Information Systems

6 Tools and Decision Making

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We have seen how information is used in business.   We have seen how management information systems help. We look at the purpose and operation of other tools that might help managers to make the best decisions.

6.1 Databases

A database is a structured collection of data that can be accessed in a variety of ways to inform its various users.

A computer database uses software to organise the storage and retrieval of data. The software is known as a database management system (dbms). Well-known examples include Oracle and Microsoft Access.

Database of Driving Lessons Sorted by Day

Databases come with their own query language, which is used to obtain information from the database according to the users requirements at the time. Routine reports on the data can also be constructed.

The reports inform and direct managers' strategic (what to do) tactical (how to do it) and operational (day-to-day) decisions.

Advantages include :

- almost limitless volumes of data can be stored
- can be accessed in an almost infinite number of ways
- routine reports easily accessed

Disadvantages include:

- only as good as the accuracy of the data it contains
- requires skill to design and set up the database, and to create ad hoc reports

6.2 Spreadsheets

A spreadsheet is a structured collection of essentially numeric data that may be used to model cash flow and profit and loss scenarios, and to model what if .. scenarios.

	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Receipts	383.60	383.60	450.50	191.80	450.50	383.60	383.60		450.50	383.60	383.60	191.80
Payments												
Rent	8	8	8	8	8	8	8	8	8	8	8	8
Delivery	100	100	100	100	100	100	100	0	100	100	100	100
Fruit	268.45	268.45	363.70	134.22	363.70	268.45	268.45		363.70	268.45	268.45	134.22
Total Payments	376.45	376.45	471.70	242.22	471.70	376.45	376.45	8	471.70	376.45	376.45	242.22
Net Cash Flow	7.15	7.15	-21.20	-50.42	-21.20	7.15	7.15	-8	-21.20	7.15	7.15	-50.42
Opening Balance	80	87.15	94.30	73.10	22.68	1.48	8.63	15.78	7.78	-13.32	-6.27	0.88
Closing Balance	87.15	94.30	73.10	22.68	1.48	8.63	15.78	7.78	-13.32	-6.27	0.88	-49.54

Spreadsheet Showing Cash flow for a Fruit Selling Business

(Spreadsheet from http://www.bized.co.uk/educators/level2/finance/activity/cashflow12_soln.htm)

A spreadsheet is a computer application. Examples include Gnumeric and Microsoft Excel.
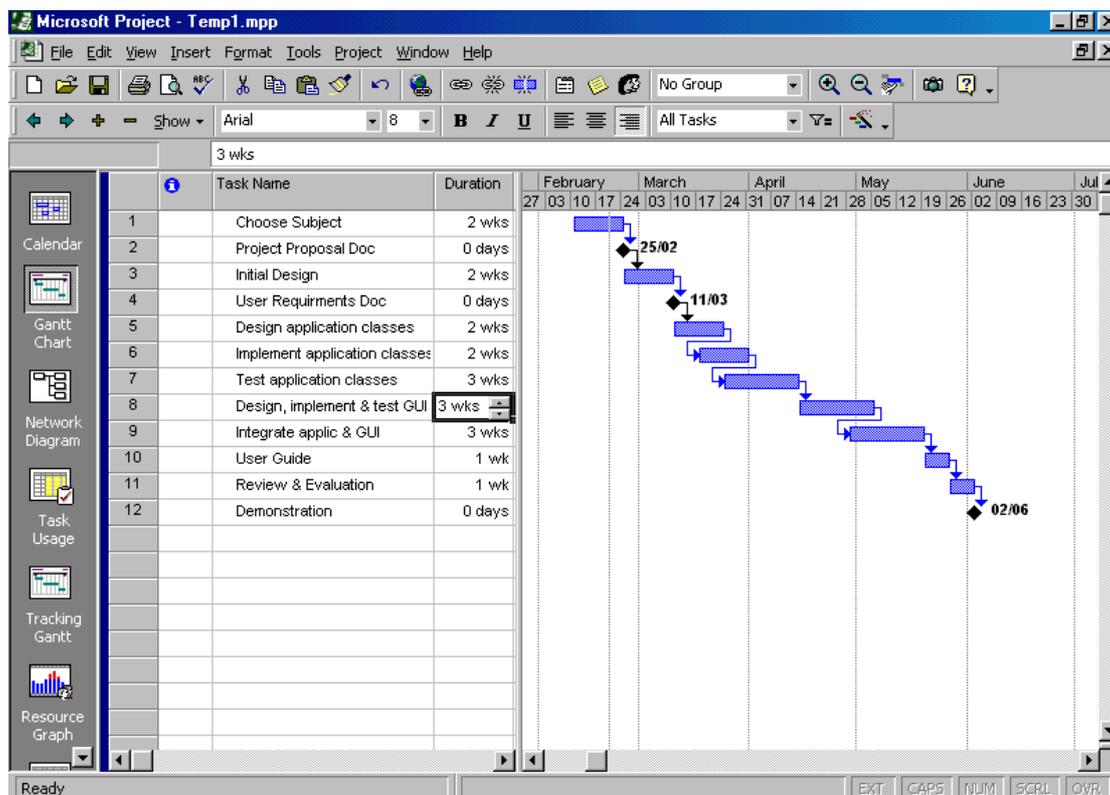
Advantages include:

- good for small models with limited complexity and size
- standard management reports on cash flow, and profit and loss

Disadvantages include:

- limited application, essentially numeric data
- skill required to model what if .. scenarios

6.3 Gantt Charts

A Gantt chart is a kind of horizontal bar chart used for scheduling tasks and deliverables, and recording progress actually made. A moveable vertical cursor shows the current day. A task falling behind schedule is easy to see, allowing the manager to either allocate more resources such as people and time, or to change the schedule. It is an essential tool to help prevent projects going over time.

Gantt Chart for Managing a Small Programming Project

GanttProject and Microsoft Project are examples of Gantt chart project management software.

Advantages include:

- excellent for task scheduling and project management

Disadvantages include:

- difficult to use if there are more than about 30 tasks
- represent the timescale for each task, not the size of each task
- applications limited to task scheduling and project management

6.4 Artificial Intelligence and Expert Systems

An expert system is a computer program that represents human expertise in decision-making. It uses a set of rules to analyse the user's response to questions, and then makes recommendations.

A very simple example:

Question: How many kg of chips are in stock?
Answer: 15
Question: How many weeks until end of term?
Answer: 3
Recommendation: Order 75kg chips

Artificial intelligence involves machines that have some human-like thinking properties. Examples include:

- robots that are able to negotiate randomly-placed hazards
- computer systems that can play chess and beat world-masters, automatically translate one spoken language into another, and diagnose medical conditions such as leukaemia

The computer programs that drive artificial intelligent systems are examples of expert systems. Lisp, Prolog and C are commonly-used programming languages.

Advantages include:

- automatic decision making for routine problems
- can be used by non-experts when created

Disadvantages include:

- limited application to routine problems
- requires considerable expertise to set up

6.5 Data Mining

Data mining is the process of searching through data looking for new patterns and connections between data objects. These new patterns help management decide on future expansion and change for improvement. The data searched through is usually contained in a database.

For example, data mining techniques could be used to discover the characteristics of a company's best employees e.g. which universities they attended and which courses they studied; this information could then be used to recruit new employees with similar characteristics.

Data mining software includes RapidMiner and Weka.

Advantages include:

- discovery of new trends
- improves the targeting of resources e.g. sales catalogues to people identified as likely to become customers

Disadvantages include:

- privacy and legality rules may be ignored since the data on individual people is being used for a purpose perhaps without their consent
- likely to show trends in random data - just because a pattern has been found does not mean it is significant

6.6 Predictive Modelling

Predictive modelling involves creating mathematical models of behaviour to predict the probability of a result. Predictive modelling is used to analyse customer behaviour to try and predict who is likely to buy goods or services, who is likely to return and buy again, and who to target marketing at.

For example, predictive modelling might show that people who bought BMW motorcycles in the 1980's and are returning to motorcycling twenty years later are likely to choose to buy bikes similar to the 1980's models.

Predictive modelling often uses data mining techniques to obtain the data on which the models are based.

Advantages include:

- improved targeting of marketing efforts
- new product lines that are likely to sell

Disadvantages include:

- requires considerable mathematical skill to create the models
- the models may not always provide results that prove to be successful

6.7 The Internet

How can the Internet help managers make sound business decisions?

The Internet is an ever-expanding source of information. Want to see what your competitors are doing? Look at their websites. Look at:

- their products - can you produce something better?

- their prices - can you produce similar items cheaper?

- their place - is the location of their business anywhere near yours? If so, can you move further away, or move to an area where there are a lot of potential customers?

- their promotion - can you make your business appear even more attractive?

Advertise your business on the Internet. Could you produce a better website liked by more people? Could you improve your company's ranking so that it appears within the first few pages of a Google listing? Can you use your website to sell your goods and services?

Advantages include:

- ever-ready source of information
- cheap to use
- effective marketing and selling tool

Disadvantages include:

- finding the particular information you want is not always easy and may be time-consuming
- the information you find may not be up-to-date and reliable
- poor websites put potential customers off and loose sales

6.8 Evaluation

We evaluate the tools with respect to their support in decision-making.

Evaluation involves making informed judgements about a product or process against clear criteria.

First, we list the criteria:

- to support the decision making process

Then we describe the products:

- Databases are a structured collection of data. The data may be accessed in a number of ways to generate routine reports and ad hoc reports.

- Spreadsheets store essentially numeric data, especially for cash flow and profit and loss purposes.

- Gantt charts are a kind of horizontal bar chart for scheduling tasks, recording their completion and seeing, at-a-glance, which tasks are behind schedule, and which are not.

Then we explain with reasons, how the products meet the criteria.

- Databases - excellent for helping with the decision making process because they can contain the largest amount of information and, with a little expertise, can generate a large number of reports that can inform the decisions of management.

- Spreadsheets - excellent for helping with making decisions about cash flow and profit and loss, essential to every business since most exist to create profits, and excellent for analysing or evaluating what if ... scenarios and helping managers decide on future developments. . However, they are limited to essentially money problems and analysing scenarios.

- Gantt Charts - excellent for managing projects - setting targets and measuring progress made. Helps management to make the right decisions that bring projects in on time and on budget, and nothing much else.

6.9 Exercises

Complete the evaluation, started in §6.8 above, of the tools that help managers make the best decisions.

Bibliography

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