Software, Database and Business intelligence.

Chapter 4

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Learning objectives

- **After this lecture, you will be able to:**
  - explain the purpose of software applications in different categories;

  - describe the features found in a variety of modern applications software packages;

  - identify some of the advantages and disadvantages associated with a variety of common applications;

  - describe some of the ways in which applications software supports the activities of a business organisation.

Management issues

From a managerial perspective:

- All major organisations make use of common applications, such as word processing and database software. An understanding of the factors involved with selecting these applications is required by all managers.

- An understanding of the range of software applications available will help managers see potential applications relevant to a given organisation or industry.

- An understanding of recent developments in the software industry and Business Intelligence.

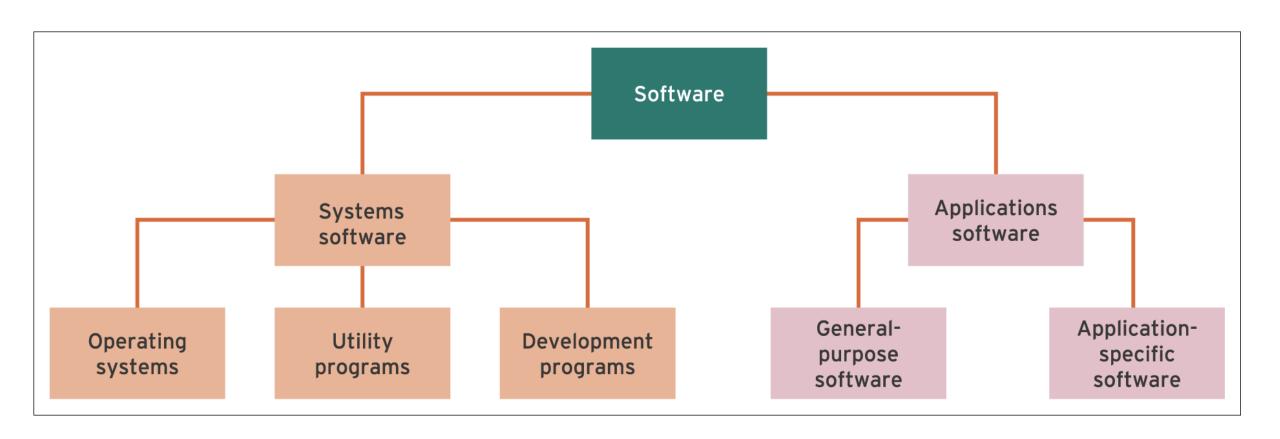# Figure 4.1 Categories of computer software

Figure 4.2 relationships between the different types of software and hardware

User documents	A spreadsheet
Application	Excel
GUI/environment	Graphical user interface
Operating system	Text-based interface
Hardware + BIOS	The PC

Microsoft Windows

Categories of software

- **Software**: A series of detailed instructions that control the operation of a computer system. Software exists as programs that are developed by computer programmers.

- **Systems software**: This form of software manages and controls the operation of the computer system as it performs tasks on behalf of the user.

Systems software

- **Operating system (OS)**: Software that interacts with the hardware of the computer in order to manage and direct the computer's resources.

- **Command line interpreter (CLI)**: Passes instructions from a user to a computer program as instructions from a user in the form of brief statements entered via the keyboard.

Systems software

- **Graphical user interface (GUI):** Provides a means for a user to control a computer program using a mouse to issue instructions using menus and icons.

- **WIMP:** WIMP (windows, icons, mouse and pull-down menus) is often used to describe a GUI environment.

- **Network operating system (NOS):** This describes the software needed to operate and manage a network system.

Applications software

- **Applications software**: A set of programs that enable users to perform specific information-processing activities that may be general-purpose or application-specific.

- **General Purpose applications**: This is also known as **productivity software** and describes a category of computer software that aims to support users in performing a variety of common tasks. (e.g. word processor, spreadsheet, database).

- **Application-specific software**: This is intended to serve a specific purpose, for example software used in the marketing and accounting functions (see chapter 6 for more details).

Spreadsheet applications

- **Modelling:** Modelling involves creating a numerical representation of an *existing* situation or set of circumstances, whilst simulation involves *predicting* new situations or circumstances.

- **What if? analysis:** This describes the ability to see the predicted effect of a change made to a numerical model.

- **Goal seeking**: In a spreadsheet, goal seeking describes a way of automatically changing the values in a formula until a desired result is achieved.

Databases

A collection of related information stored in an organised way so that specific items can be selected and retrieved quickly.

Database – advantages

- Multi-user access
- Distributed access
- Speed
- Data quality
- Security
- Space efficiency

Database types

Flat file database

Free-form database

Hypertext database

Relational database management system (RDBMS)

Key database concepts

Field

Record

Table

Entity

Primary key (unique identifier in a Table)

Foreign (secondary) key fields

Compound key (two or more unique ids)
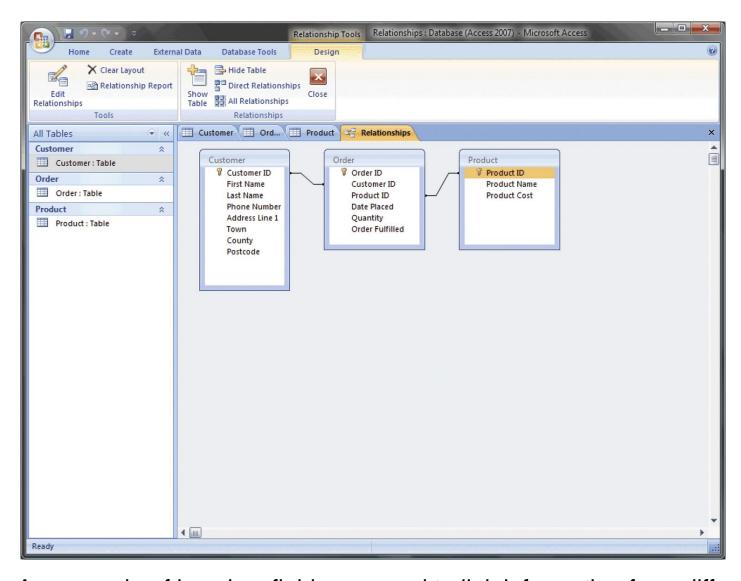
Relationship (relation between entities)

Figure 4.6 An example of how key fields are used to link information from different database tables

Database features

Update query: An update query can be used to change records, tables and reports held in a database management system.

Structured query language (SQL): A form of programming language that provides a standardised method for retrieving information from databases.

Filter: In a spreadsheet or database, a filter can be used to remove data from the screen temporarily.

Other database types

- **Object-oriented database**: The database is made up of objects combining data structures with functions needed to manipulate the object or the data it holds.

Business intelligence

- Business intelligence systems are needed due to the vast amounts of data now held in organisational information systems.
  - the need to extract useful information from the IS in the form of patterns, trends and present this in a understandable way to decision makers.

- Figure 4.2 shows the main elements of a business intelligence system.

- 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.
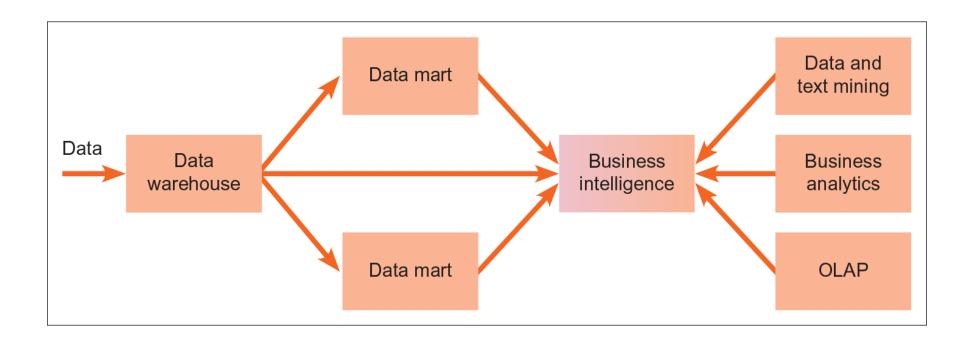
Business intelligence (Continued)

Figure 4.2 Business intelligence system overview

Data warehouses

Data warehouses are large database systems containing current and historical data that can be analysed to produce information to support organisational decision making.

Data marts are a smaller, departmental version of a data warehouse which may be easier to manage than a company-scale data warehouse.

- Data marts do not aim to hold information across an entire company, but rather focus on one department.

Figure 4.3 indicates the major steps in the data warehousing process.
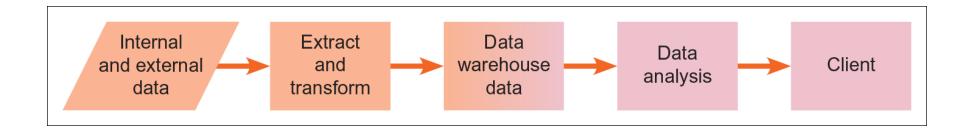
Data warehouses (Continued)

Figure 4.3 The data warehousing process

Data mining

Data mining in its broadest sense is a process that uses statistical, mathematical, artificial intelligence and other techniques to extract useful information from large databases.

Under this wide definition most types of data analysis can be classified as data mining.

In its original definition data mining is used to identify patterns or trends in the data in data warehouses which can be used for improved profitability.

Data mining (Continued)

- Particular data mining techniques include:
  - *Identifying associations*
    - This involves establishing relationships about items that occur at a particular point in time.
  - *Identifying sequences*
    - This involves showing the sequence in which actions occur, e.g. path or click-stream analysis of a web site.
  - *Classification*
    - This involves analysing historical data into patterns to predict future behaviour.
  - *Clustering*
    - This involves finding groups of facts that were previously unknown.
  - *Modelling*
    - This involves using forecasting and regression analysis to predict sales.

Text mining and web mining

Text mining

Text mining is the application of data mining to text files.

- Text held in documents will normally be unstructured in terms of its content and text mining aims to find previously hidden patterns in text within and between documents.
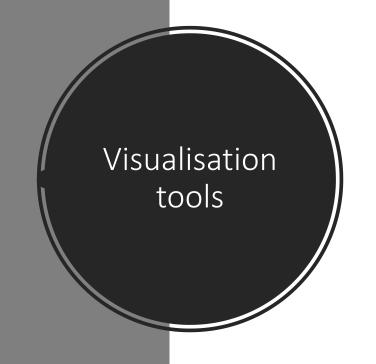
Web mining

Because of the size and popularity of the web many data mining applications are being developed to analyse information from the web and these are classified under the term web mining.

- Extraction of information from web pages specifically is termed *web content mining* and involves reading and analysing data from web pages.

Business analytics

Business analytics (BA) is a term that is used to describe various approaches to data driven analysis including reporting tools such as OLAP and visualisation tools such as dashboards.

Online analytical processing (OLAP) refers to the ability to analyse in real time the type of large data sets stored in data warehouses. 'Online' indicates that users can formulate their own queries, compared to standard paper reports.
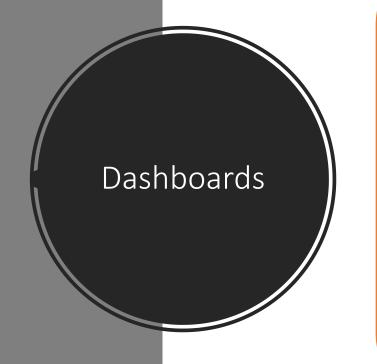
Visualisation tools

Easier understanding of data, software that provides a visual representation of data is available.

- Applications such as spreadsheets, dashboards, scorecards and geographical information systems can be utilised as visualisation tools.

Spreadsheets

- createa a variety of different charts
- updated automatically in response to changes in data is covered in Chapter 3.
- In conjunction with their statistical and forecasting capabilities spreadsheets are particularly useful are providing graphical displays of trends such as sales for analysis by organisations.
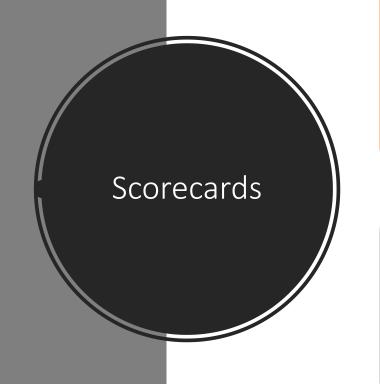
Dashboards

A dashboard display is a graphical display on the computer presented to the decision maker which includes graphical images such as meters, bar graphs, trace plots, text fields to convey real-time information. An example of a dashboard display is shown in Figure 4.7.

Dashboards (Continued)

Figure 4.7 Example of a dashboard

Source: http://www.dashboardinsight.com/articles/digital-dashboards/fundamentals/a-closer-look-at-scorecards-and-dashboards.aspx

Scorecards

Whilst dashboards are generally considered to measure operational performance, scorecards provide a summary of performance over a period of time.

An example of a scorecard display is shown in
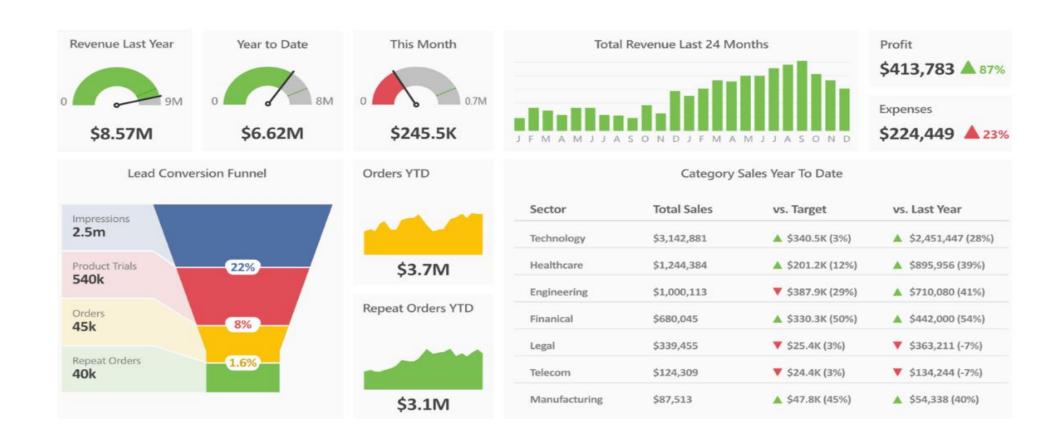Figure 4.8.

Scorecards (Continued)

Figure 4.8 Example of a scorecard

Business activity monitoring (BAM)

- **Business activity monitoring** software is designed to monitor, capture and analyse business performance data in real time and present them visually in order that rapid and effective decisions can be taken. It offers an alternative approach to real time Business Intelligence.

Business activity monitoring (BAM) (Continued)

- *Alert and Dashboard.*
  - capture data from various applications and internal and external data sources
  - which are then filtered and analysed to provide an alert of unusual performance.

- *Automatic Response.* In a standard Alert and Dashboard system any decisions made on the basis of the information supplied by the BAM are made using traditional telephone, e-mail or alternative communication systems.

- *Predictive and Adaptive.* This implementation of BAM, not only provides alerts in response to exception events, but also suggests alternative actions which could be taken and allows the exploration of future scenarios based on alternative responses.

Geographical information systems (GIS)

- A **geographical information system (GIS)** uses maps to display information about different areas. They are commonly used for performance analysis
  by marketing staff for:

  - Performance of distribution channels such as branches can be shown by
    colour-coding them.

  - Colour-coded areas on the map can be used to show variation in the demand of customers for products or the characteristics of people living in different areas, such as average disposable income.

Data and Decision making

Summary

the purpose of software applications in different categories;

the features found in a variety of modern applications software packages;

Databases

Business Intelligence

Questions ?