1   Becoming a critical thinker

Why are some people better than others at problem solving and decision making? One important characteristic that differentiates effective decision makers is their ability to think critically. Managers who are critical thinkers use information , both qualitative and quantitative, to help arrive at and to present the most reasonable and justifiable position that is possible.

To many of us the numbers can be a turn off. We can deal with headlines like a 70% increase, but after that our interest begins to wane. The danger is that we accept things at face value rather than try to untangle the numbers to gain a truer picture. Consider the following:

> **Sleight of statistic**
>
> **Headline:** 5,000 extra police pledged
> **In actual fact:** This will replace those leaving the force
>
> **Headline:** £50m promised to fight heart disease
> **In actual fact:** This was part of the £21bn already pledged to the Health Service
>
> **Headline:** £21bn for the Health Service
> In actual fact: Spread over 3 years

Source: www.bbc.co.uk

Critical thinking involves acquiring information and evaluating it to reach a well justified conclusion. This doesn't mean collecting information exhaustively. Collecting information can be costly and time-consuming. Some information may not be available, because of Data Protection for example, or because it is held by a competitor. We need the skills to decide when we have sufficient information, and when obtaining further information is impracticable or unnecessary.

This first theme begins by looking at the role information plays in effective management and at the sources of data you use. It ends by exploring the concept of critical thinking in more detail. Rather than trusting that things will turn out right, we'll explain the benefits of carefully following a logical process and critically checking your thoughts, actions and decisions at every stage.

In this theme you will:

◆ **identify the information needs of your team and assess how effectively these are being met**

◆ **critically consider the factors that affect the quality and use of data and information**

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◆ **gather and record information relevant to your own area of responsibility, complying with any constraints on the collection of, and access to, data**

◆ **explore the characteristics of critical thinking and assess your own critical thinking skills.**

Why we need information

"Errors using inadequate data are much less than those using no data at all."
Charles Babbage

At the heart of any management system you need good decisions and good information. In his book on Leadership, Rudy Guiliani, ex-mayor of New York tells how timely access to accurate information helped improve decision making in New York City's fight against crime.

Back in the early nineties, the scale of crime in New York was immense. "We were looking at 9000-10000 felonies a week and anywhere from 1800-2000 murders per year. Evaluating the data annually or even quarterly wasn't telling us anything. By the time a pattern was noticed, it would have changed. It was anyone's guess whether say a pattern of three AM gas robbers was emerging."

Compstat (an abbreviation of "computer comparison statistics") was an innovation of the New York City Police Department designed to make information available instantly. As each report was logged by a Police Officer it was plotted onto a computer-generated citywide map showing where and when crime was occurring. With 'real time' access to information on the victim, time of occurrence, and other crime-specific details police were able to identify trouble spots and target the appropriate resources to fight crime strategically. The impact was immediate and revolutionary. Major felonies fell 12.3% in the year following its introduction and soon lay below that in other American cities.

Source: Adapted from Guiliani (2003)

Information for decision making

Whether in their immediate impact or their long term significance, some decisions are undoubtedly more important than others and require more time and more resource. One way to think about decisions is to look at them at three levels:

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♦ **Operational decisions** are the day-to-day decisions affecting the running of the organisation. The decisions tend to be short term (days or weeks), routine and need to be made quite frequently. For example, a supermarket deciding on whether it needs to order more strawberries to cope with current demand. The consequences of a bad operational decision will be minimal, although a *series* of bad or sloppy operational decisions can cause harm.

♦ **Tactical decisions** have a longer time frame (months or years) and tend to have moderate consequences. For example, a toy shop timing the start of its Christmas promotion.

♦ **Strategic decisions** affect the organisational plans of the whole business, possibly for a number of years, and so are made less frequently. For example, whether to sell off a subsidiary company in response to falling profits. These decisions are the most risky, partly because they reach so far into the future and partly because they are of such importance.

All these decisions will require information, but the type and volume of information that is needed will be different for each level of decision making. See Figure 1.1.
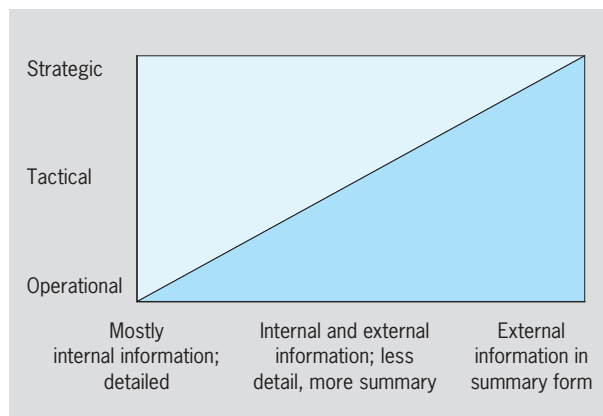

Figure 1.1 *Characteristics of information for management decisions*

Source: Nickerson (2001)

Operational decisions rely mostly on detailed data that is generated internally; how many strawberries did we sell yesterday, or last weekend? Operational decisions are often proceduralised by setting up information systems to capture performance data e.g. a stock control system. Decisions are usually low-cost because they can be made quickly with the minimum of effort.

Tactical decisions involve collating a wider spread of information that is relevant to the problem: for the past two years, what were the sales figures for the month prior to the Christmas promotion and during the promotion? When are other stores starting their promotion?

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Strategic decisions are the most uncertain and high cost to make. Because of their impact they usually demand information from a number of sources. These will include performance figures from inside the organisation, but also far more external information in the form of financial forecasts and analyses from the wider marketplace, its own shareholders' views, and so on.

Do notice, however, that all of these decisions will inevitably be linked. For example, if a supermarket has made a strategic decision to maximise its payments to shareholders, it may make a linked tactical decision to delay the introduction of a new products delivery system, and this may itself make it difficult for local managers to make operational decisions to change stock levels when there is a change in the weather.

How good are management decisions?

Informix, a software development company, carried out a survey in 1999 to examine how decisions are made in different organisations around the world, and to find out how well the available information, in all its forms, supported the decision-making process.

A general finding was that managers, even when they are supported by a multitude of different information sources, find decision making extremely stressful. Most of these managers quoted examples of major decisions that were made incorrectly in the previous six months, and the larger the organisation, the more likely it was to have had a problem.

Among the most important negative effects on decision making was using limited, incorrect or misinterpreted data.

Some key findings of the survey:

◆ 32 per cent of the sample had made an important business decision in the past six months based on hope or luck.

◆ 33 per cent of managers ignore relevant data either when making a decision in the first place or when it becomes apparent that a decision has been incorrect.

◆ the single biggest cause of stress in decision making is a lack of information.

Source: *Informix* (1999)

What information do you need?

Without a good flow of information, most organisations would not find it possible to function, and all organisations will have information systems of some kind even if they are relatively

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informal. Information systems have evolved radically in recent years to mirror changes in organisations and the business context and to take advantage of advancing technologies. This has had an impact on how people use information.

◆ Organisations have become flatter and moved towards fluid, team based structures and project environments. These operate with reporting structures and information systems that look more like a net than a tree. Information systems are focused on getting information to the people who need it rather than passing information up and down the line of management command.
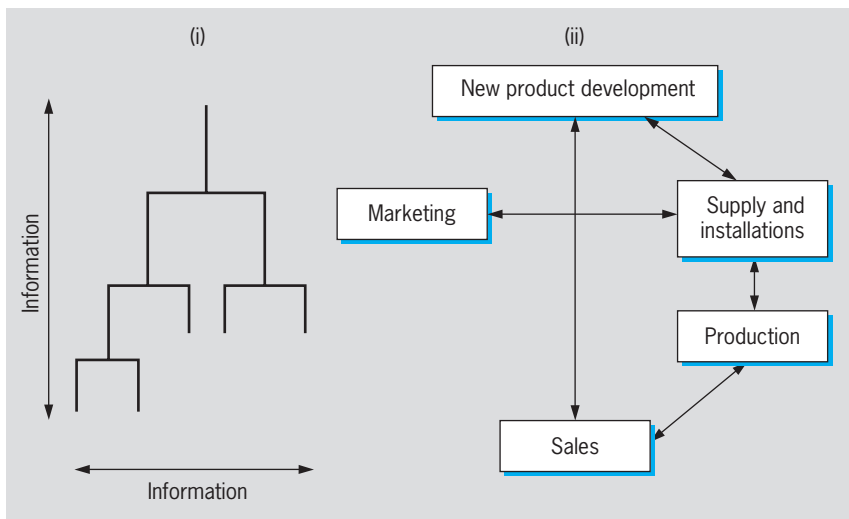
Figure 1.2 *Information flow in i) a hierarchy and ii) a project based organisation*

◆ New media (particularly electronic media) have made it possible to communicate information faster and more directly and through many more channels. From e-mail to pagers and mobile phones, PDA's, wikis and Intranets, the options to present information through different channels and formats is now immense.

◆ With the explosion of electronic information, information has become more readily available and far exceeds that which most organisations or its people can handle. Instead of information being pushed to the users, the new rule is to expect the users to pull information from the system when they need it.

The impact, as a manager, is that you need to manage information flows proactively, rather than rely on the systems. You need to know what information you and your team need and how to get it, and you need to know what information other people need from you and be able to provide it. This means regularly assessing information flows into and out of your team.

Activity 1

Your contribution to the information flow in your organisation

Objective

To analyse the way in which information flows in and out of your team.

Task

Mapping the information flows into and out of your team is one way to think about how effectively you manage information. To do this you need to identify the people who supply you and your team with information, and the people who require information from you.
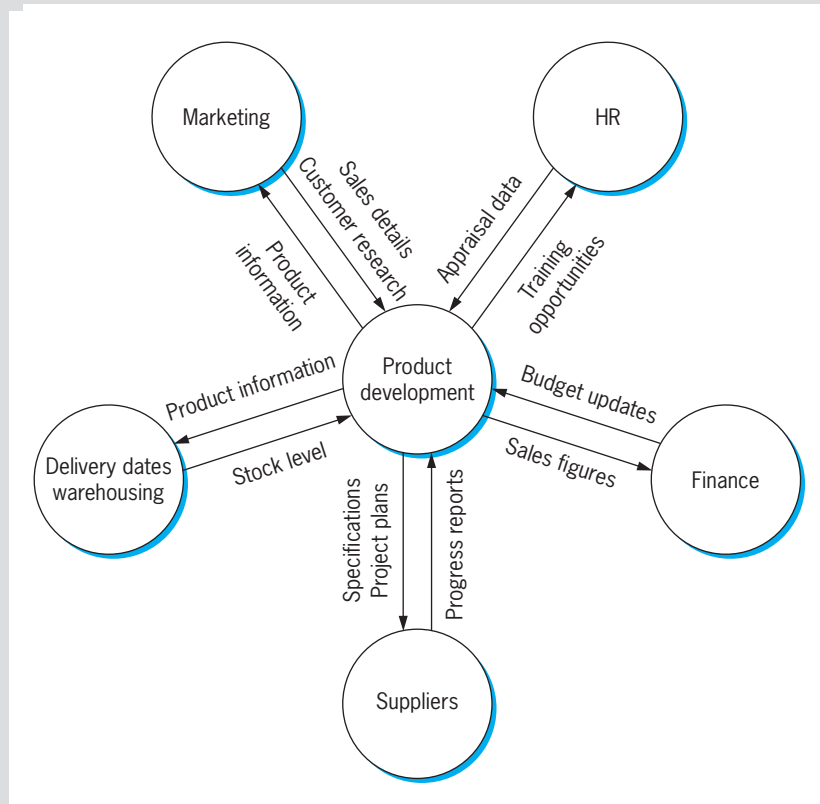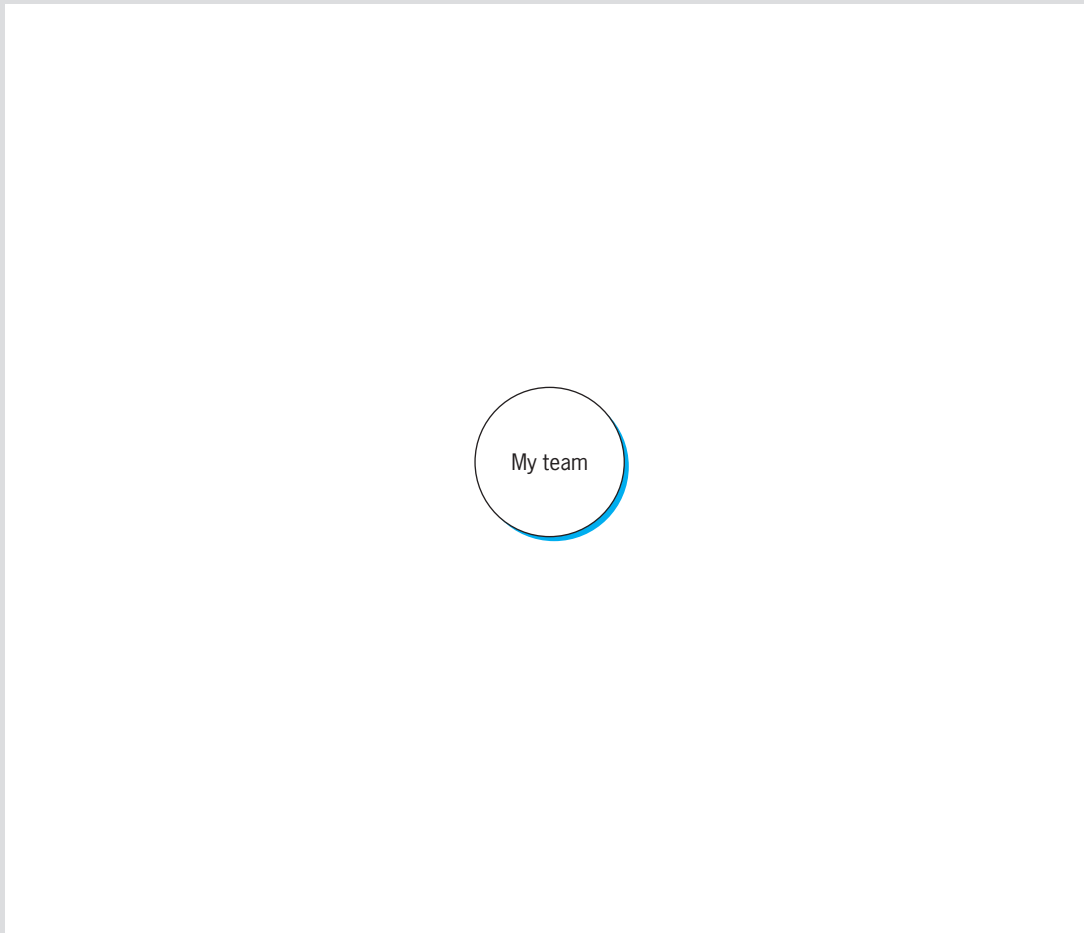

Figure 1.3 *Information map*

1. Draw a similar map to show how information flows to and from you and your team. Highlight on your map the key information that is important to you achieving your objectives.

My team

2. Now think about how effectively this information meets your decision making needs. And conversely, how well you are meeting the information needs of others within and outside your organisation. Summarise any barriers you have identified below and identify what you might do to remove them.

Barriers	Possible actions for improvement
Information that my team receives	

Information that my team provides

Feedback

You probably found that some of the information that you use and/or provide passes through formal systems and some through informal channels. On the map you might like to highlight which channels are formal and which are informal.

Formal systems tend to be structured systems that have a fixed purpose. Examples might include a stock control system. Formal systems tend to be managed by a strict set of rules and to require specific inputs (e.g. barcode scans) to create pre-defined outputs (e.g. stock control reports). One of the most common barriers in a formal system is whether the output is in a format that is useful to you. This can be difficult and expensive to change and despite enormous investments in systems design, the rapidly changing business environment means that it is often difficult for formal information systems to mirror business practice.

Far more information passes informally. This includes information that passes by email, voicemail, computer conferencing, searching in databases, surveys, internet searches and the list could go on. People sometimes prefer informal systems because the response is instant and the information can be tailored to meet your specific needs. The process is quicker and so it may feel more efficient than a formal system, but as a user you need to keep in mind that informal communication systems are far more susceptible to human fallibility. The information may be incomplete, inaccurate or arrive too late for you to make a decision at all. Poor information leads to poor decisions, potentially worse than those made with no information at all. The ability to judge the credibility of information is central to your effectiveness as a critical thinker and decision maker. We look more at this later in this theme.

We noted earlier that rather than push information around, there is a move to make individuals responsible for 'pulling' information from systems when they need it. The most obvious example is the Intranet but you might have identified other examples in your own map. It's blindingly obvious but unless you know how to find and access the information that you need, it may as well not exist. To hone your decision making skills you need to be able to navigate your organisation's information systems – both formal and informal.

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Using data, information and knowledge

Information systems might differ wildly in form and application but essentially they serve a common purpose which is to convert data into meaningful information which in turn enables the organisation to build knowledge:

◆ **Data** is unprocessed facts and figures without any added interpretation or analysis. "The price of crude oil is $80 per barrel."

◆ **Information** is data that has been interpreted so that it has meaning for the user. "The price of crude oil has risen from $70 to $80 per barrel" gives meaning to the data and so is said to be information to someone who tracks oil prices.

◆ **Knowledge** is a combination of information, experience and insight that may benefit the individual or the organisation. "When crude oil prices go up by $10 per barrel, it's likely that petrol prices will rise by 2p per litre" is knowledge.
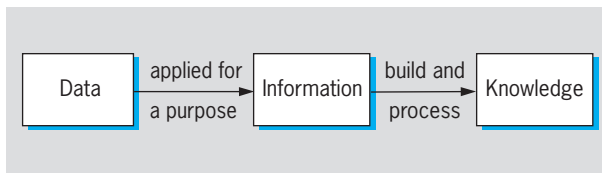

Figure 1.4 *From data to information to knowledge*

The boundaries between the three terms are not always clear. What is data to one person is information to someone else. To a commodities trader for example, slight changes in the sea of numbers on a computer screen convey messages which act as information that enables a trader to take action. To almost anyone else they would look like raw data. What matters are the concepts and your ability to use data to build meaningful information and knowledge.

Converting data into information

Data becomes information when it is applied to some purpose and adds value for the recipient. For example a set of raw sales figures is data. For the Sales Manager tasked with solving a problem of poor sales in one region, or deciding the future focus of a sales drive, the raw data needs to be processed into a sales report. It is the sales report that provides information.

In the first column below you'll see some examples of the huge amount of data that managers may receive. The second column then shows how the various types of data could be processed to create useful information.

Data	Possible methods of converting data into information
Sales figures	Plot charts and identify trends
Market and competition data	Find average or typical values
Financial performance	Present complex data as a chart or graph
Production output	Monitor changes over time and forecast future values
Costs of resources or other inputs	Compare figures and identify similarities or differences
Staff absences, holidays or sick leave	Assess whether a result is significant or occurred by chance
Accident records	Assess whether one thing is related to another.

Table 1.1 *Converting data to information*

Collecting data is expensive and to merit the effort, you need to be very clear about why you need it and how you plan to use it. One of the main reasons that organisations collect data is to monitor and improve performance. Measure what matters might be a bit of a cliché but if you are to have the information you need for control and performance improvement, you need to:

◆ collect data on the indicators that really do affect performance

◆ collect data reliably and regularly

◆ be able to convert data into the information you need.

Here are some perspectives from CEOs on the indicators that they track. Read their comments and then decide for yourself. What are the measurements that matter to you?

There are few metrics to which I pay closer attention than "system uptime" -- how often Sun systems are up and running at customer sites. The most important commitment that we can make as a company is to share our customers' risk. Most of our customers face the same risk: computer systems that go down when people need them.

Scott McNealy, President and CEO of Sun MicroSystems

I monitor costs because being low-cost is the core of our business strategy. The rationale behind an airline like Go is that keeping costs low lets us offer customers a cheaper way to fly -- and, as a result, more people will want to travel.

Barbara Cassani, ex CEO of Go Fly (now part of EasyJet)

We are a service organization. Our customers are the citizens of Charleston. In my 17 years as head of this organization, the question that I've always asked myself is, "are citizens happy with the job that we're doing?" One metric I use to answer that question is the number of complaints that we receive. Complaints provide a window into your overall performance. When one citizen makes a complaint, four or five others probably feel the same way but either don't take the time to complain or don't think that it would do any good.

Reuben Greenberg, Chief of police,
Charleson Police Department, South Carolina.

The difference between a great technology company and an average technology company is how much intellectual property a company creates. I keep a close eye on two measurements. One is our rate of innovation in existing products. I want to know how many customer-requested features are making it into the next release. The other measurement that I track is patent flow.

Edward Iacobucci, Founder, chairman, and CTO, Citrix Systems Inc.

Source: www.fastcompany.com

To be useful, data must also satisfy a number of conditions. It must be:

◆ **relevant** to the specific purpose

◆ **complete**

◆ **accurate**

◆ **timely**; data that arrives after you have made your decision is of no value

◆ **in the right format**; information can only be analysed using a spreadsheet if all the data can be entered into the computer system

◆ **available at a suitable price**; the benefits of the data must merit the cost of collecting or buying it.

The same criteria apply to information. Throughout this book you will repeatedly see the importance of:

◆ getting the right information

   and

◆ getting the information right.

A manager investigating poor punctuality of trains on a particular line needs information showing all the arrival data on that line. Data on other lines is irrelevant, unless late connections elsewhere are causing the problem. Just as important, the manager must use the data correctly. One day of engineering works will have a major

impact on a week's results. Wrongly interpreting the results could identify a problem where no problem actually exists.

Converting information to knowledge

Ultimately the tremendous amount of information that is generated is only useful if it can be applied to create knowledge within the organisation. Building and managing knowledge is one of the greatest challenges that faces organisations in the twenty first century. We hear a lot about the knowledge economy and for many organisations it is their knowledge or 'know how' that defines their competitive advantage.

There is considerable blurring and confusion between the terms 'information' and 'knowledge'. It is helpful to think of knowledge as being of two types:

◆ **Formal, explicit or generally available knowledge**. This is knowledge that has been captured and used to develop policies and operating procedures for example.

◆ **Instinctive, subconscious, tacit or hidden knowledge**. Within the organisation there are certain people who hold specific knowledge or have the 'know how' – "I did something very similar to that last year and this happened….."

Clearly, both types of knowledge are essential for the organisation.

A systematic approach to information management

When you want a sandwich for lunch, do you buy the one wrapped roughly in cling film or the one that is carefully packaged, looks more appetising but costs more? Quality, design and branding are important factors in determining price. It is true for trivial purchases but also for major ones such as cars. Consider the following saloons, the Kia Magentis costs £14495 and the Audi A4 25% more at £19875. On the face of it these two cars are very similar:

Model	Length	Width	Top speed	0-60mph	Mpg	Co2/tax %
Kia Magentis 2.0 4 door	474	181	129	10.2	36.7	192/26%
Audi A4 2.0 4 door	445	177	131	9.9	34.9	185/24%

Source: Top Gear

From the customer point of view the price suggests that the Audi represents a far more attractive combination of raw materials than the Kia. Starting with the same kinds of inputs (and similar amounts of labour and materials), Audi add more value or build in more 'know how' than Kia. Know-how of course includes different types of information, for instance design information, production information as well as the tacit knowledge of Audi's staff. Presumably the manufacturers at Kia would like to know how to produce a car that they can charge more for and so it's reasonable to assume that they face an important challenge on how to manage their information and use it more effectively to build knowledge and capability in their organisation.

Source: Adapted from Wilson (2002)

Information on its own will not create a knowledge-based organisation but it is a key building block. The right information fuels the development of intellectual capital which in turns drives innovation and performance improvement.

Activity 2
Using data and information to make a difference

Objective

This activity will help you to consider how effectively you use data and information to measure performance in your business area.

Task

Earlier you looked at how a number of CEO's use indicators to track performance in their organisation. e.g. costs in a low cost airline. Simple measures have an important influence on behaviour – what gets measured gets done. They also indicate issues for you to explore further e.g. Why did sales figures surge (or conversely, plummet) last month?

Think about your team or business area. Identify the key processes that you carry out. Focus on the one or two processes that are really important to the achievement of your objectives. Now think about how you measure how well these processes are working. What data do you capture and how do you translate that into information that you can share with your team?

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Make some notes in the table below:

Process	What are the key indicators of performance?	What data do you capture ?	How is this translated into information to share with your team ?	How effective is the information? What improvements would you suggest?
A consultancy team delivers training design services to corporate clients.	Client satisfaction is a key measure of performance as are the number of fee-earning days completed per month to ensure that the team meets its financial targets.	Data is captured through client feedback sessions and from the completed time sheets of consultants.	Data is summarised into reports that are shared with the consultants at team meetings.	The information is timely and accurate. Customer feedback shows whether the customer was happy with the service but not whether they went onto purchase further business. Need to incorporate repeat business into the report.

Feedback

Completing this activity emphasises that both you and your team members need data and information to operate and measure how effectively you are operating. In relation to the performance data that you collect, you'll also need to consider whether you are measuring what matters. You can do this by identifying the information you need in order to achieve your objectives. Collecting too much information might be expensive and render you liable to information overload.

For the performance data that you collect, and for the information that is available to your team members you need to consider how it meets each of the conditions:

◆ relevant to the specific purpose

◆ complete

◆ accurate

◆ timely

◆ in the right format

◆ at the right cost.

It is quite likely that the different team members will need different information, presented to suit their particular needs and formats. But you need to consider how you can meet their needs in a timely way and at a reasonable cost. For managers the challenge is to put in place systems that ensure formal and informal information can flow freely around the team, with no bottlenecks and blockages (human or technical) and be equally accessible to all who need it.

Finding the information you need

For many managers, their information needs are changing all the time, depending on the teams that they work with and the roles they fulfil. Managers need to be able to research and combine information from a range of sources to meet their needs, and also to share information effectively with others. As you read through this short case study, identify the types and sources of information that Chris is using.

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When Chris was asked to research Project Management systems he started by using the Internet to identify possible suppliers and attended several software demonstrations. Although the demonstrations were impressive, Chris was sceptical about the manufacturer's claims – he had read in a trade journal that they were exaggerated. He also found it difficult to understand some of the technical jargon and desperately wanted a more practical insight and guidance on what he should do.

A colleague gave him details of a local company which had implemented a similar system. The co-ordinator there was able to give Chris a great deal of practical advice and to highlight the pitfalls. After a couple of visits, Chris felt much clearer about his requirements and asked four software suppliers to provide more detailed specifications and a quote.

After selecting the supplier, Chris negotiated a six week pilot to enable them to evaluate the software.

Chris is using information from a wide range of sources to help him develop his knowledge before he makes a decision. The information may be classified in a number of ways:

◆ Primary or secondary data. Primary data is original data collected in relation to the specific problem or decision whereas secondary data is data that has been previously collected for other purposes, generally by someone else. Trade journals, marketing literature and software demonstrations are all examples of secondary of data whereas the information that Chris has from site visits or from his supplier questionnaire or from the pilot was all primary (or original) data designed specifically to help Chris arrive at his decision.

◆ **Public or limited access.** Everyone can access the marketing literature on the websites but fewer people have access to the first hand experience of the local co-ordinator.

◆ **Hard or soft.** Is this information factual or is it based on opinion?

◆ **Formal or informal.** Formal information appears in reports, procedures and so on. Informal information comes from discussion with colleagues, your line manager, suppliers or customers, or through networking as in our case study.

◆ **Qualitative or quantitativ**e. Is it based on numbers or words? Is it enough to know that 'users were satisfied with the system', a qualitative statement, or do you need a quantitative statement like '90 per cent of users are satisfied'?

◆ **Internal or external.** Is the information created or available within the organisation, or do you have to access it through external sources such as journals or the Web?

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Notice that one piece of information may fall into many categories. An email saying 'I think we have a problem with the cutting machine' provides internal, soft, qualitative, informal information.

The value of information

Primary (or original) data might be the most likely to give you an answer but there is a cost attached to it both in terms of time and money. Chris could, for example, have piloted a wider range of systems but it would have added both to his timescales and his budget. Also it's unlikely that the pilot will have given him all the information that he needed; long term performance for example. To provide a more complete picture and to save time and money, intelligence and research from secondary sources is often used by managers.

Look out for spin

Using secondary data is a cost effective approach but you do need to consider the source. Look quickly at the bar charts. What messages do they each give?

> **"There are three kinds of lies: lies, damned lies, and statistics."**
>
> **Often attributed to Benjamin Disraeli**
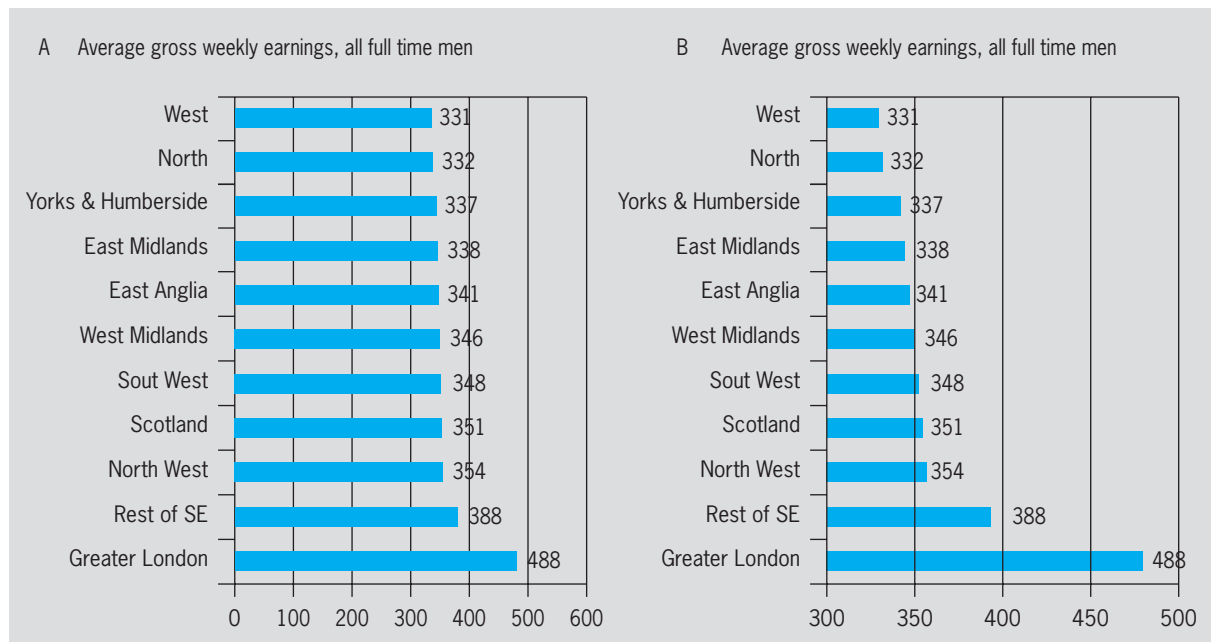
Figure 1.5 *Spot the difference*

Looking at them quickly can easily give very different messages. Chart B suggests that London pay is far greater than pay levels elsewhere – it would be useful for the manager in London trying to prevent a large pay rise. In contrast, chart A suggests that there is very little difference between pay levels.

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It's a simple trick, involving omitting the origin from the horizontal scale in Chart B. It would not confuse anyone who looked at the charts carefully, but we do not look carefully at every piece of information. It is natural for people to present information that gives a least some 'spin' to the message.

Another point to consider is the extent to which the secondary information itself is based on pre-processed data? Consider the following example:

WonderProduct have increased their sales from 1.4% to 1.6% of the total market, in other words a change of

$$\frac{0.2 \times 100}{1.4} = 14\%$$

If corrected to one significant figure, the original figures become 1% and 2%, which show an increase of 100%. A trade journal that had only been supplied with those figures may correctly report the change as "WonderProduct claims to double output in year one".

By using pre-processed data the journal has exaggerated the actual growth by a factor of seven.

Think back to the earlier quotation from the Informix survey:

32% of the sample had made an important business decision in the past six months based on hope or luck.

You should now be starting to think about that statement more critically. How many managers were surveyed? How many managers replied to the survey request? In what industry, or culture, did those managers work?

Not knowing the answers to those, and other, questions, you cannot be sure how relevant the data is for you, or what conclusions you can draw.

Effective information sources need to be credible, unbiased and accurate. Generally speaking, the closer you can get to the original source of information, the more confident you can be in its accuracy. To evaluate your source, ask:

1. does the source have the necessary qualifications or levels of understanding to make the claim?

2. does the source have a reputation for accuracy?

3. does the source have a motive for being innacurate or biased?

4. does the source have the necessary data to support their claims?

Using the web

The biggest source of secondary data is now the World Wide Web and you need to be able to search it.

The starting point for all Web searches is a **search engine** – a tool that responds to an information request by searching the Web for what it interprets as relevant material. Search engines are also referred to as '**indexes**' as they act like gigantic indexes to selected chunks of the Web. They take an input search word (**search term**) or phrase, and retrieve a set of results (**hits**) that relate to that term or phrase from the Web pages that they have identified, collected into a virtual database and indexed. Note the word 'selected' – none of them scans absolutely everything, and you will need to learn which search engines are most useful for which purposes.

There are four basic types of search tool:

◆ free text search engines

◆ human-generated indexes

◆ metasearch tools

◆ natural language tools.

As search engines develop, the distinction between the types is becoming more blurred, and all types are continually improving.

Free-text search engines

Search engines retrieve a set of Web pages (hits) that match a word or phrase input by the user. They do not search the entire Web – only those pages that exist in the index of the search engine. The indexes are compiled by computer robots and can be vast. Google (www.google.com) and Alta Vista (www.altavista.com) are currently the biggest with billions of pages each. Since the indexing method is basically a free text search, the engine will retrieve every instance of the search term, whether it is relevant to your search or not. This means that if you're a bird enthusiast looking for information on 'cranes', you will also retrieve references to heavy lifting gear, maybe crane flies and companies that have crane in their title. On the other hand, these searches may not pick up useful **related terms**, so a search on 'boats' may not select references to 'yachts' or 'ships'.

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Index-based search engines

Some companies also try to catalogue the Web. Whereas search engines use computers to create the search engine index, classified and specialist directories use humans to select and catalogue the Web pages. Yahoo (www.yahoo.com) is one of the most notable. As well as being able to enter search text, the user can also browse through the directory. For example, if you want to find a new movie, you might start with entertainment and then click movies and carry on until you find what you want.

There are numerous specialist directories that act as gateways to specific subjects on the Web. The medical gateway www.omni.ac.uk is an example. For a comprehensive list of what is available, go to www.vlib.org.

Metasearch engines

These are not search engines themselves – more tools that know about other search tools and will submit your query to several search engines at once. Metacrawler (www.metacrawler.com) and Dogpile (www.dogpile.com) are examples.

Natural-language search engines

Natural-language search engines are very appealing, as you can literally type in a question in the way that you would ask it. www.uk.Ask.com (previously AskJeeves) is one of the best known of these. Inputting: 'Who won the World Cup in 2006?' retrieves not only the result but details of many other World Cup and football-related sites.

Quantitative data from the Web

Since most enquiries to search engines are based on text, it is easy to conclude that the Web can provide qualitative, rather than quantitative, data and information. However, it is often very easy to find up-to-date, accurate quantitative data from reputable sources. We followed the process:

◆ Go to *Google* and use *More* to access the *Google Directory*

◆ Select *Business*, then *Mining and Drilling*, and then *Associations*

◆ Select *National Mining Association*

◆ Select *Statistics*

◆ Select *Facts about minerals*

◆ Select *Minerals Production. Mine Production Statistics of Selected Non-Fuel Minerals, 2000–2005*

◆ This gave data on the total U.S. mine production of 30 minerals for the five years 2000 to 2005.

To see what information is available, try a similar process in your own industry.

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Getting better results

Choosing the right kind of search engine for your purpose will go a long way towards getting better search results more quickly.

A number of other techniques are available, including:

◆ using the terms AND, OR and NOT, or the operators + and – (e.g. car AND van to find sites with both words)

◆ putting phrases in quotes ('London Bridge' finds a specific structure; London Bridge will find all the bridges in London)

◆ criteria such as language, or expanded by the use of 'wildcard' characters.

Selected search engines

◆ Google (www.google.com)

◆ Alta Vista (www.altavista.com)

◆ Ask (previously Ask Jeeves) (www.uk.ask.com)

◆ Dogpile (www.dogpile.com)

◆ Excite (www.excite.com)

◆ HotBot (www.hotbot.com)

◆ Lycos (www.lycos.com)

◆ Metacrawler (www.metacrawler.com)

◆ Yahoo! (www.yahoo.com)

If you're looking for non-English language search engines, try www.searchenginecolossus.com which covers about 100 countries.

For suggestions on effective searching go to *Finding information: search engines* on www.philb.com/whichengine.htm

A list of useful sites can also be found on www.rba.co.uk/search/list.pdf

Privacy and Data Protection

If you work with information about people, you must be aware of their rights under Data Protection legislation. This concerns Personal Data – factual information or opinions that relate to a living individual (known as the Data Subject) and allows people to identify that individual. Personal Data may be as little as a name and address. The information can be held on a computer, CCTV system, taped telephone records or – provided the structure enables information about a specific individual to be found easily – in manual filing systems.

The legislation throughout Europe is based on eight principles, which can be summarised as follows:

The information itself	The information must be relevant, accurate and up-to-date.
	The data subject must give consent for collection and storage.
Using the information	The data subject must give consent for the specific use.
	The information must be protected if transferred outside the EU.
Storing data	The information must be stored securely.
	Once the data is no longer needed it must be destroyed.
The data subject's rights	The data subject generally has a right to see the personal data.
	The data subject can prevent processing or use of data for direct marketing.

A key element of the legislation is the idea of 'consent'. As an example, employees who join a new organisation generally sign a form giving consent for the organisation to store data like names, addresses, pension and tax payments, and so on. On the other hand, employees do not give the organisation consent, for example, to sell their names and addresses to a direct mail company.

Activity 3
Finding relevant information

Objective

This activity will help you to find relevant information linked to your work, and also help you to select suitable sources and Web search engines in future.

Task

You have been asked to think about increasing the size of your team or department. You realise that, among other things, you will need to consider:

1   buying new equipment, perhaps from a manufacturer you have not used before.

2   the health and safety issues.

3   the trends in your industry, since you will be asked to justify the costs.

In each case, identify and comment on the effectiveness of internal and external sources of relevant information. In at least one case use a range of search engines, and techniques, and compare them so that you can use the most suitable engine/s in future.

	Internal sources		External sources	
	Source	*Comments*	*Source*	*Comments*
Industry trends				
Health and safety				
New equipment				

Search engine	*Advantages*	*Disadvantages*

Feedback

Future trends and predictions for your industry can be found in trade magazines or the journals of associations. You can probably also find them by searching the Web, following a process similar to the mining example we gave earlier.

General health and safety information is found in publicly available documents from the Health and Safety Executive (www.hse.gov.uk), or in documents from your own H&S department. Specific safety instructions from your organisation's H&S department may be issued as paper documents or over your organisation's computer network.

Trade prices of equipment used in your industry can often be found in trade magazines or the journals of associations. Retail prices may also be advertised or available in publicly available catalogues. Journals and catalogues may also be available over the Web. Your organisation may also have a direct internet link to the sales departments of a range of suppliers.

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Table 1.2 summarises the key uses of some of the most common search engines.

Type of search engine	Example	What it's most useful for?
Free text search engines	Google.co.uk	When you know exactly what you want and can be specific about it. Good for 'Mercedes-Benz'; bad for 'performance cars'.
Index-based search engines	uk.yahoo.com directory.google.com	An overview of the subject area, structured so that you can narrow down a search or make it broader. For example, from 'Motor manufacturer' you can go up to the broader category 'Vehicle manufacturer' or down to the more specific 'Sports car manufacturer'.
Metasearch engines	dogpile.com	A broad and comprehensive view of sites in a subject area.
Natural language search	uk.ask.com	Good if you want a general look around a subject area.
Specialist indexes	omni.ac.uk	In-depth access to a highly specific subject area.

Table 1.2 *Key uses of the most common search engines*

Critical thinking

What goes wrong in decision making?

Even with information, decisions can still go badly wrong. Below we capture some of the factors that contribute to faulty decision making. Read through them and assess the extent to which any of them have affected your decision making in the past.

◆ **Selective use of data**. We are all tempted to give greater weight to data that supports our own case, and ignore those facts that disprove it. As an extreme example, think of the millions spent on research in the pharmaceutical industry – would you want to publish a report that showed that a new drug was not effective?

◆ **Premature termination of the search for evidence.** "We've got the evidence that supports our case. We don't need any more data."

◆ **Wishful thinking**, letting emotions make what should be a logical decision. "There's a 50% chance that it will work. I like the idea, let's try it."

◆ **Group think.** A group may focus more on consensus rather than on trying to find the best solution. This makes it very difficult for one person to say "I disagree. It won't work."

◆ **Personal biases and prejudice.** We each have personal biases and prejudices resulting from our unique life experiences which make it difficult to remain objective. For example if you believe that white vans are driven badly, then you'll notice whenever you see one speeding but tend to ignore all the other instances.

◆ **Incorrect assumptions.** For example It is rarely a safe assumption to say "Provided sales continue to rise…".

◆ **Circumstances may change** during the decision-making or implementation processes. During 2006 many estate agents trained their staff to carry out surveys for seller packs, not knowing that the government would change their plans.

◆ **Managers take an unrealistic view of what is achievable.** In December 2005, construction company Multiplex stated that Wembley would be ready for the May 2006 Cup Final. By August 2006, Multiplex said it was unlikely Wembley could hold a test event before June 2007.

Many of those difficulties can be avoided if the manager adopts a critical, or analytical, approach. Rather than trusting that things will turn out right, carefully follow a logical process and critically check your thoughts, actions and decisions at every stage.

The twelve key abilities of critical thinking are listed in Table 1.3. In the final column we've included questions relating to a company that wants to plan output levels for a number of different products.

Purpose	Key abilities		Typical comments
Clarification	1	Focusing on a question	Which product outputs are we considering?
	2	Analysing arguments	Why are we considering increasing production of Product B?
	3	Asking and answering questions of objectives and scope	Can we discuss closing output in our other factories?
	4	Defining terms, and judging definitions	Does 'Product B' include the other products that use Product B as a component?
	5	Identifying assumptions	What economies of scale are we assuming will result from doubling output?
Basic support	6	Judging the credibility of a source	Have Marketing correctly predicted sales levels in the past?
	7	Observing, and judging observation reports	They've based their predictions on the South East. Do we know anything about the North and Scotland?
	8	Deducing and judging deductions	Sales tend to follow the rules of supply and demand. I think the predicted increase in sales is realistic.
	9	Inducing, and judging inductions	When we increased output by 30% last time we doubled our profits. I'm not sure that we can assume it will happen again.
	10	Making and judging value judgements	I think the market is ready for a new product. But that's only a guess.
Strategic and tactical aspects	11	Deciding on an action	Based on all the information available, we should …
	12	Interacting with others	I'm going to explain my suggestion. Tell me what you think and we can discuss it.

Table 1.3 *Critical thinking – the 12 key abilities*

Source: Adapted from Ennis (1987)

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Activity 4
Critical thinking in practice

Objective

This activity will help you to understand how structured information systems are used for management decision making.

Task

1. Work through the list in '*What goes wrong with management decisions?'* and identify which of the factors, if any, have tended to affect your decision making in the past. What impact did this have on the quality of decision making? What might you do differently in a similar decision making situation in the future?

2. Focus on two or three decisions that you have recently been involved in. To what extent did the decision makers use the 12 key abilities shown in Table 1.3?

Feedback

As you worked through the factors that contribute to faulty decision making, you might have reflected on how effectively you use data and information to help you make decisions. Not all managers view data as essential for their effectiveness. Some tend to see data-driven decision making as mechanistic or boring and prefer to rely on their intuition and experience. Depending on training or personality, most people will favour either a rational or an intuitive approach.

As you thought about the people you work with, you might have identified different approaches. You can probably think of at least one person who works steadily to clarify the problem and evaluate the information until he or she can solve it and convince other people. You are also likely to have colleagues who have a very good feel for things or who jump quickly to decide a course of action and are very difficult to persuade even when the evidence suggests otherwise.

Although there is no doubting the value of intuitive judgments, the critical thinking abilities in Table 1.3 show that you need to go beyond intuition and the bounds of your own experience to become a critical thinker. Critical thinking involves acquiring information and being able to evaluate it objectively to reach a well justified conclusion.

Much does of course depend on the nature of the decision. There will be times when we need to make decisions without all the facts, often when time is imperative. In relation to many interpersonal questions, there might not even by any relevant factual information. Generally speaking however, opinions and decisions based on a critical analysis of the evidence stand on firmer ground than those formulated through less rational processes.

Knowing something of your natural decision making style and your biases can help you make the most of this book. If your natural tendency is to be intuitve, use this book to work out how you can use a more logical approach in future. If your preferred approach is to be rational, use this book to assess the effectiveness of your approach and to identify areas for improvement.

◆ Recap

Identify the information needs of your team and assess how effectively these are being met

◆ To manage information effectively you must define exactly what information you and your team needs. This will include information you need to achieve your objectives or to measure performance in your area.

◆ It is important to prioritise your information needs on the areas that really have an impact on performance and to ensure that the benefit of obtaining information outweighs the cost of obtaining it.

Consider the factors that affect the quality and use of data and information

◆ Data is unprocessed facts and figures without any added interpretation or analysis. Information is data that has been interpreted so that it has meaning for the user. Knowledge is a

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combination of information, experience and insight that may benefit the individual or the organisation.

◆ Data and information must be relevant to the specific purpose, complete, accurate, timely, in the right format, and available at a suitable price.

◆ Knowledge may be formal, explicit or generally available; or it may be instinctive, subconscious, tacit or hidden. We develop our own knowledge by analysing problems or situations.

Gather and record information relevant to your own area of responsibility, complying with any constraints on the collection of, and access to, data

◆ Sources of information may be internal or external; public or limited access; hard or soft; qualitative or quantitative; formal or informal. You need to take particular care when information has been processed for a purpose different from your own.

◆ The Web is a source of vast amounts of information, most easily accessed using suitable search engines and specific search techniques.

◆ If you work with information about people, you must be aware of their rights under Data Protection legislation. This generally applies to information from which the person could be identified. Data subjects must give consent for the specific use of the data, and generally have the right to see the personal data that you hold.

Explore the characteristics of critical thinking and assess your own critical thinking skills

◆ There are a number of reasons why management decisions go wrong, for example because they are based on incorrect assumptions, on insufficient information, or because situations change.

◆ Many of those difficulties can be avoided if the manager adopts a critical, or sceptical, approach. Carefully follow a logical process and critically check your thoughts, actions and decisions at every stage.

◆ The 12 abilities of critical thinking fall under three broad headings: clarification, basic support, and *s*trategical and tactical aspects.

◆ Managers often have to make decisions based on insufficient information ('satisficing'). In these situations, it may be necessary to reconsider decisions as more information becomes available.

▶▶ More @

Bedward, D. and Stredwick, J. (2004) *Managing Information: Core Management,* **Elsevier**
This book provides an introduction to the use of information systems, finance and statistics.

Buckley, P. and Clark, D. (2004) *A Rough Guide to the Internet*, **Rough guides**
Written in plain English, this book covers everything from getting online for the first time to advanced tips and tricks.

McKenna, E.F. (1996) Business Psychology and Organisational Behaviour, Psychology Press
Chapter 5 of this book is titled Human Processing and Decision Making and discusses the different ways in which people make decisions.

Robson, W. (1997) *Strategic Management and Information Systems,* **Prentice Hall**
This describes the various types of management information system, and considers the information needs of managers from an Information Technology perspective.

Wilson, D. (2002) *Managing Information: IT for Business Process*, **Butterworth-Heinemann**
This book describes how successful organisations make best use of information and knowledge and explains why information technology is essential for the management of business processes.

Information Week (www.informationweek.com) and **Better Management (**www.bettermanagement.com) are both useful sites to search for downloadable articles, white papers and research reports.