

## Data Anomalies

Normalization is the process of splitting relations into well-structured relations that allow users to insert, delete, and update tuples without introducing database inconsistencies. Without normalization many problems can occur when trying to load an integrated conceptual model into the DBMS. These problems arise from relations that are generated directly from user views are called anomalies. There are three types of anomalies: update, deletion and insertion anomalies.

An update anomaly is a data inconsistency that results from data redundancy and a partial update. For example, each employee in a company has a department associated with them as well as the student group they participate in.

Employee_ID	Name	Department	Student_Group
123	J. Longfellow	Accounting	Beta Alpha Psi
234	B. Rech	Marketing	Marketing Club
345	B. Rech	Marketing	Management Club
456	A. Bruchs	CIS	Technology Org.
567	A. Bruchs	CIS	Beta Alpha Psi

If A. Bruchs' department is an error it must be updated at least 2 times or there will be inconsistent data in the database. If the user performing the update does not realize the data is stored redundantly the update will not be done properly.

A deletion anomaly is the unintended loss of data due to deletion of other data. For example, if the student group Beta Alpha Psi disbanded and was deleted from the table above, J. Longfellow and the Accounting department would cease to exist. This results in database inconsistencies and is an example of how combining information that does not really belong together into one table can cause problems.

An insertion anomaly is the inability to add data to the database due to absence of other data. For example, assume Student\_Group is defined so that null values are not allowed. If a new employee is hired but not immediately assigned to a Student\_Group then this employee could not be entered into the database. This results in database inconsistencies due to omission.

Update, deletion, and insertion anomalies are very undesirable in any database. Anomalies are avoided by the process of normalization.