ORDBMS - Introduction
Theme

- The need for extensions in Relational Data Model
- Classification of database systems
- Introduce extensions to the basic relational model
- Applications that would benefit from extended relational databases
Why Extend Relational Data Model

To eradicate the following weaknesses

- Poor representation of ‘real world’ conceptual model
  - Usually the relational schema does not correspond to real world entities
- Difficult to change schema without affecting the applications; e.g., Y2K
- Semantic overloading
  - The same relation is used to represent entities as well as relationships
- Poor support for integrity and business rules
- Fixed number of attributes & all attribute values must be atomic
- Limited operations
- Difficult to handle recursive queries
- Impedance mismatch (when SQL is embedded in PLs)
  - Type System mismatch, Evaluation Strategy mismatch
- Poor navigational access
- Short-lived transactions (strict locking and recovery mechanisms)
Michael Stonebraker’s Classification

- Michael Stonebraker presents this four-quadrant matrix in the book entitled “Object-Relational DBMSs: The Next Great Wave”
  - This is a classification of both database applications and systems.
Lower-Left Quadrant

- Those application that process simple data and require no query capability e.g. text processors (word, emacs)
  - Information has little internal structure.
  - Document updates are relatively infrequent.
  - Documents are of modest size.
  - Queries are simple string or pattern searches.
**Upper-Left Quadrant**

- Those applications that process simple data and require complex query capability e.g. a typical business application require RDBMS.
  - Information has straightforward and fixed structure.
  - Information collection may be large.
  - Information storage must be reliable.
  - Queries are relatively complex.
  - Updates are frequent and Security is vital.
Lower-Right Quadrant

- Those application that process complex data and require no query capability e.g. a CAD application requires OODBMS.
  - Information has complex structure.
  - Analysis are complex.
  - Information is moderate in quantity.
  - Updates are periodic.
Upper-Right Quadrant

- Those applications that process complex data and require complex query capability e.g. an Image Data Archive requires ORDBMS.
  - Information has complex structure.
  - Information may include special data types.
    - Images, Spatial information
  - Information is large in quantity.
  - Queries are important.
  - Updates are periodic.
Object-Relational Databases

- Object-Relational databases (ORDBSs) seek to:
  - Retain the relational model as a subset.
  - Retain the strengths of the relational model and all the technologies that come with it.
  - Supports complex data types (BLOBS, ADTs, Spatial, and Multimedia, …).
  - Supports object-oriented design.
  - Reduces impedance mismatch (type system).
Advantages of ORDBMSs

- Resolves many of known weaknesses of RDBMS.

- Preserves significant body of knowledge and experience gone into developing relational applications.
Disadvantages of ORDBMSs

• Complexity.
• Increased costs.
• Supporters of relational approach believe simplicity and purity of relational model are lost.
• Some believe RDBMS is being extended for what will be a minority of applications.
• OO purists not attracted by extensions either.
• SQL now extremely complex.
Classification Problems

- Most of OODBMSs claim to be in Upper-Right quadrant not just ORDBMSs.

![Diagram showing the classification of different types of databases based on query presence and data complexity.](image-url)