

4 Database Systems

The purpose of a database is to keep track of things (Kroenke, 2007). Databases can exist on paper, for example a telephone directory, but are inefficient and costly to maintain. A computer-based database offers the advantage of powerful search facilities which can be used to locate and retrieve information many times faster than by manual methods. An electronic database provides facilities for users to add, amend or delete records as required. Indexing features mean that the same basic information can be stored under a number of different categories. This provides great flexibility and allows users to locate, retrieve and organise information as needed. Databases used throughout a company are usually accessed by many different users across a network system. Some of the advantages of this approach include minimising the unnecessary duplication of information, consistency is maintained by ensuring any changes made to the information held in the database are reflected to all users and although information is held in a structured manner, the database software will normally provide sufficient flexibility to meet the different requirements of individual users and departments.

4.1 Organising data in a database

The data in an electronic database is organised by fields and records. A field is a single item of information, such as a name or a quantity. A record is a collection of related fields and a table is a collection of related records. In order to identify a specific item of information within a database, all records must contain a unique identifier, normally called the key field or primary key. The key field usually takes the form of a number or code and will be different for each record in the database.

Relational databases enable data to be stored within a number of different tables and are the most widely used type of database. The tables within a relational database can be linked together using one or more record keys. This include the primary key and also other keys to help locate data stored in another table. The record keys contained in each table can be used to establish one or more relationships between tables. By using record keys in combination it is possible to retrieve data from several tables at once. The field used to locate information in another, related table is often called a foreign key.

4.2 Database Software

The majority of database programs support the creation of relational databases containing several linked tables. Many programs, such as Microsoft Access, provide the ability to link tables together automatically to create any required relationships. All major database programs enable users to create and modify data entry forms. A data entry form provides a convenient means of viewing, entering, editing and deleting records. An index stores information concerning the order of the records in the database. All modern database programs provide a range of sophisticated security features. Examples of some of the most common features available including encryption and password protection. Finally all major database packages allow users to generate a wide variety of reports. Many programs are capable of creating simple reports automatically. In addition, many programs allow users to perform calculations and other actions as the report is produced.

4.3 Retrieving Data from a Database

When using database software data is retrieved from a database using what is called a query. A query enables a user to locate, sort, update or extract records from the database. Users design a query by specifying the conditions that must be met in order for a record to be selected. There are two types of query called selection queries and update queries: A selection query can be used to locate and display any records meeting a set of specified conditions. None of the data held in the database are altered and any records not meeting the conditions set are simply hidden from view temporarily. An update query can be used to modify records in a variety of ways such as according to a set of conditions specified by the user. Common actions performed by update queries include updating values held in fields, deleting any records no longer required, appending new records to the database and generating new tables containing selected records or summary information.

The majority of database programs make use of a special structured query language (SQL) in order to create queries. Structured query language (SQL) provides a standardised method for retrieving information from databases. Although traditionally used to manage large databases held on mainframes and minicomputers, it has become a widely used and popular tool for personal computer database packages. SQL programs are created by producing a series of statements containing special key words.

4.4 Business Intelligence

Business Intelligence (BI) systems are needed due to the vast amounts of data now held in organizational information systems and the need to extract useful information from this in the form of patterns, trends and present this in a understandable way to decision makers. BI systems generally focus on providing timely information at a strategic level in large organizations with large data sets (hence the need for a data warehouse described later). BI systems also generally provide indirect support for particular decisions rather than the decision specific orientation of decision support systems.

A BI system has four major components of a data warehouse, business analytics, business performance management (BPM) and user interface (Turban et al, 2010). Data is gathered from various sources and then held in a special database repository termed a data warehouse in order to support decision-making in the organisation. Repositories of data focused on departmental or subject areas are termed data marts. Data mining is a type of analysis that aims to identify patterns in the data that can be used to predict future behaviour. Business Analytics are used to conduct analysis of the data held in the data warehouse using reporting and querying tools. Business performance management covers the methodologies used to measure and manage business performance. The user interface integrates and displays information from multiple business areas. Dashboards provide a visual representation in the form of graphs comparing actual performance to desired performance targets.