Database Management System and Security

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[Struab] chap 2
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Database Demand on ISM

- Large user population
- Very high concurrency
- Large database size
- Granularity
- Manageability

Database Design

- Current System Analysis and Survey
- Logical Database Design
- Physical Database Design
- Implementation
- Testing and Debugging
- Training, Evaluation and Documentation

Fungsi Database

- Transactional, contoh :
  - Client-server Database
  - OLTP Database
  - Transactional Database
- Decision Support System. :
  - Forecasting
  - Executive Information System
  - Office Automation System
- Hybrid

Model Data

- Relational Database
- Hierarchical Database
- Network Database
- Object-oriented Database

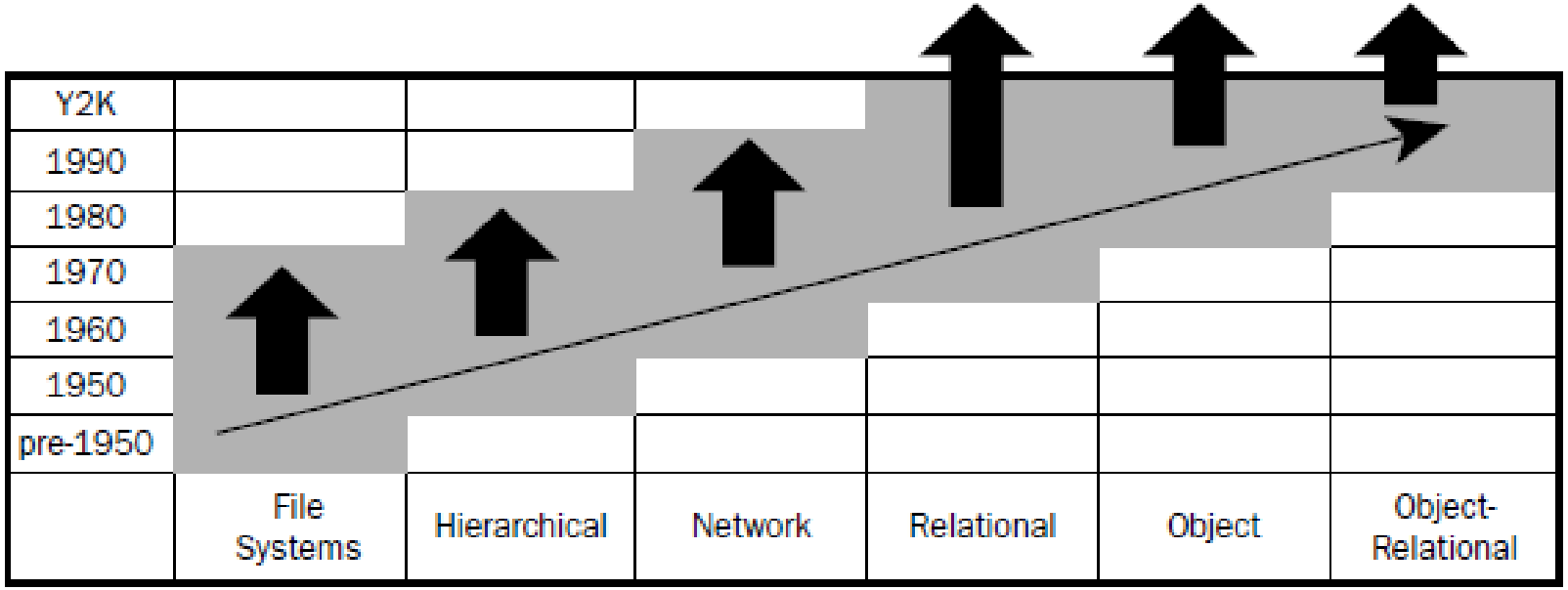

Figure 1-3: The evolution of database modeling techniques.

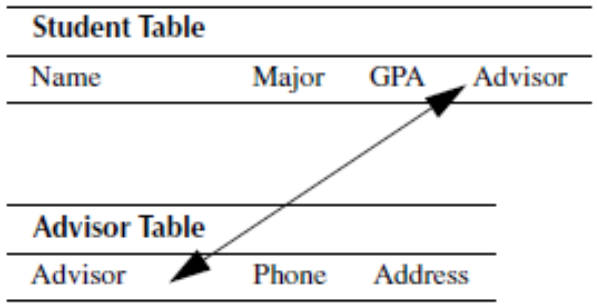

FIGURE 6.2 A relational database.

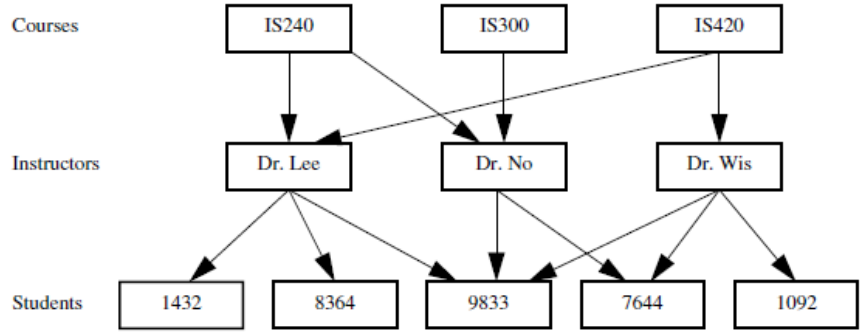

FIGURE 6.4 A network database.

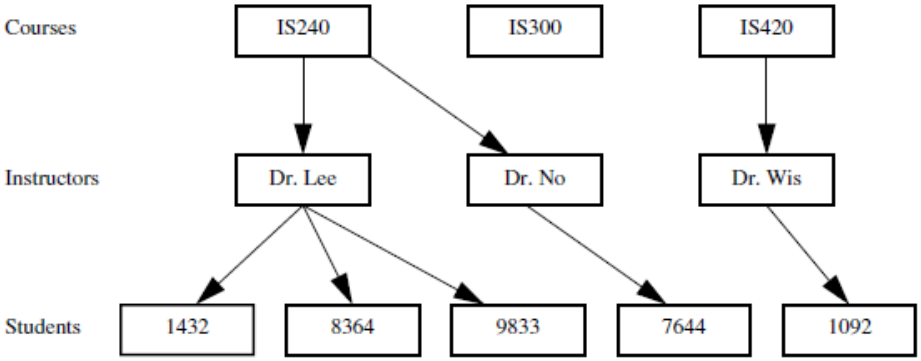

FIGURE 6.3 A hierarchical database.

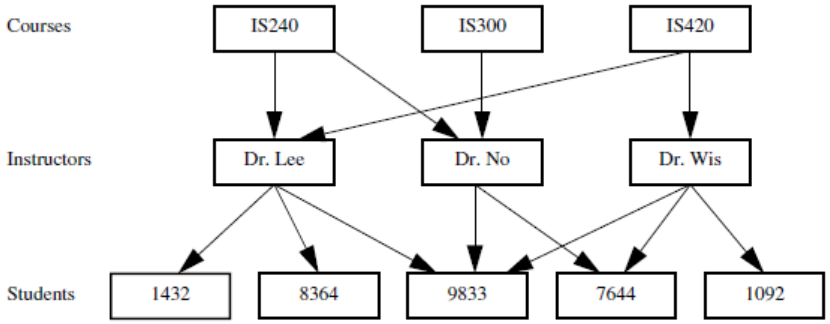

FIGURE 6.4 A network database.

Benefit Database Management System

- Mengurangi Redudansi Data
- Meningkatkan Integritas Data
- Meningkatkan keamanan Data
- Mengurangi waktu pengembangan

Penentuan Integritas Data

- Penentuan Dependecy yang jelas: Primary Key, Secondary Key, Foreign Key
- Keterkaitan antara Desain Konseptual (ERD), dengan desain logika
- Tunning Phase: Evaluasi database seperti pemberian index, normalisasi lanjutan, denormalisasi, sistem keamanan data,

AIC's Principle in Data Security

- **A**vailability
- **I**ntegrity
- **C**onfidentiality

STRIDE in Data Security

- **S**poofing : Penipuan identitas
  Contoh: pada http authentication secara basic atau digest (RFC2617)
- **T**ampering: Modifikasi Data
- **R**epudiation: Transaksi yang benar disangkal oleh vendor
- **I**nformation Disclosure: Informasi rahasia terbuka
- **D**enial of Service: membuat server tidak berfungsi
- **E**levation of Privilege: user biasa berubah hak menjadi admin

Information Security Management

Theory	Activities	Characteristics
Security policy theory	Policy establishment Policy implementation Policy maintenance	• Policy is the main focus • Emphasize sequential, structured procedures
Risk management theory	Risk assessment Risk control Review and modification	• Understand and cope with insecure environments • Ignore security policy and information audit mechanisms • Overemphasize structures
Control and auditing theory	Establish control systems Implement control systems Information auditing	• Internal control and information audit is the main focus; ignore security policy and risk management • Lack of requirements planning and contingency for the unexpected
Management system theory	Establish security policy Define security scope Risk management Implementation	• Information auditing is ignored and the implementation is affected • Lack of periodic check • Lack of feedback
Contingency theory	Policy strategy Risk management strategy Control and audit strategy Management system strategy	• Consider environments both outside and inside of an organization, and choose appropriate security strategies • Lack of integration and structures

Source: Adapted from Hong et al., 2003, p. 246

Framework for Information Security Management System ISO/IEC 17799:2005

Consist of 10 Control Clause:

1. Security Policy
2. Security Organisation
3. Asset classification and control
4. Personnel security
5. Physical and environmental security
6. Communication and operation Management
7. Access Control
8. System development and maintenance
9. Business continuity management
10. Compliance

Other Security IS Standard

- BS7799:2002
- ISO 27001:2005

For Mobile

- OMA (open mobile Alliance) DRM 2.0
- CSS (Content Scrambling System)
- Fairplay from Apple
- Window Media DRM

Masalah dalam DBMS

- **Redudansi Data** : Kerancuan value, Anomali Penghapusan
- **Concurrency, real-time query database**
- **Skema database berdasarkan level management**
- **Kesalahan Normalisasi**:
  - Lossy Join Decomposition
  - over normalisation
- **Bentuk struktur Data yang berbeda pada sistem sharing Database**
- **Efektivitas SQL**
- **Ukuran Data**

Efektivitas SQL : Penggunaan Select

- Hindari Query semua field
  - SELECT NAME FROM AUTHOR; lebih cepat dari
  - SELECT * FROM AUTHOR;
- Gunakan index

  SELECT ISBN FROM EDITION;
- Alias yang sederhana

  SELECT A.NAME, P.TITLE, E.ISBN
  FROM AUTHOR A JOIN PUBLICATION P USING (AUTHOR_ID)
  JOIN EDITION E USING (PUBLICATION_ID);

  This is much easier to deal with than this query:

  SELECT AUTHOR.NAME, PUBLICATION.TITLE, EDITION.ISBN
  FROM AUTHOR JOIN PUBLICATION USING (AUTHOR_ID)
  JOIN EDITION USING (PUBLICATION_ID);

Penggunaan Where

- *Single record searches*
  SELECT * FROM AUTHOR WHERE AUTHOR_ID = 10;
- *Record range searches—Using the* >, >=, <, *and* <= *operators executes range searching*
  SELECT * FROM AUTHOR WHERE AUTHOR_ID >= 5 AND AUTHOR_ID <= 10;

Contoh :

Bentuk relasi semula

NIM	NAMA	PROGRAM STUDI
1104001	ALI	EKONOMI
1104002	EDI	EKONOMI
1104003	ALI	FISIKA

(a) Contoh dekomposisi aman

Relasi : NIM_NAMA

NIM	NAMA
1104001	ALI
1104002	EDI
1104003	ALI

Relasi : NIM_PROG

NIM	PROGRAM STUDI
1104001	EKONOMI
1104002	EKONOMI
1104003	FISIKA

(b) Contoh dekomposisi tidak aman

Relasi : NIM_NAMA

NIM	NAMA
1104001	ALI
1104002	EDI
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Relasi : NAMA_PROG

NAMA	PROGRAM STUDI
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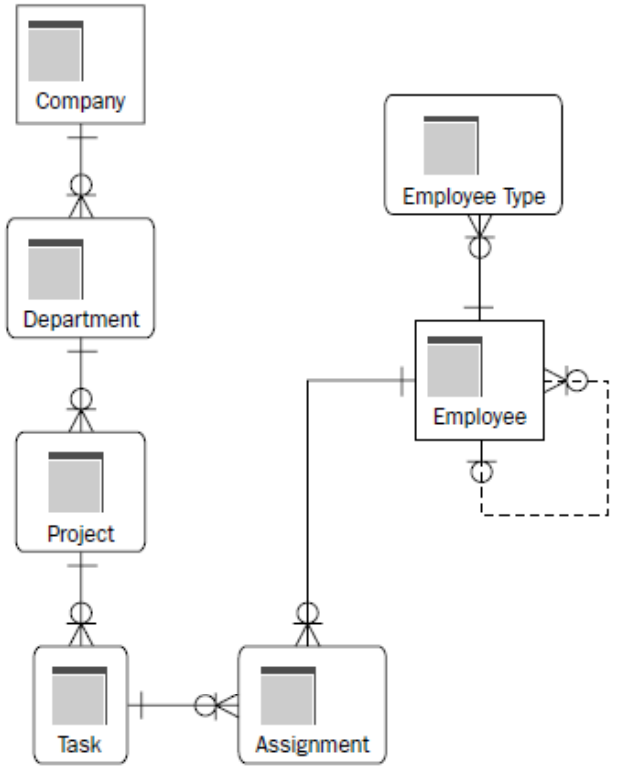

Figure 1-6: The relational database model.

Project

PROJECT_ID	DEPARTMENT_ID	PROJECT	COMPLETION	BUDGET
1	1	Software sales data mart	4-Apr-05	35,000
2	1	Software development costing application	24-Apr-05	50,000
3	2	Easy Street construction project	15-Dec-08	25,000,000
4	1	Company data warehouse	31-Dec-06	250,000

Task

TASK_ID	PROJECT_ID	TASK
1	1	Acquire data from outside vendors
2	1	Build transformation code
3	1	Test all ETL process
4	2	Assess vendor costing applications
5	3	Hire an architect
6	3	Hire an engineer
7	3	Buy lots of bricks
8	3	Buy lots of concrete
9	3	Find someone to do this because we don't know how

Figure 1-7: The relational database model—a picture of the data.

Other Feature

- Data Dictionary
- Database Utilities
- Database Recovery
  - Recovery via reprocessing
  - Recovery via rollback/rollforward
  - Transaction logging
  - Write-ahead log

Query Language

- Structured Query Language
- Contoh :
  - Query by Example (QBE) helps the manager construct a query by displaying a list of fields that are available in the files from which the query will be made.
    - SELECT name, gpa
    - FROM student
    - WHERE gpa >=3.0
    - ORDER BY name

Entity Relationship Diagram

- Kardinalitas : one to many, one to one, many to many
- Jenis2 atribut: null, mandatory, simple, composite, derived, single /multivalue
- Key: primary key, guest/foreign key
- Variasi entitas: subentitas, weak entitas
- Variasi relasi: redudansi, multi relasi, spesialisasi/generalisasi, aggregasi
- Implementasi ERD pada tabel
- Struktur penyimpanan

Manajemen Sistem Informasi Database

- Analyzing Database Model
  - Identify the operations of the company.
  - Draw up a picture of basic tables.
  - Establish simple relationships.
  - Create basic fields within each table.

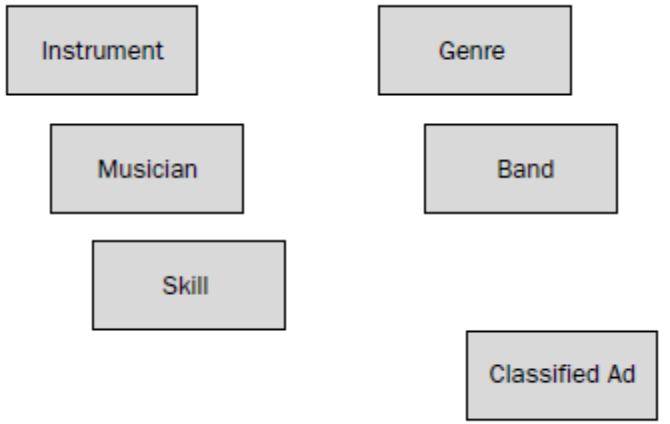

Figure 9-17: Identifying basic operations.

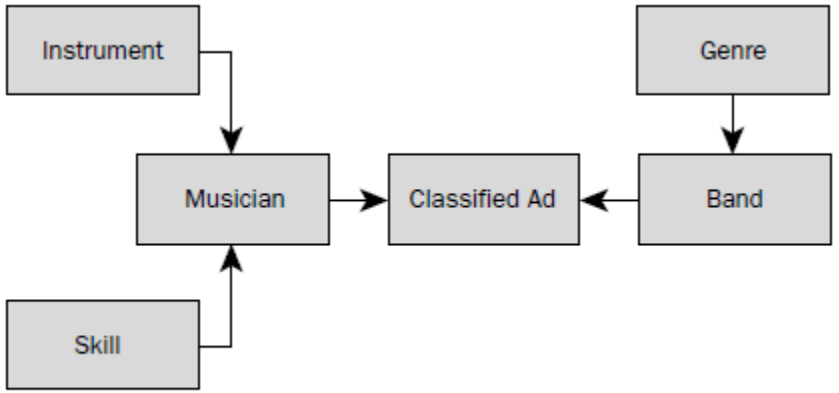

Figure 9-18: Linking the basic operations.

Creating ERD

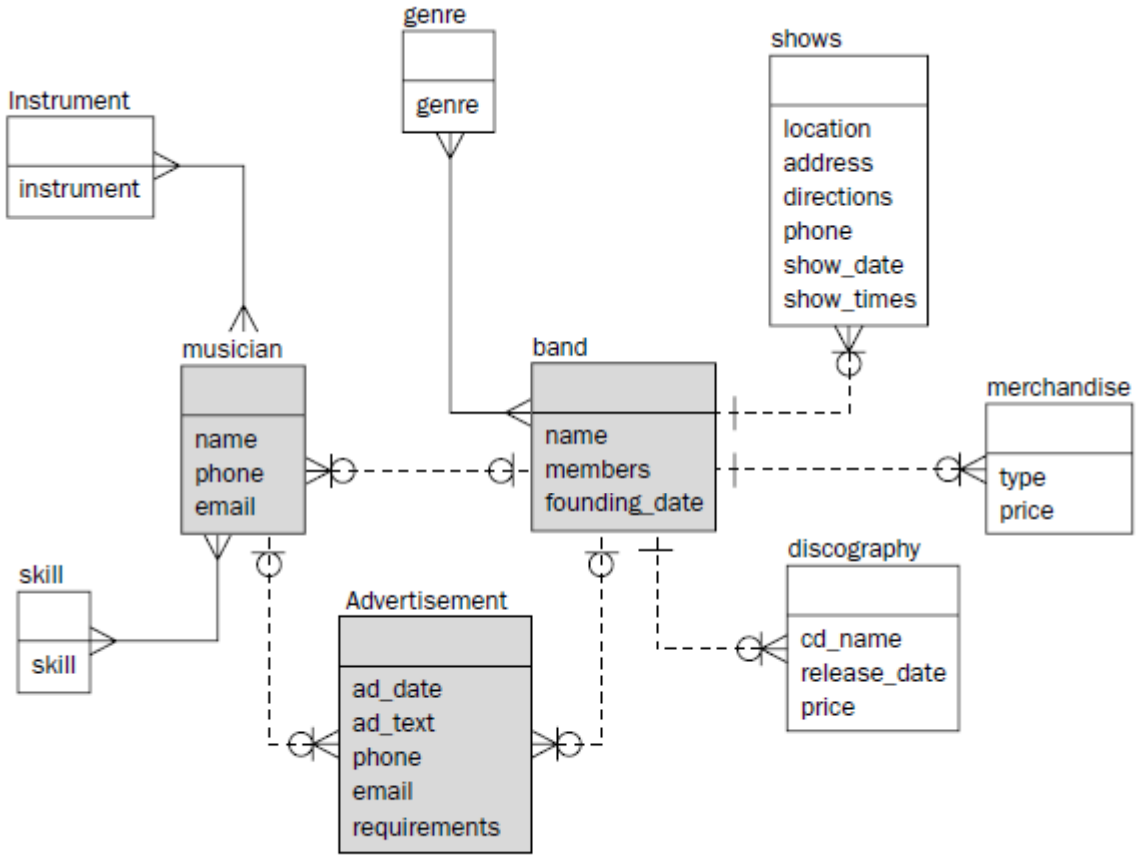

Figure 9-19: Creating a basic analytical ERD of business rules

Establishing Company Operation

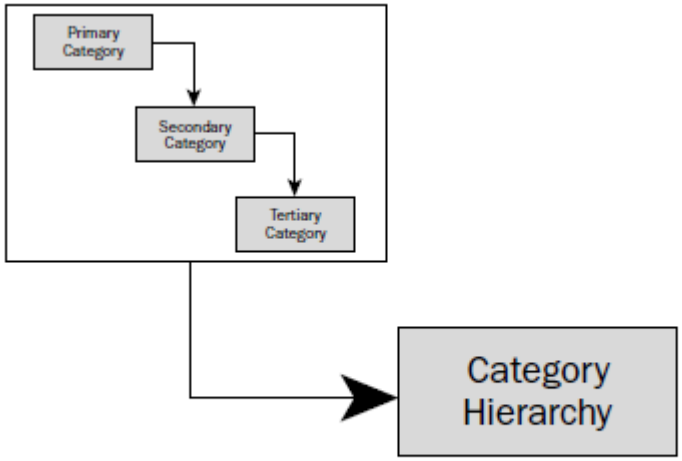

Figure 9-20: Data warehouse data modeling denormalizes multiple hierarchical static tables into single static structures.

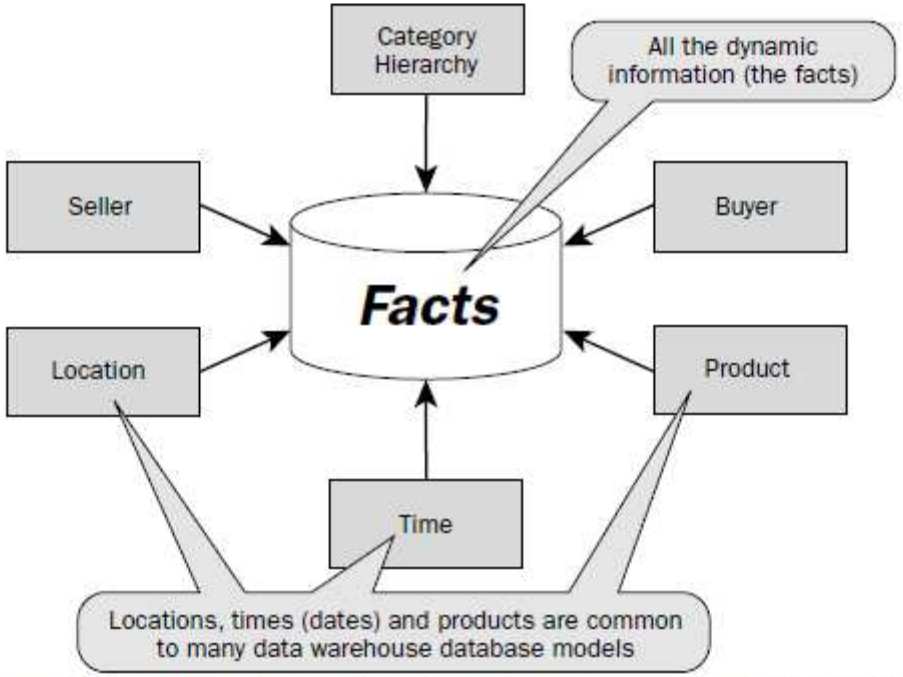

Figure 9-21: A data warehouse star schema database model for the online auction house.

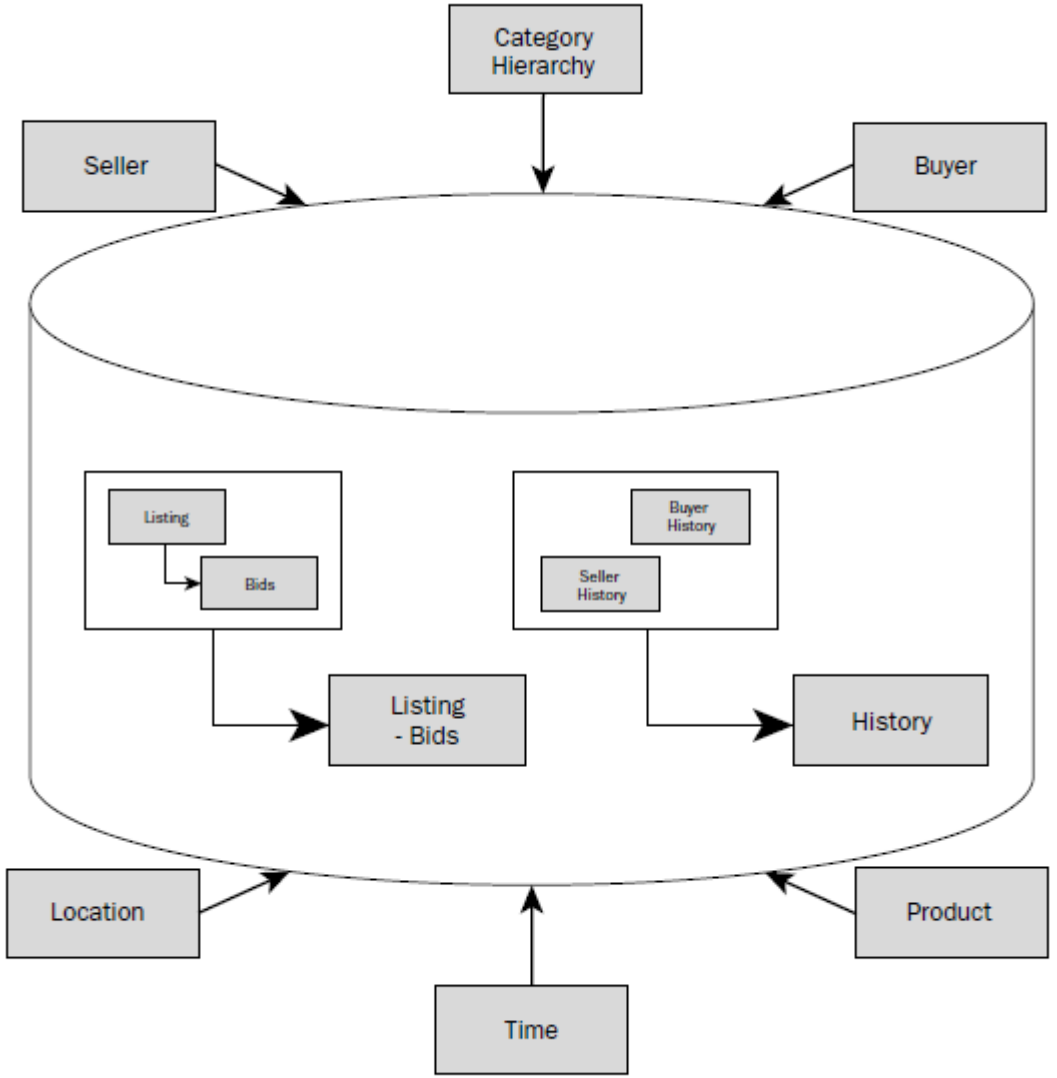

Figure 9-22: Analyzing the facts in a data warehouse database model.

Discovering Business Rule

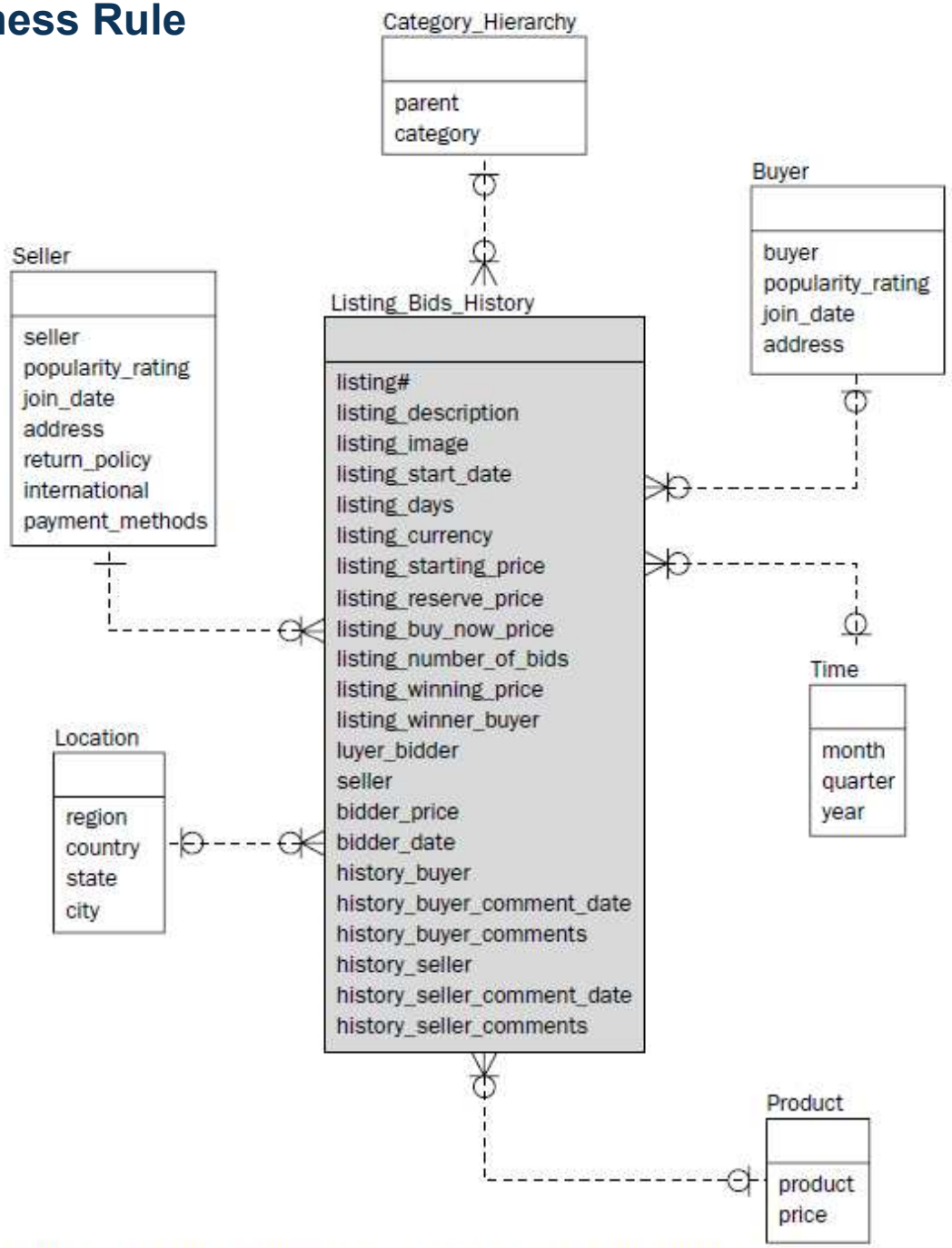

Figure 9-25: A data warehouse database model ERD for an online auction house.

DSS Practical Application

1. Hewlett-Packard developed *Quality Decision Management* to perform production and quality-control functions. It can help with raw material inspection, product testing, and statistical analysis.
2. *Manufacturing Decision Support System (MDSS),* developed at Purdue University to support decisions in automated manufacturing facilities, is especially useful for CAD/CAM operations.
3. RCA has developed a DSS to deal with personnel problems and issues. The system, called *Industrial Relations Information Systems (IRIS),* can handle problems that may not be anticipated or that may occur once, and it can assist in difficult labor negotiations.
4. The Great Eastern Bank Trust Division developed a DSS called *On-line Portfolio Management (OPM)* that can be used for portfolio and investment management. The DSS permits display and analysis of various investments and securities.
5. *RealPlan,* a DSS to assist with commercial real estate decisions, is useful for various decision aspects of purchasing, renovating, and selling property.
6. *EPLAN (Energy Plan) is* a DSS being developed by the National Audubon Society to analyze the impact of U.S. energy policy on the environment.