Data Independence

In this lesson, we will look at one of the results of the three-schema architecture.

Data independence is defined as a property of the database management system that helps to change the database schema at one level of a database system without changing the schema at the next highest level. The three-schema architecture can be used to further explain the concept of data independence. We outline the two types of data independence:

1. Logical data independence

The ability to change the conceptual schema without changing the external schema or user view is called logical data independence. For example, the addition or removal of new entities, attributes or relationships to this conceptual schema should be possible without having to change existing external schemas or rewriting existing application programs.

In other words, changes to the conceptual schema (e.g., alterations to the structure of the database, like adding a column or other tables) should not affect the function of the application (external views).

2. Physical data independence

Physical data independence helps you to separate the conceptual schema from the internal schema. It allows you to provide a logical description of the database without the need to specify physical structures.

So for example, there is a change to the internal schema because some physical files were reorganized, for example, by creating additional access structures to improve the performance of retrieval or updates. Physical data independence makes sure that these changes to the internal schema do not affect the conceptual schema. In turn, the external schemas need not be changed as well.

Does data independence work in reality?

Generally, physical data independence exists in most databases and file environments where physical details, such as the exact location of data on disk or the type of storage device, are hidden from the user. On the other hand, logical data independence is harder to achieve because it must accommodate changes in the structure of the database without affecting application programs; which is a much stricter requirement.

In the next lesson, we will outline the different classifications of database management systems.