TATA CONSULTANCY SERVICES

Data Models – Conceptual, Logical and Physical

Version 1.0

1 - DATA MODELING

A data model provides a structure for the data stored in an information system. Data modeling is the process of creating this data model using formal datamodeling techniques

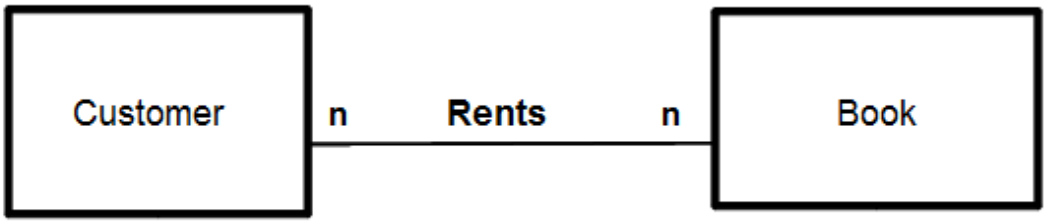
Data models are built during the analysis and design phases of a project to ensure that the requirements for a new application are fully understood and correctly captured before the actual database is created.

Conceptual datamodel, logical datamodel and Physical datamodel describe different phases of data modeling.

1.1 Conceptual Data Model

A conceptual data model depicts a high-level, business-oriented view of information. A CDM shows the key concepts or entities in a particular area and how these concepts interact with each other.The conceptual data model includes entities, their definitions, and the relationships that show how these entities interact with each other. The goals of conceptual modeling are clarity and simplicity.

- ✓ Non-critical details can be left out of the conceptual data model in order to emphasize the most important entities, attributes, and relationships.
- ✓ The conceptual data model may contain many-to-many relationships.
- ✓ It is not necessary to discover and document every attribute of each entity at the conceptual level.
- ✓ Cardinality, optionality, and data types can be skipped at the conceptual level.
- ✓ Some simple candidate keys may be recorded, but the conceptual data model will not identify most keys because the high level of abstraction makes useful key identification impractical or impossible.
- ✓ Every relationship need not be named on the conceptual data model. Remember, the goal of a conceptual data model is clarity at a high level. If the relationship names clutter up the data model diagram, they work against that goal.

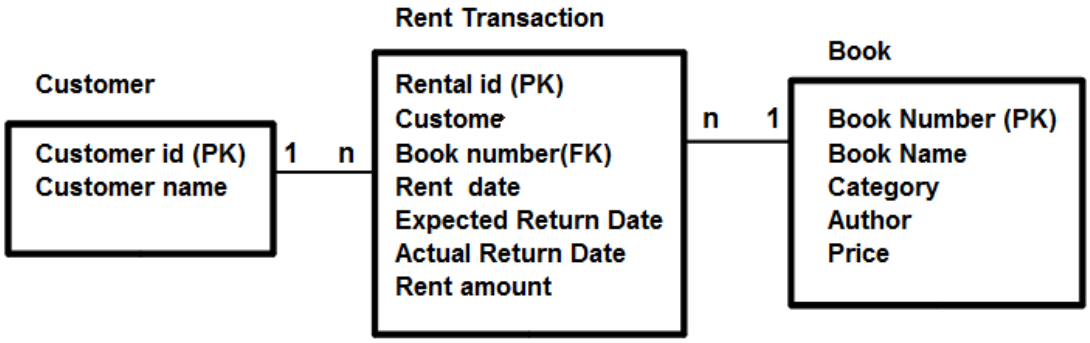


1.2 Logical Data Model

A logical data model (LDM) represents a detailed business solution. The relational logical data model includes entities along with their definitions, relationships, and attributes along with their definitions. The logical data model offers a comprehensive formal structure that serves as a blueprint for business data.

A logical data model consists of fully normalized entities with all attributes defined.

- ✓ A logical data model requires the specification of candidate keys for unique identification of each occurrence in every entity.
- ✓ For those entities having multiple candidate keys, the logical data model must indicate which candidate key to use for identification, that is, the primary key.
- ✓ Foreign key definitions should be clearly defined or implied by the data relationships.
- ✓ Many-to-many relationships should be translated into associative entities, which may acquire additional attributes and identifiers.
- ✓ Additional details, such as cardinality and whether relationships are optional or mandatory, must be documented in the logical data model.
- ✓ All relationships should be clearly and explicitly named.
- ✓ A logical data model should be a complete document from which a physical database can be developed.



1.3 Physical Data Model

A PDM takes the business solution defined on a logical data model to the next level of a technical solution. The relational PDM includes entities with their definitions, relationships, and columns along with their definitions. Note that often the term table is used instead of the term entity, and column instead of attribute, on the physical data model.

- ✓ The physical data model (PDM) is the logical data model compromised for specific software or hardware.
- ✓ The physical data model is created to transform the logical data model into a physical implementation using a specific DBMS product such as DB2, Oracle, or SQL Server.
- ✓ The physical data model transforms the logical data model into a physical implementation using a specific DBMS.