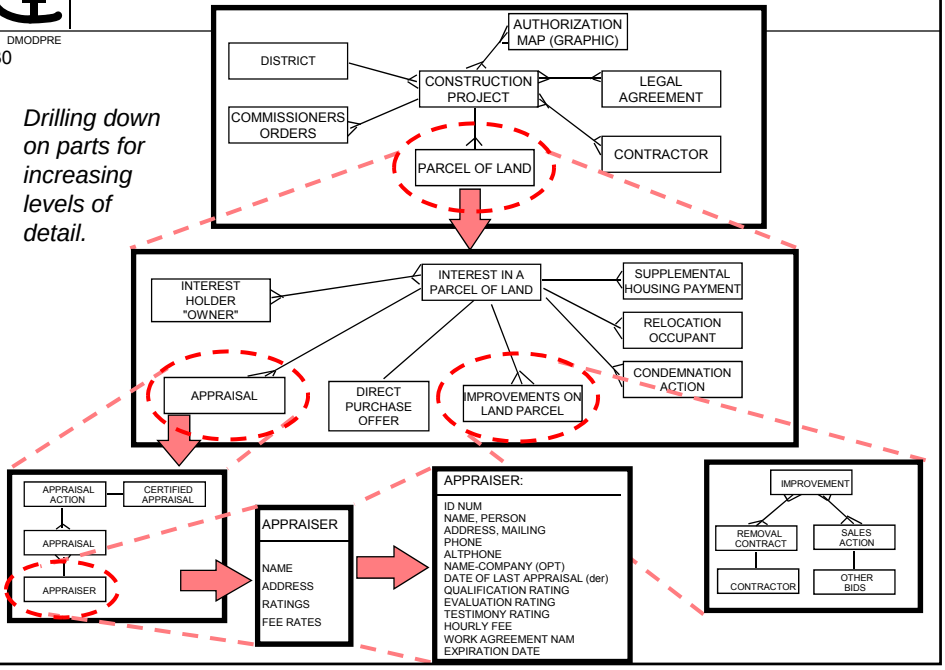
Drilling down on parts for increasing levels of detail.



Distortion: Bifocal View

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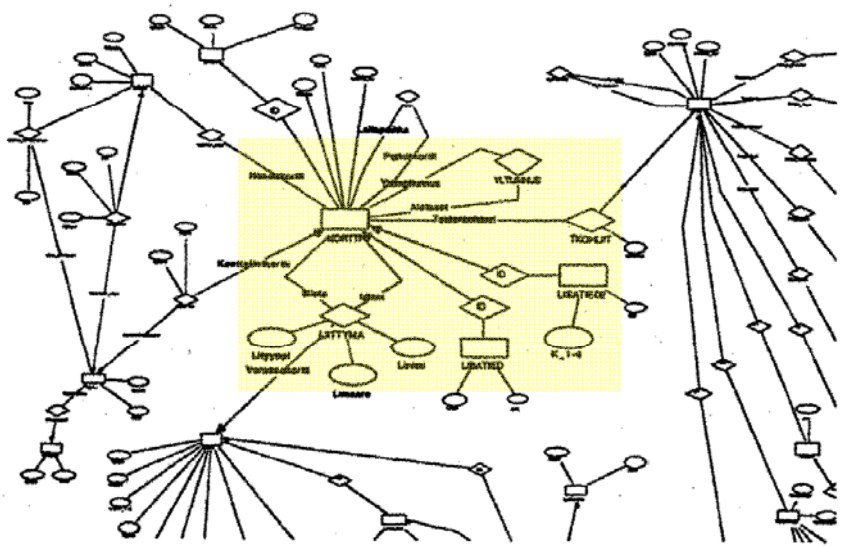
Harri Siirtola, ER'96, Cottbus, Germany



ORM Data Model - Presentation

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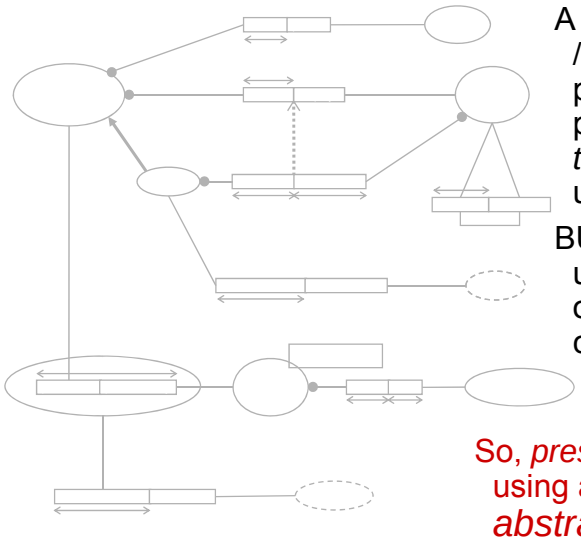

A major criticism of NIAM / ORM, both by protagonists and proponents, is that it is *too detailed*, a bottom-up design,

BUT… ER Diagrams usually *hide* the details of attributes and most constraints.

So, *present* the ORM model using a series of top-down *abstractions*.

Abstractions of ORM Data Model

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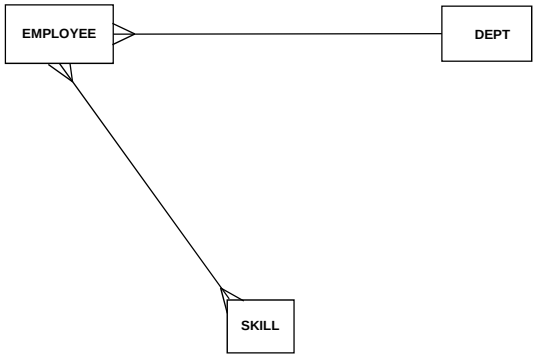

1. Hide "Terminal" (M:1) Objects (=> Attributes)
2. Hide Reference Modes
3. Hide Constraints
4. Hide Less Important Objects & Predicates
   - Subtypes
   - Objectified Predicates
   - Reflexive Relationships
5. Hide all Predicates

   Leaving BASE Entities!
6. Add back Multiplicity char. on relationships

A High-level Abstract Conceptual Data Model...

an ER Diagram ?!!!

Simplifying an ORM Diagram

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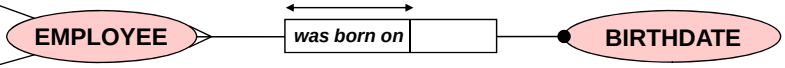
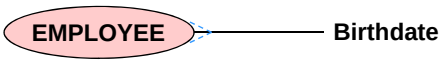
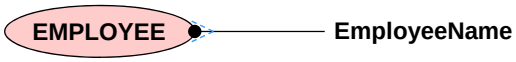
- Since *terminal objects* with only *functional dependencies* are most common, show them in the simplest way => "attribute"



- Eliminate the predicate box and the terminal object icon, and assume a many-to-one dependent relationship

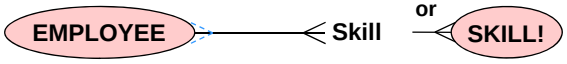


- If mandatory:

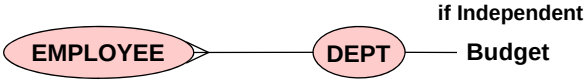


- If identifier (1:1):

- If multivalued (M:N):
  (add Name on Relationship arc?)



- If further interest in the attribute, it becomes an entity:
  (add a Predicate box?)



if Independent

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Needed in a Data Modeling Tool

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- A Data Model Viewer
  - to designate Partitions
  - to "build" Abstractions (from the most detailed) successively hiding detail
  - allow editing from any abstraction
- User designed graphic elements for icons
- Hover/click on an icon to bring up a description and drill down to more detail
- Allow user preferences for graphic notation for dependency, multiplicity, identifiers, etc.
- Ability to pan/scroll/zoom over a data model

11. Relational Table View

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- Compound, convoluted, confusing column names
- Undesirable default ordering of columns
  - Primary keys and foreign keys moved around with no apparent consistency

SUGGESTIONS:

- Prompt the designer to rename columns, particularly for foreign keys and objectified predicates
- Migrate changed column names to the ORM model, retain for regeneration of tables.
- Allow designer to reorder columns; retain in repository
- Verbalize the relational table diagram
- Optionally display column properties
- Allow model notes to be added to a table diagram

12. Database Generation

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- Having to define a "project" before generating the DDL was confusing and unnecessary (similar problem in VisioEA)

SUGGESTION:

- Add a tabbed window in the diagram/document area for generic ANSI SQL, similar to the generation of the relational table diagram view
- A separate project folder may be appropriate when generating the DDL for a specific DBMS

Summary & Conclusion

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- NORMA may be ready for student use, but is not yet ready for enterprise data modeling in the corporate world
- NORMA is a solid base for further development
- NORMA could have a major impact on the practice of data modeling
- We leave it for the developers and the ORM community to set priorities, and determine the effort required and how best to implement these suggestions.

NORMA – Suggestions for Improvement

The Goal -- Revisited

NORMA

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