

Games in the Classroom

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Quest for Effective Classroom Examples

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Traditional Examples

- **Business** 
- **Hospitals** 
- **Libraries** 

Boring / Uninspiring
Trivial
False Feeling of Simplicity;
Real Modeling Tasks never will be so easy....



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Traditional Examples

| S# | SNAME | STATUS | CITY | P# | PS# | QTY |
|----|-------|--------|--------|----|-----|-----|
| S1 | SMITH | 24 | LONDON | P1 | P1 | 300 |
| S2 | JONES | 18 | PARIS | P1 | P2 | 200 |
| S3 | BROWN | 24 | PARIS | P2 | P2 | 400 |
| S4 | CLARK | 24 | LONDON | P1 | P4 | 200 |
| S5 | ADAMS | 24 | ATHENS | P1 | P5 | 100 |
| | | | | P1 | P6 | 100 |
| | | | | P2 | P1 | 300 |
| | | | | P2 | P2 | 400 |
| | | | | P3 | P2 | 200 |
| | | | | P4 | P2 | 200 |
| | | | | P4 | P4 | 300 |
| | | | | P4 | P5 | 400 |

| P# | PNAME | COLOR | WEIGHT | CITY |
|----|-------|-------|--------|--------|
| P1 | WAL | RED | 12 | LONDON |
| P2 | WAL | RED | 15 | PARIS |
| P3 | SCREW | BLUE | 17 | ROME |
| P4 | SCREW | RED | 18 | LONDON |
| P5 | BAR | BLUE | 12 | PARIS |
| P6 | COG | RED | 19 | LONDON |

FIG. 3.8 The suppliers and parts database (sample values)

© C.J. Date; Introduction to Database Systems; 6th edition

Suppliers & Parts Database

We All Know what Business is Really About....



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(Computer) Games



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© Games Workshop



© Blizzard Entertainment



© 3DO Company



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(Computer) Games

- Strategic Games
- Management
- Competition
- Combat
- Characteristics:
 - Turn Based / Real Time
 - Modern / History / Phantasy / SF
 - Grid Based World / Continuous
 - Atomic Combat / Subgames



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Advantages

- Non-Trivial & Inspiring
(otherwise the game wouldn't sell)
- Definite Universe of Discourse
(it is all in the program)
- Familiarity
- Scales to Object Modelling
- Information Extraction
- Politically Correct ???!



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Specific Topics

- The Gap between Tables in Documentation and the RDMS Model
- The impact of Leonardo's Workshop on the Class Hierarchy
- The tree of Knowledge: easy and hard Algorithmic Problems
- Object Identity in Alien Worlds

The first three examples involve Civilization II ;
the final one involves Dark Castle.



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Turn Based / Real Time
Modern / History / Phantasy / SF
Grid Based World / Continuous
Atomic Combat / Subgames

Covers History from 4000 BC to the Space Age

Target: World Domination and/or Victory in
Space Race

Management issues: Growth, Happiness, Defense
Conquest, Diplomacy, Production, Research,
Expansion, Development.

Basics: Land squares, Food, Shields, Money, Cities
Advances, Improvements, Units, Wonders....



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Terrain Characteristics

| Terrain Type | Food | Wood | Gold | Stone | Resource Bonus | Health of Infantry | Health of Ranged | Health of Cavalry | Explosion Vulnerability | Penalty Specific Resources |
|--------------|------|------|------|-------|----------------|--------------------|------------------|-------------------|-------------------------|----------------------------|
| Desert | 0 | 1 | 0 | 1 | Normal | +1 Food | +1 Stone | +1 Trade | Plains | Gold, Oil |
| Forest | 1 | 2 | 0 | 2 | +30% | Plains | NA | none | Standard | Plains, Oil |
| Cliffside | 0 | 0 | 0 | 2 | Normal | NA | +1 Stone | none | Cliffs | Iron, Oil |
| Grassland | 2 | 1 | 0 | 1 | Normal | +1 Food | Forest | +1 Trade | Hills | Standard |
| Hills | 1 | 0 | 0 | 2 | +30% | +1 Food | +3 Stone | none | Plains | Coal, Wine |
| Jungle | 1 | 0 | 0 | 2 | +30% | Standard | Forest | none | Plains | Spice, Fuel |

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Basic Properties

| Special Resource | Terrain Type | Food | Wood | Gold | Stone | Health of Infantry | Health of Ranged | Explosion Vulnerability |
|------------------|--------------|------|------|------|----------------|--------------------|------------------|-------------------------|
| Buffalo | Plains | 1 | 0 | 0 | Normal | Plains | Standard (25%) | |
| Coal | Hills | 1 | 0 | 0 | Normal | Normal | Buffalo | |
| Flax | Cliffside | 0 | 0 | 0 | NA | NA | NA | |
| Fruit | Jungle | 1 | 0 | 1 | Standard (25%) | NA | Wheat | |
| Fur | Tundra | 0 | 0 | 0 | Normal | NA | Oil (25) | |
| Plains | Forest | 0 | 0 | 0 | Buffalo | NA | Standard (25%) | |
| Wool | Tundra | 0 | 1 | 0 | Normal | NA | Coal | |

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Special Resources

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A Table is a Table ?

| Terrain Type | Food | Shield | Wood | Power Cost | Discovery Bonus | Health of Troops | Health of Ships | Health of Boats | Effect of Boats | Feature Transformation | Possible Special Resources |
|--------------|------|--------|------|------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------------|----------------------------|
| Desert | 8 | 1 | 0 | 1 | Normal | +1 Food | -1 Shield | +1 Trade | None | Plains | Clash, Oil |
| Forest | 1 | 2 | 0 | 2 | +30% | None | N/A | None | None | Woodland | Plentiful, Silk |
| Grassland | 8 | 0 | 0 | 2 | Normal | N/A | +1 Shield | None | None | Tundra | Iron, Oil |
| Hills | 1 | 0 | 0 | 2 | +30% | +1 Food | +1 Shield | None | None | Plains | Coal, Wine |
| Jungle | 1 | 0 | 0 | 2 | +30% | Woodland | Forest | None | None | Plains | Gold, Oil |

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Basic Properties

Icons in Domain?

Which Domain?

Null Values ?

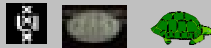
Set valued Attribute ?

Converse to pos. sp. res. ?

| Terrain Type | Food | Shield | Wood | Power Cost | Discovery Bonus | Health of Troops | Health of Ships | Health of Boats | Effect of Boats | Feature Transformation | Possible Special Resources |
|--------------|------|--------|------|------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------------|----------------------------|
| Water | 0 | 0 | 0 | 0 | Normal | Plentiful | None | None | None | Water | None |
| Desert | 8 | 1 | 0 | 1 | Normal | Normal | Normal | Normal | None | Plains | Clash, Oil |
| Forest | 1 | 2 | 0 | 2 | +30% | None | N/A | None | None | Woodland | Plentiful, Silk |
| Grassland | 8 | 0 | 0 | 2 | Normal | N/A | +1 Shield | None | None | Tundra | Iron, Oil |
| Hills | 1 | 0 | 0 | 2 | +30% | +1 Food | +1 Shield | None | None | Plains | Coal, Wine |
| Jungle | 1 | 0 | 0 | 2 | +30% | Woodland | Forest | None | None | Plains | Gold, Oil |

Special Resources

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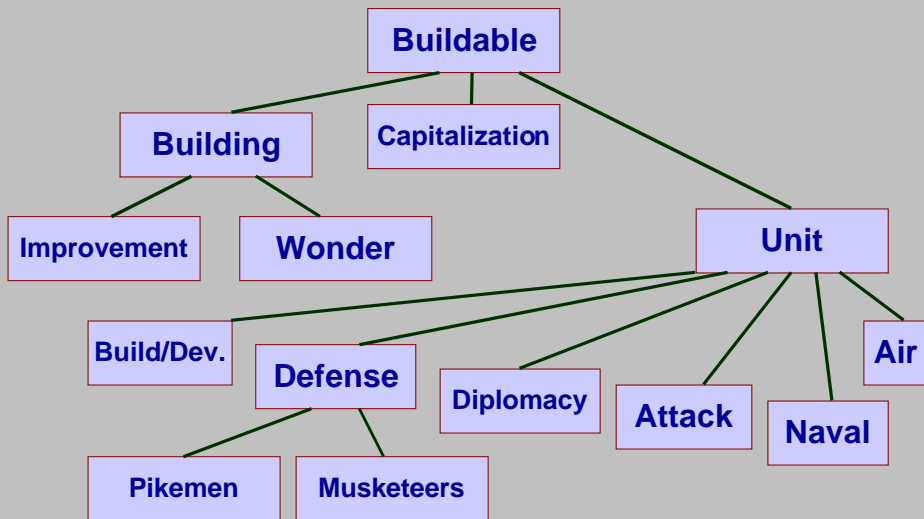
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Units in Civ II

| Unit | Cost | Food | Shield | Wood | Power | Special Features | Special Resources |
|----------|------|------|--------|------|-------|------------------|-------------------|
| Infantry | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Cavalry | 150 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Spearman | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Spearman | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Spearman | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Spearman | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
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| Archery | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Warrior | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Spearman | 100 | 0 | 0 | 0 | 1 | Standard | None |
| Archery | 100 | 0 | 0 | 0 | 1 | Standard | |

Class Hierarchy



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Leonardo's Workshop



Pikemen can become Musketeers !

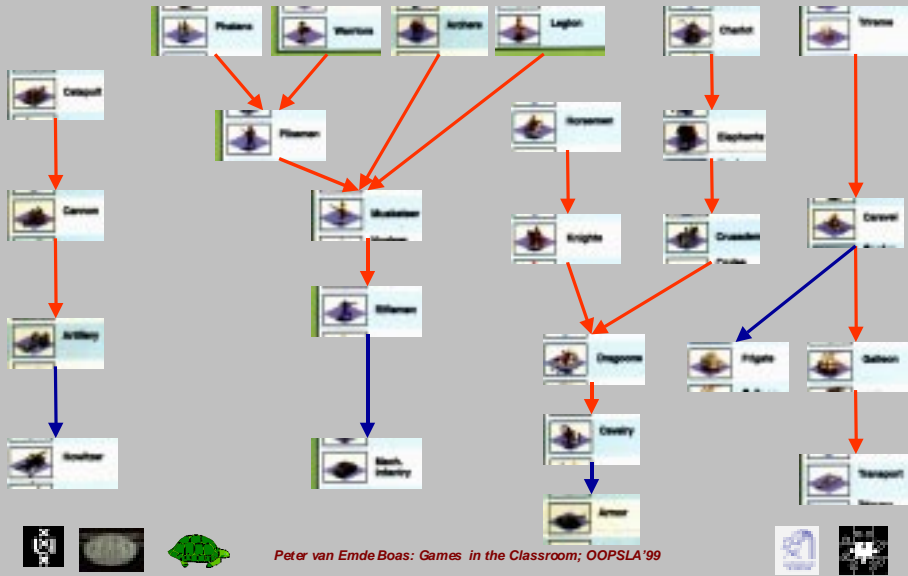


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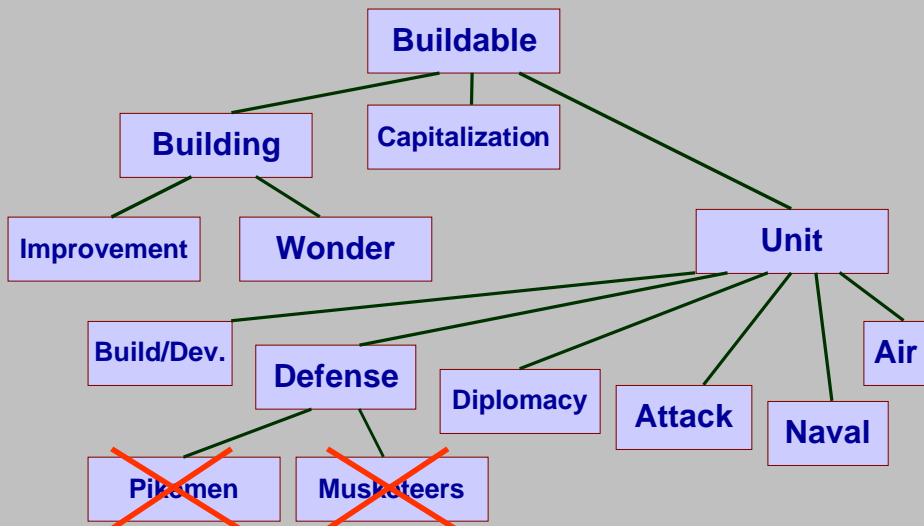
Obsolescence

↓ units made obsolete
 ↓ upgrades by Leonardo



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Class Hierarchy ?



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The Tree of Knowledge

Dependencies between
Civilization Advances

Backward Edges / Implicit Edges

TASK: Design Nice Lay-out!

Stratification: Easy
(Topological Sort)

Few Crossings: Hard
(likely to be NP-hard)



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Identity Crisis in Dark Castle



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Identity Crisis in Dark Castle

Rats are **killed** but re-appear
Bats are **killed** but re-appear
Robots are **knocked down** and
stand-up again. Later in the
game they are **destroyed**....

You return to the same
Dungeon, yet the **keys** are on
different pegs. You must **knock**
down the same **Henchmen** to
get the **keys**.....



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Alien Identity Conditions

How Often can you Kill the Same Rat or Bat ???



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Conclusions

- All examples were used for a **Classical Relational Database Course**
- Behavioral Aspects seem Attractive to OO courses as well.
- **Alternative types of Games** (tabletop, real-time, continuous world, flight simulators)
- **Attractive examples for females and minorities must be found.**



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