**The Database Development Process**

**Database development process**

Are the 6 steps/phases that guide us in the creation of new databases, including **feasibility and requirements gathering**, **design phase**, **implementation phase**, **data application phase**, **testing phase** and **maintenance**.

**Feasibility and requirements gathering phase**

* This phase identifies the needs in the business environment to discover the most convenient way to resolve these needs.
* We also look at the requirements of the data and operations within the business. These requirements can be determined by varies factors such as interaction with customers, size of business, etc.

**Design phase**

Based on the previous phase, the structure of the database is designed to facilitate the needs and requirements.

The database design can include components such as:

* **conceptual database design**
* **logical database design**
* **physical database design**

**Conceptual design**

* Here we identify the entities (weak and strong entities), determine their relationships.
* Draw ERD.
* Use crows foot or chen’s notation.

**Logical design**

* Determine attributes, cardinalities, primary keys, foreign keys or composite keys.
* Use a data model of that DB, i.e. relational, network, etc.

**Physical design**

* Identify the data types for attributes, also define how data should be stored and used in the database.
* Implement access methods e.g. b-tree, hash table, indexes.

**Implementation phase**

Involves selecting an appropriate database management system to create a working database, converting and applying the design of the database discovered in the previous stage.

**Data Application phase**

This refers to storing data in the newly created database and integrating it with the application used in the organization.

**Testing phase**

Evaluating the newly created database to see if it performs as expected and it produces the intended results, and most importantly if it satisfies the needs of the organization.

**Maintenance phase**

Means monitoring, updating and optimizing the database in order to facilitate new requirements, e.g. accommodation of new users, and also to make sure the database is running smoothly and is up to date with standard performance.

**Entity**

Entity is an object containing characteristics which makes it distinct from others. An entity is described by a set of attributes.

* Entity set – a collection of similar entities, e.g. all employees.
* All entities in an entity set have the same set of attributes.
* Each attribute has a domain.
* Each entity set has a key/ identifier.

**Entity Class and Entity Instance**

|  |
| --- |
| **Person** |
| name |
| surname |
| age |

|  |
| --- |
| Showen |
| Otto |
| 18 |

**Fig. 1 Entity class Fig. 2 Entity instance 1**

|  |
| --- |
| Franklin |
| Ayele |
| 18 |

**Fig. 3 Entity instance 2**

**Strong and Weak Entities**

Strong entities:

* Able to exist independently.
* Has its own unique identifier.
* Are represented by a single-line rectangle.

Weak entities:

* Depends on a strong entity in order to exist.
* Doesn’t have a unique identifier.
* Represented by a double-line rectangle.

**Attributes**

An attribute is a characteristic of an entity type.

|  |  |
| --- | --- |
| **Entity type** | **Attribute** |
| PERSON | name, surname, age, gender |
| COMPUTER | manufacturerID, name, ram, storage, cpu |
| SCHOOL | name, students, teachers, principal |

**Types of attributes**

* **Single-valued** – can only take one value for an entity instance.
* **Multi-valued** – can take or support many instances
* **Derived –** can attribute whose value can be calculated from other attributes, e.g. fullName can be constructed from the attributes firstName, middleName(s) and lastName.
* **Composite –** an attribute which can be broken down into meaningful components or even other attributes, e.g. address can be broken down into streetName, postalCode, city, etc.

**Identifiers**

An **identifier** or **key** is an combination of attributes which can uniquely identify a entity/record in a database.

A **composite identifier** consists of two or more attributes, when combined they can uniquely identify an entity/record in a database.

**Characteristics of identifiers**

* Value doesn’t change.
* Never has a null value
* No intelligent identifiers, e.g. containing locations, phone numbers, these are all attributes whose value can change.
* Substitute new, simple keys for long composite keys.

**Degree of Relationships**

A **degree** of a relationship is the quantity or number of entity types that participate in a relationship.

The **3 most common** relationships in E-R models are:

* **Unary (degree 1)**
* **Binary (degree 2)**
* **Ternary (degree 3)**

However it is possible for an entity to have a relationship with itself, this is called a **recursive relationship**.