

Data Anomalies

One of the key reasons for performing normalisation is that without it your data stored in the database will lose its integrity.

Course_ID	Course_Name	Course_Teacher	Class_Room	Room_Size
4637	Programming	B. Murray	D588	20
2364	Data Design	V. Matongo	D523	50
8237	App Development	M. von Stedingk	D587	35
2364	Data Design	V. Matongo	D523	50

There are three types of data anomalies that can occur:

Update Anomalies	This occurs where data that repeats in multiple records is changed in one record, but not all the records. For example, in the table above, if we were to update the teacher of Data Design to S. Cross for the first instance, we may forget to update the second instance of this.
Insertion Anomalies	This occurs where you need to insert data into a table, but cannot as there are fields that require values you don't currently have. Such as in the table above, if we were to add a new course but haven't assigned a teacher or classroom yet, there would be a lot of missing data.
Deletion Anomalies	This occurs where we delete unwanted data, which causes data we still require to be deleted with it. Such as in the table above, if we deleted the course 4637, we'd lose the data on the classroom, such as the size of the room.

Indexing

Indexing	Indexing involves producing a database index. This is a data structure that is designed to save time when retrieving specific data from the database. It works quite similarly to the index of a book.
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Referential Integrity & Cascading Update/Delete

Referential integrity	Referential integrity means that the value in a foreign key field must match with a value in the primary key field of the related table.
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In the tables below you can see that the foreign key field in the order table doesn't match any value in the primary key field in the customers table.

CustomerID	Customer_Name	Customer_Phone	Order_ID	Order_ID	Order_Date	Order_Price
1	D. Samways	07700 900967	1	1	28/09/2017	£126.83
2	J. Khan	07700 900576	2	2	31/10/2017	£82.54
				3	02/10/2017	£132.73

Not enforcing referential integrity leads to an increase of redundant and inaccurate data in your database. To ensure this doesn't happen we use cascading referential integrity constraints.

Cascading Update	If you change the value in the primary key field of a parent table then the matching values in a related foreign key field of a child table will update to match this new value.
Cascading Delete	If you delete the record in a parent table, then all matching records in the related child table will be deleted.
Set to Null	An alternative to cascading delete. If you delete the record in a parent table, then the values in the foreign key field in the related child table will be set to null.

The Normalisation Process

First Normal Form (1NF)	<p>To move our un-normalised data into first normal form we must ensure that:</p> <ul style="list-style-type: none"> All attributes contain only atomic values. For example, this means things like a persons name must be split into first name and last name. All repeated groups of data are removed and put into new entities so that each record within the primary entity is the same length. These entities are linked together through one-to-many relationships by including a primary key from one entity as a foreign key in another entity.
Second Normal Form (2NF)	<p>Any attribute in our entities that is not functionally dependent on all parts of the primary key is moved into a new entity.</p> <p>Create a relationship using one of the attributes.</p>
Third Normal Form (3NF)	<p>Any attribute that is not entirely functionally dependent on the primary key is moved into a new entity.</p> <p>Create a relationship using one of the attributes.</p>

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