Data models define how the logical structure of a database is modeled. Data models define how data is connected to each other and how they are processed and stored inside the system.

|  |  |  |
| --- | --- | --- |
| Entity Relationship Diagram | Class Diagram | Ontology |
| **Used for Database Design**  represent the abstract representation of the data model  R diagrams most often map in to the tables in the database  When you think about an ER diagram, you are thinking about the rules around the existence and relationship of data that will be stored. | **Used for Object Oriented Analysis-Design**  represent the static structure and behavior of the proposed system  Class diagram are more likely to map in to real-world objects,   about the organization of behavior/functions and the relationship like Inheritance  focus on how their behavior interract with other class | defines a set of concepts and relationships between them  Like data model but focus more on the relationship between nodes |

https://www.inf.unibz.it/~calvanese/teaching/10-11-kro/lecture-notes/1-ontologies.pdf

Def.: Ontology

is a representation scheme that describes a formal conceptualization of a domain

Ontologies affect the whole life-cycle of the information system:

* Ontologies, with the associated reasoning capabilities and inference tools, can provide support at design time.
* The use of ontologies can significantly simplify maintenance of the information system’s data assets.
* The ontology is used also to support the interaction with the information system, i.e., at run-time.
* ❀ Reasoning to take into account the constraints coming from the ontology has to be done at run-time

https://thesai.org/Downloads/Volume10No10/Paper\_37-Ontology\_Learning\_from\_Relational\_Databases.pdf

RDB = Relation Database

However, **RDB**s are considered **“semantically poor**” because of the nature of the used components that are structure oriented. Indeed, the schema of a RDB is composed by a **set of tables related by foreign key constraints**. This limitation makes the use of RDB for semantic purposes very difficult. Transforming the RDB to an ontology can lift the limitation.

https://www.sciencedirect.com/science/article/pii/S2210832717300649

in the real world **the ER model** has been used primarily for database design and they **often do not store domain knowledge**. Therefore, **the ER based query formulation approaches cannot provide a reliable method to depend on its comprehensiveness in expressing low-level query constraints**. More recently, several ontology languages with properly specified semantics have been developed. Several ontology-based approaches have been reported in the literature that can **provide intelligent query formulation services for relational databases**. Such approaches are reviewed in the following sections.

**Ontology (**ISO 15926);

ISO 15926 is a data representation standard based on **the ideas of semantic networks** and the Resource Description Framework, conceived as a lingua franca for the **exchange of data between independent information systems.**

Traditionally, **data** associated with a manufacturing plant **has focused on a particular group of descriptions at a point in time**. Such data was usually **defined and maintained independently of other user groups**, which led to **data duplication and inconsistencies in the data**, as well as to the **impossibility of sharing** it either within the organization or with the organization's business partners.

ISO 15926 is a standard for representing the **life cycle of an entire process plant**. This view is specified through a **generic conceptual data model suitable for implementation in shared databases or data warehouses**. This data model is designed to be used in conjunction with reference data representing information common to a range of users and / or process plants.

The basis of the standard is **a data model that describes everything related to the support of activities and practices of the life cycle** of continuous production plants, and in a single context of a standardized ontology that determines the value of information about the life cycle. The ontology proposed by the standard supports all groups of descriptions that process engineers, equipment engineers, operators, maintenance engineers, and others may have with respect to an installation. Based on this data model, mechanisms for validation, integration, analysis, etc. are proposed.