1.1 Computer ethics: an overview

> Computer systems perform tasks and the way they perform tasks has moral consequences, consequences that affect human interests.
>
> Johnson & Powers, (2004)

As a field of academic research, computer ethics had its beginnings in the early 1980s, and was defined by James Moor in a paper published in 1985: *What is Computer Ethics?*

Computer ethics represents:

> The analysis of the nature and the social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology.

Moor argues that computer ethics is unique because computers have certain properties that raise unique issues and, according to Moor, there are three properties that make computers a special case:

- **Logical malleability**
- **Impact on society**
- **Invisibility factor.**

These are summarised in Figure 1.1 and are briefly outlined on the following pages.

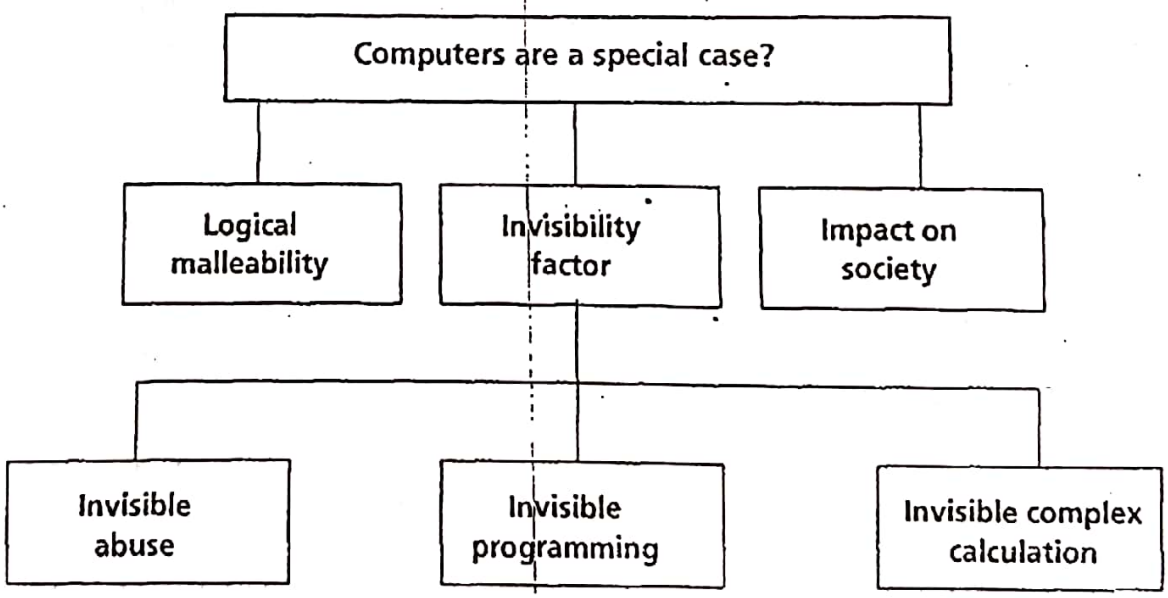

Figure 1.1: Moor makes the case that characteristics of computer-based technologies are such that they raise ethical issues that are somewhat unique. Others have suggested that computer ethics is no different from any other branch of professional ethics.

Logical malleability

What Moor means by 'logical malleability' is that computers can be shaped and moulded to perform any activity that can be characterised in terms of inputs, outputs and connecting logical operations. This is in contrast to the majority of manufactured products. For example,

The logic of computers, however, can be shaped in infinite ways through changes in hardware and software and in terms of their usage. This enables computer-based technologies to exhibit tremendous flexibility. Moor writes:

> Just as the power of a steam engine was the raw resource of the Industrial Revolution so the logic of a computer is a raw resource of the Information Revolution. Because the logic applies everywhere, the potential applications of computer technology appear limitless. The computer is the nearest thing we have to a universal tool. Indeed, the limits of computers are largely the limits of our own creativity.

Impact on society

The extensive impact of computerisation on society is clear. Naturally, in 1985, when Moor wrote his paper, relatively few could foresee the extent of that impact, nor did anyone envisage the Internet and the World Wide Web. Moor did, however, foresee the changing workplace, and the nature of work:

> Computers have been used for years by businesses to expedite routine work, such as calculating payrolls. However, as personal computers become widespread and allow executives to work at home, as robots do more and more factory work, the emerging question will not be merely *How well do computers help us work?* but *What is the nature of this work?*

Invisibility factor

An important fact about computers is that most of the time, and under most conditions, computer operations are invisible. Moor identifies three kinds of invisibility that can have ethical significance:

- Invisible **abuse**
- Invisible **programming**
- Invisible **complex calculation.**

We shall now discuss these in further detail.

Invisible abuse

Moor describes this as: 'the intentional use of the invisible operations of a computer to engage in unethical conduct'. He cites the example of the programmer who realised he could steal excess interest from a bank:

> When interest on a bank account is calculated, there is often a fraction of a cent left over after rounding off. This programmer instructed a computer to deposit these fractions of a cent to his own account.

Another example of invisible abuse is the invasion of the property and privacy of others – for example, computers can be programmed to surreptitiously remove or alter confidential information.

Invisible programming values

These are values which, according to Moor, are embedded into a computer program:

> A programmer makes some value judgements about what is important and what is not. These values become embedded in the final product and may be invisible to someone who runs the program.

Invisible complex calculation

In this context, Moor writes:

> Computers today are capable of enormous calculations beyond human comprehension. Even if a program is understood, it does not follow that the respective calculations are understood. Computers today perform ... calculations which are too complex for human inspection and understanding.

He argues that the issue is how much we should trust a computer's invisible calculation. This becomes a significant issue as the consequences grow in importance. For example:

> Computers are used by the military in making decisions about launching nuclear weapons. On the one hand, computers are fallible and there may not be time to confirm their assessment of the situation. On the other hand, making decisions about launching nuclear weapons without using computers may be even more fallible and more dangerous. What should be our policy about trusting invisible calculations?

There are those who disagree with James Moor and say that computer ethics is no different from any other branch of professional ethics such as legal ethics and medical ethics (for example, Gotterbarn, writing in Johnson & Nissenbaum (1995). Spinello (1995) warns against thinking in terms of uniqueness, and advises that the digital environment simply requires a different approach to resolving problems such as, for example, privacy.

Whether we favour the arguments put by Moor, or Gotterbarn and Spinello, there is no disagreement that information communication technology (ICT) has an impact on our lives in good and bad ways, and certain rights, such as privacy, are increasingly threatened by digital technologies. As new developments in technology emerge it is clear that the issues within the field of computer ethics require constant review and consideration.

Background to computer ethics

By means of examples, explain the terms 'logical malleability'; 'impact of society'; and the 'invisibility factor'. If possible, obtain a copy of Moor's article and read it in full.

1.2 Identifying an ethical issue

Most people have a clear ability to distinguish between what is 'ethical' and what is 'not ethical'. However, when asked to explain our reasons for deeming an action to be ethical or unethical, we often experience difficulty. This is often because we base our judgement on a complex set of criteria that may include those remarkable human traits – common sense, instinct and wisdom (based on experience). In addition, we tend to use the terms 'ethical' and 'moral' interchangeably – although it is interesting to note that we normally use their opposites 'unethical' and 'immoral' more specifically.

In fact, 'ethics' is derived from the Greek 'ethos,' whereas 'morality' is derived from the Latin word 'moralis'. The ancient Greeks were greatly interested in issues of philosophy and thus we may consider ethics to relate to the philosophical study of the way in which we act.

The *Oxford English Dictionary* defines 'ethics' as:

> ...the science of morals in human conduct.

We can, however, consider 'morality' to be a more practical term – representing 'ethics' in action.

Morals are concerned with good and bad, right and wrong, justice and injustice. In certain cases the distinction between right and wrong is clear – helping someone in trouble is acting ethically; stealing from someone is acting unethically. However, there are many cases where the degree of 'wrongness' is not clear, or where choosing the right action conflicts with another action that causes harm.

For example, consider the case of a person who steals food to feed a starving family. Although we generally perceive stealing to be wrong, we can see that under certain circumstances, it may be the only course of action and may alleviate suffering. Furthermore, it is important to note that different people may perceive moral standards quite differently. For example, in the second world war, members of the French Resistance were perceived by the German occupiers as being criminals and murderers. If the outcome of the war had been different, this view would most likely have continued and would have been established within the history books. However, given the allied victory, the history books record the courage and bravery of Resistance workers whose actions are both applauded and perceived as being morally justified.

In this book we will generally not distinguish between ethics and morality – for simplicity, we will use these concepts interchangeably. However, when referring to their opposites, we will normally avoid the term 'immoral' as modern society has tended to associate this word with issues that are of a sexual nature and, to some extent, its generality has therefore been eroded.

Let us turn now to issues that relate directly to computer ethics (morals). Key issues include:

- **Stealing** (to be discussed under the topic of hacking in Chapter 2)
- **Intellectual property** (Chapter 4)
- **The right of privacy** (Chapter 6)
- **The right of equality** (Chapter 7)
- **Keeping promises** (such as professionals meeting a deadline)
- **Not lying.**

A useful guideline in recognising an issue that has some ethical (moral) component is to watch out for the word 'should'. If the question 'what should I (he/she/they) do?' is asked, then very often the issue is an ethical one. This is because, when used in this context, the word 'should' implicitly implies a desire to 'do the right thing' – to take the most appropriate/professional/moral course of action.

Activity 1.2

Identifying an ethical issue

Read the following, and identify the issues that you consider to involve ethical issues.

Spend a little time thinking about your concerns as to the ramifications of the general deployment of such computer-based technologies; if you have the opportunity of discussing this with fellow students, friend or colleagues, then this would be very useful.

In February 2003 an article appeared in the *Philadelphia Inquirer* describing a United States project aimed at safeguarding US troops in foreign urban areas (Sniffen, M J, 'Pentagon project could keep a close eye on cities').

'Using a combination of computer technologies and cameras, information about a vehicle could be recorded. The software program underlying the project can also recognise drivers and passengers by face. The software is capable of issuing an alert if the monitored vehicle appears on any 'watch' list, and is capable of searching records to locate and compare vehicles seen around the sites of terrorist incidents. According to scientists, law enforcement officers and privacy advocates this technology could also be used within the United States to monitor US citizens, although the article also reports that a representative of the Defense Advanced Research Projects Agency (DARPA) 'insists that CTS technology was not designed with local law enforcement or homeland security in mind', and that sweeping alterations would be needed to implement it in such a way. However, a member of the Federation of American Scientists was quoted as saying that he 'can easily foresee pressure to adopt a similar approach to crime-ridden areas of American cities ... or any site where crowds gather'. This view is supported by a comment from the New York deputy police commissioner that the police would encourage the adoption of this type of technology. The immediate 12 million-dollar plan is to deploy CTS technology over the next four years in two stages. First, to install 30 cameras in a fixed site to improve troop protection, and second to set up around 100 cameras in support of military operations incorporating software that can analyze the video recordings with a view to noting abnormal activity.'

1.3 Ethics and the law

We could ask why we need ethical principles to guide our decisions when we have the law to turn to. Laws, should (at least in principle) tell us when it is right or wrong to do something.

However, laws are not always ethical – they are created by governments and may be introduced to further ethical or not-so-ethical aims. For example, laws can promote equal rights (such as the Disability Discrimination Act in the UK), or reduce rights (such as the US Patriot Act).

As far as law and ethics are concerned, we can have laws that are ethical, and laws that are unethical. When we pursue a course of action it can be:

- Legal and ethical
- Not legal but ethical
- Not ethical but legal
- Not ethical and not legal.

In Figure 1.2 these possibilities are illustrated within a simple 2-by-2 array; although four combinations exist we cannot assume these are fixed in scope; there is not always a simple boundary between ethical and non-ethical decisions. By way of example, in our everyday conversations we may describe something as being 'not quite ethical' or 'totally illegal' – thereby indicating that we perceive a sliding scale of legality and ethicality.

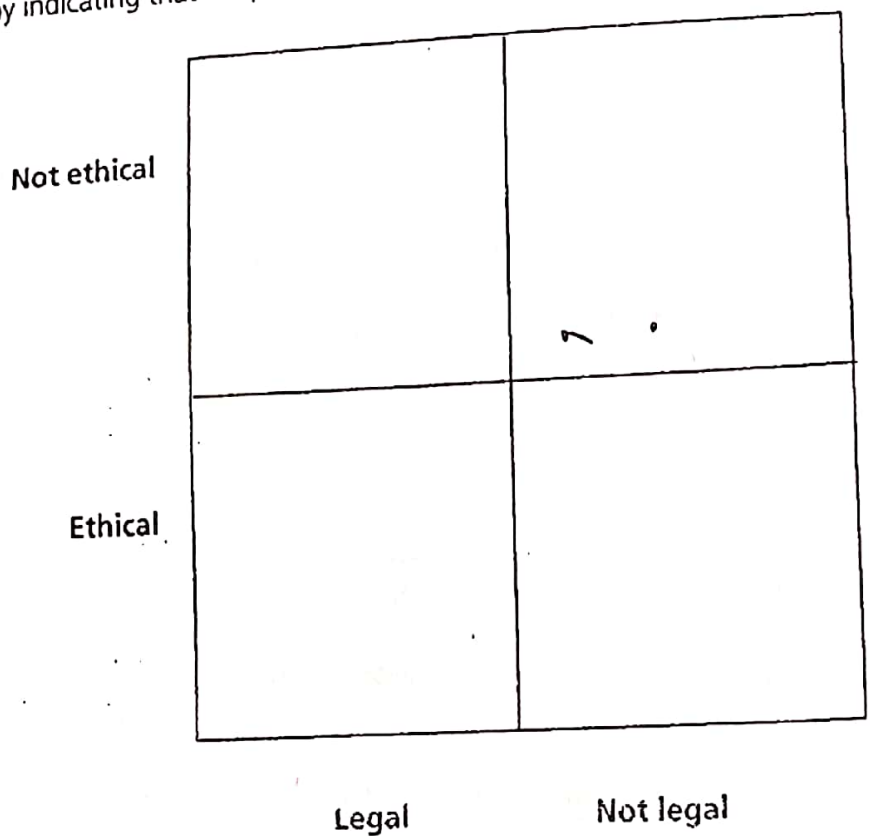

Figure 1.2: Legality and ethicality

When faced with a difficult decision, reference to the law is often a good starting point. It should not be assumed, however, that simply following the guidance of the law will result in 'good' (ethical) decision making. Later in this chapter we will propose a framework for making an informed ethical decision.

ACTIVITY 1.1

Ethics and the law

Select actions to be placed in the array presented in Figure 1.2 to illustrate each of the four combinations (choose one action for each of the four sections). Explain your reasons for choosing each action.

1.4 Ethical theories

Theories are commonly used to explain natural phenomena and so provide us with an understanding of the world in which we live. Theories are put forward, assessed and discussed – and either generally accepted, revised, or discarded. There is also usually more than one theory put forward on a specific topic, and some people will be convinced by one theory and not by another.

In all of these respects, ethical theory follows the same pattern. Ethical theories attempt to explain human morality, and why we think some actions are good, while other actions are bad. Ethics falls within the domain of philosophy and, as with other theories, different philosophers have come up with different ethical theories. Coverage of a broad range of types of theory is beyond the scope of this book.

Here, we briefly refer to two influential western ethical theories. These theories can be useful in ethical decision making, and they are also helpful in providing a basis for critical thinking. Taking different perspectives on an issue provokes thinking, and helps to form opinion.

Aspects of two theories are outlined below. These are:

- **Kantianism** (a theory provided by Immanuel Kant)
- **Consequentialism** (sometimes called utilitarianism).

Kantianism

The German philosopher Immanuel Kant (1724-1804) believed that how we behave ethically comes from within us, and the things that we decide are 'good' or 'bad' are based on whether we could imagine everyone doing them.

He embodies this idea within a 'categorical imperative' (that is to say, a moral rule that is absolute and which therefore has no conditions attached to it):

> Act only according to that maxim by which you can at the same time will that it should become a universal law.

Thus, we could simply say that we must not lie – and according to Kant, there are no circumstances in which a lie could be justified. The point to note is that if we believe that it is *acceptable* to lie, then in accordance with the above categorical imperative, we must then accept that telling lies should become the norm – everybody can lie. As a result, truth and honesty would become things of the past – in an extreme case, they would no longer exist.

By way of a further example, consider the breaking of promises. It would be logically inconsistent to say that breaking a promise is good – because if everyone broke their promises there would be a loss of trust in promises, and the whole nature of a promise would be lost. Therefore, he says, certain things cannot be 'universalised' (that is, they would not work if everyone did them), and these things are wrong. Examples include: killing, lying, stealing, breaking promises. Moreover, in Kant's view, things that we view as wrong are 'essentially wrong' – that is, they are always wrong and there is never any circumstance where they would be right. This conflicts directly with the theory of consequentialism (see below).

It is interesting to note that Kant's categorical imperative, as outlined above, is in essence equivalent to the Christian teaching 'do unto others as you would have done unto yourself'. In short, the concept of right or wrong and the entire ethical ethos comes from within ourselves; furthermore, Kant believed that it is the underlying motives that lie behind our actions that determine how good or bad they in fact are. However, Kant's model is inflexible as we illustrate in the simple cartoon presented in Figure 1.3.

Here, two friends – Alice and Bob are talking. Bob wishes to share a confidence with Alice but first seeks a promise that the conversation will be treated as being strictly confidential. Alice promises confidentiality and has every intention of keeping the promise. The great secret is revealed – Bob is having an affair! Some time later Bob's astute (suspicious) wife approaches Alice and asks her whether or not she has any idea as to whether or not Bob is having an affair. On the basis of Kant's model, Alice is now in a very difficult (impossible) situation.

If she tells Bob's wife the truth, then she will be breaking her promise to Bob. On the other hand, if she lies to Bob's wife then she is accepting that lies can be the norm. Unfortunately the inflexible nature of Kant's theory does not accommodate such a situation!

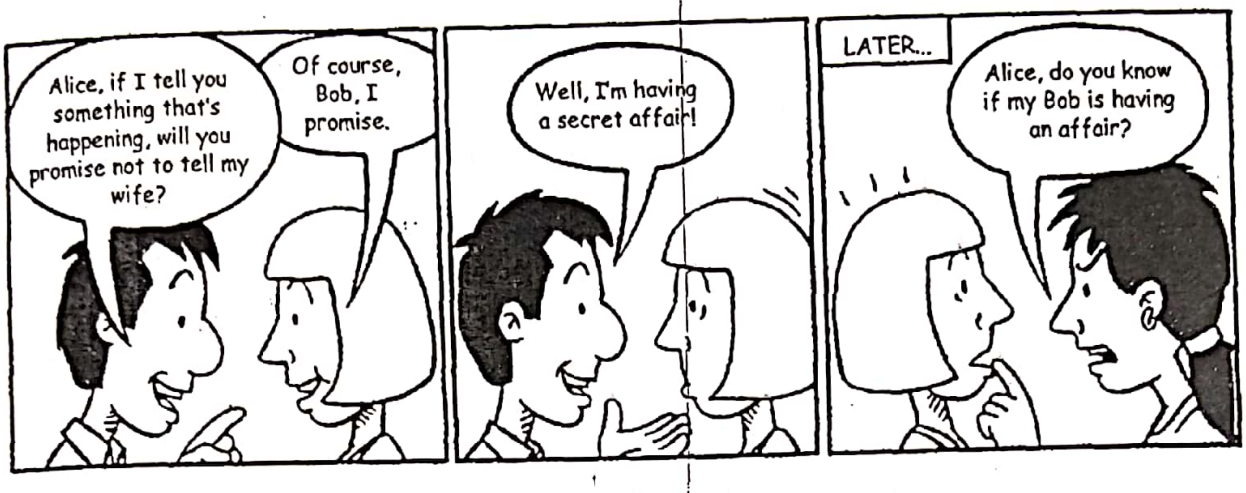

Figure 1.3: Kant's model is inflexible – Alice must either break her promise to Bob (by telling the truth to Bob's wife), or keep her promise to Bob and lie to Bob's wife. Neither of these possibilities fit with the objectives of Kant's 'categorical imperative'.

Consequentialism

Consequentialism, as its name suggests, deals with consequences of actions rather than the actions themselves (in contrast to Kant's theory). So, for example, it could be argued that stealing could sometimes be the right action to take, provided the outcome is for the 'good'. What 'good' is has always been a matter for extensive discussion among philosophers, but for our purposes we use the definition provided by utilitarianism (which is a type of consequentialism). Utilitarian theory says that a good outcome is that which brings 'the greatest benefit to the greatest number of people'. Therefore stealing, for example, is a morally permissible act if it brings greater benefit to the greatest number. Consider, for instance, that a dictator has a warehouse full of food while most of the people in the country are starving. In this instance, stealing the food to distribute it to the starving people would be considered the 'right' thing to do.

Discussion of the theories

Both of the above theories have strengths and weaknesses.

- In favour of Kant's theory is that it assumes *equality*. It is based on logic and rationality (on the premise that human beings are rational agents). Therefore, if something is good enough for one person, logically it must be good enough for another person. Arguments against this theory are that it does not take into account conflicting priorities, or special circumstances, such as those given in the example regarding the stealing of food. To claim that stealing food from someone who has more than enough is wrong, seems to go against human intuition.
- Consequentialism, on the other hand, takes into account different circumstances and can (as the example of stealing shows) accommodate conflicting priorities. A major argument made against this type of theory is that it does not take into account the individual, or accommodate minority groups. This theory, as we have said, looks for the greatest benefit for the greatest number of people.

The approach would therefore ignore minority groups such as the disabled. The theory would, therefore, make it morally acceptable to produce computers that some people with disabilities cannot use, thus denying them access to information technology and the ensuing benefits (see Chapter 7). It is also important to remember that, although this theory supposes that a certain action is good if the *consequences* are good, it is often impossible to predict the consequences at the time of an action being taken. By way of an example consider the simple scenario depicted in the cartoon presented in Figure 1.4. Here, a president wishes to rid a country of a corrupt and homicidal dictator. He decides the best approach is by military invasion. If we accept his motives at face value, then it follows that, at the time of making the decision, he is acting for the good of the majority (the population of the country). However, it is impossible for him to predict with certainty the ultimate consequences of his actions. In short he opens up a Pandora's box – and others use the chaos of invasion for their own ends. Here, we note that although the basic objective (regime change) may, under the circumstances, have been ethical, the way in which this objective was implemented (invasion) is likely to have influenced an undesirable outcome. Thus we must view conseqentialism not in terms of a single decision but rather as it applies to a series or set of decisions.

In summary, both of these theories have something to offer but are far from ideal. However, they do provide an interesting framework for debate.

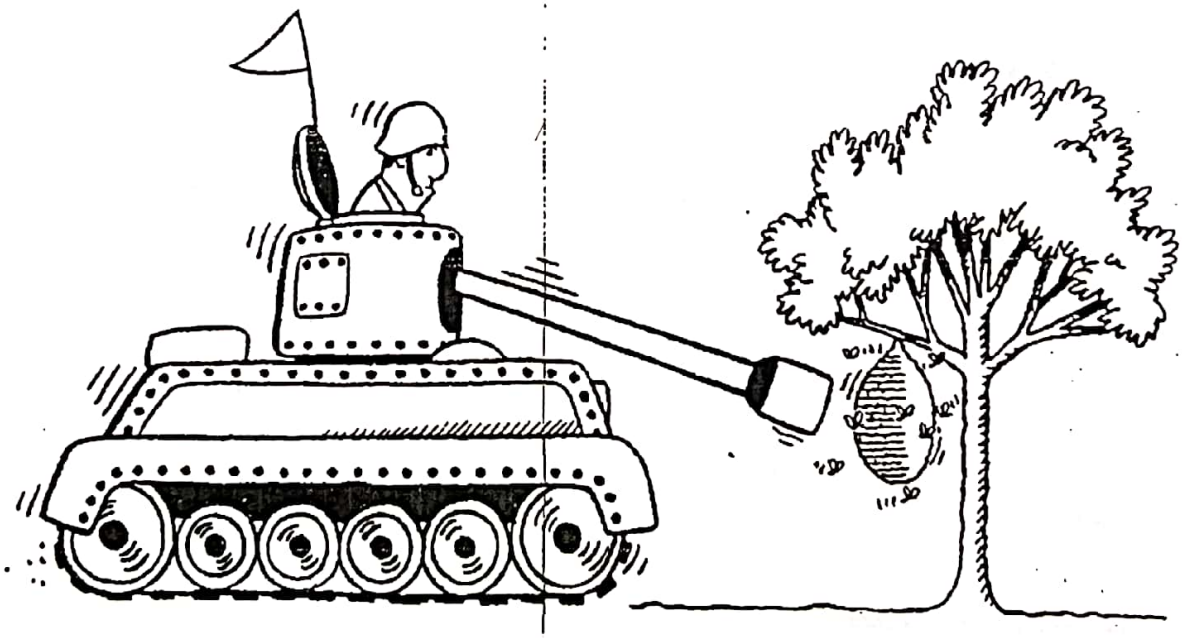

Figure 1.4: Unforeseen consequences

Consider a president, who wishes to remove a dictator from power and chooses to do so by military force. It is possible that his objective is ethical – he may be trying to rid the country of a despot and have the good of the countries citizens in mind. However, he cannot predict with certainty the ultimate consequences of his actions. Others may use the chaos brought about by invasion for their own purposes – it is possible that the president has inadvisably poked a stick at a hornets' nest! Generally, conseqentialism should be viewed not in terms of its application to a single isolated decision, but rather as it applies to a series or set of related decisions. These trigger a train of events and make it extremely difficult to accurately predict

Activity 1.4

Applying ethical theories

A programmer, after returning from a holiday to an underdeveloped country, was deeply affected by the level of poverty. When he returned to his job in a large international corporation, it occurred to him that he could write a program that filtered off small amounts of money from the advertising account and pay it in to a private account. His idea was to collect enough money to provide IT equipment and training to the people in the town he had visited on holiday. However, he is not sure about his decision. What should he do?

a) What solution does a Kantian approach offer?

b) What solution does a consequentialist approach offer?

c) Are their conclusions the same?

d) What do *you* think he should do?

1.5 Professional codes of conduct

Most professional bodies have codes of conduct, or codes of ethics (for our purposes the precise title is unimportant). Their purpose is to offer guidance to members, and set standards for the professional body. The British Computer Society Code of Conduct, 2001 (**www.bcs.org/server.php?show=nav.6030**) sets standards for computing professionals in the UK and lays out a number of principles.

Under the heading 'The Public Interest', the Code states:

> In your professional role you shall have regard for the public health, safety and environment.

Therefore, in any situation where public health, safety or the environment is affected, members of the British Computer Society must always make sure these aspects are not threatened. Not only do codes of conduct offer guidance; they are also useful as a defence. If, for instance, an employee were asked by their organisation to carry out some action that they considered unethical, the employee could point out that their own code of conduct did not allow such action to be taken.

1.6 An ethical dilemma

In some of the chapters of this book we present ethical dilemmas. Some of these describe actual, real-world situations; others are of a hypothetical nature. In the final chapter, we discuss aspects of these dilemmas.

By and large, we do not place ourselves in situations in which we seek out ethical dilemmas – these are simply situations that we encounter (often by chance) and must deal with. As mentioned previously in this chapter, in the case of the BCS Code of Conduct, the first statement made under the heading of 'Public Interest' is that members of the BCS shall have regard to the protection of the environment.

1.9 Review questions

Review question 1.1

Briefly describe the three kinds of invisibility mentioned by James Moor with regard to computer operations.

Review question 1.2

What are the arguments for and against a Kantian position?

Review question 1.3

Explain utilitarianism in your own words, giving your own example.

Review question 1.4

What are the four guiding principles for understanding ethical issues, and making informed decisions?

1.10 Feedback on activities

Feedback on activity 1.1

i When James Moor talks about logical malleability, he means that computers can interpret any logical command. Therefore, computers could be programmed to do anything that we could logically instruct them to do – which in principle amounts to almost anything. He says the limits of computers are only the limits of our imagination. We could, for example, program a computer to make ethical decisions on our behalf.

ii Moor claims that computers have a big impact on society, and computers will transform institutions and the way we work. For example, computers and the Internet have provided an environment for distance learning – the teaching material is delivered in a totally different way than if tutors only had personal interaction with students. The way tutors work has been totally transformed.

iii The invisibility factor includes a number of different aspects. One of them is that because the operations of a computer are invisible, they can be intentionally abused. An example of this is a computer programmer who intentionally programs the computer to transfer small amounts of interest to their own bank account.

Feedback on activity 1.2

We note from the article reported that a surveillance technology has been developed to 'watch' US troops and vehicles in foreign urban areas. However, the concern expressed in the article is that this technology could also be used for surveillance in non-combat situations in the United States – in other words, to watch United States citizens. There are serious privacy issues in that the monitors can read licence plates and identify facial

characteristics, and match details to a database of records. Law enforcement agencies (or other government agencies) could use this technology in specific areas of the United States – saying that they are combating crime. Civil liberties groups are afraid of this 'misuse'. So, the original idea put forward would seem to be 'good', in offering some protection to US troops in life-threatening situations. However, it could also be used to monitor innocent citizens, which raises ethical questions such as 'what citizens', 'why are they being watched', 'do they know they are being watched', 'do they have any choice over being watched'? We could ask, is the ordinary citizen's life likely to be better or worse if this technology is introduced in the United States? We could also be concerned with the ultimate ramifications of such technologies – as technologies advance, how could this type of activity develop?

Feedback on activity 1.3

For the purpose of the activity the following acts have been selected from the topics covered in this module:

Not ethical	Sending junk email (spam). *It is not illegal to send junk email from the US as it has an opt-out policy*	Sending a malicious virus. *This is in violation of the Computer Misuse Act*
Ehical	Providing good security measures to protect personal data. *The Data Protection Act requires that where personal data is stored on a computer it must be secure*	Gaining unauthorised access to a computer to reveal information that is in the public interest. *The law against unauthorised access is the Computer Misuse Act*
	Legal	**Not legal**

Feedback on activity 1.4

a What solution does a Kantian approach offer? Taking the Kantian approach, we have to ask 'what would happen if everyone did it?' – that is, can it be 'universalised'? We have to decide whether this is stealing. If it is (which it certainly looks like: he is, after all, taking something which belongs to someone else), then he would be morally wrong in taking this action. There is no provision in Kantian terms for taking something from someone else that they are not going to miss. In other words, it does not matter that the third party has plenty. It could be, though, that these small amounts of money are the fractions of percentages that are left over after calculating interest (as in Moor's example cited earlier in the chapter). In this case the programmer is not 'stealing' anything, because the small amounts would be lost in any event, and would not be used. In this case, the programmer would be making good use of the money, and he would be in the right.

This first (actual) ethical dilemma relates to this statement.

> *Several years ago, a colleague of the editor of this book was faced with an ethical dilemma specifically relating to the impact of computer equipment on the environment. One morning, on the way to her computer science department, she noticed two enormous industrial refuse containers loaded with a sizeable mountain of computer workstations. Upon enquiry she found that these computers were destined for the local rubbish dump. The university was disposing of its large network of SUN™ workstations. During the course of the morning, two additional rubbish containers arrived and over a hundred workstations were soon ready for disposal.*
>
> *She was well aware that, although the metallic and plastic components that form the workstations would gradually decompose, the lead glass from which the displays were constructed and the toxic materials (heavy metals) contained therein represented an environmental hazard; certainly in the case of the glass this hazard would not lessen with time.*
>
> *Given the large number of computers being disposed of, this person decided to act in an ethical manner – within the scope of the BCS Code of Conduct. She began by visiting the university's Health and Safety department, only to be told that at that time there was no legislation in place concerning the disposal of computer systems: in short, the university was acting within the law. She attempted to explain the ethical nature of the problem and the negative impact of this bulk disposal on the environment. The only response was a further reassurance that the university was acting within the law. Subsequently she discussed the matter with the head of computer science and several colleagues. Nobody seemed to be particularly interested*

Is this an ethical issue of importance? Do you feel that she should have taken this matter further and, if so, what should she have done? What would you have done? Was the university acting in an unethical way by disposing of computer equipment in this manner simply because at the time there was no law precluding the dumping of computer systems?

In the final chapter of this book we draw some conclusions from some of the 'ethical dilemmas' described in the chapters.

1.7 A framework for ethical decision making

Many ethical issues are complex; deciding on the best course of action can be difficult. We have briefly outlined aspects of the relationship between ethics and the law, the role of codes of conduct, and have introduced two ethical theories. These ideas, coupled with social norms and that remarkable human attribute 'common sense', can help us to develop a rational approach to making an ethical choice.

Ethical choices are not made with absolute certainty; they are not deductive, in the same way as mathematical problems and solutions. Ethical decisions are made through judgement and by validation through a rational appeal to a number of principles (see, for example, Table 1.1). There is often no unique correct solution to a moral dilemma. However, in assessing moral positions, a person can rationally examine alternative options and choose the correct one for themselves. This does not mean others will necessarily agree with them but, by rationalising their point of view, individuals can be confident that they have thought thoroughly about the issue, and are not simply 'following the crowd'.

Guiding principles	Questions to consider
Law	Is there a law applicable to this issue? What does it say? Is it a good law?
Codes of conduct	Do professional codes of conduct have anything to offer on this issue?
Ethical theories	What solution does a Kantian approach offer? What solution does a consequentialist approach offer? Are their conclusions the same? If not, which provides the most convincing argument?
Social norms and other arguments	What do social norms say about this? Are the arguments valid? Are there other arguments that might help – for example, economics?

Table 1.1 A framework for understanding ethical issues, and making informed decisions

In subsequent chapters we refer to laws, to professional codes of conduct and to ethical theories. By and large, though, we do not focus on social norms – these are formed by the society in which we live and work, and may be heavily influenced by culture or religion. It is important to bear in mind that what is normal and acceptable to one society may be very different in another.

1.8 Summary

This chapter has set the context for the module as a whole by introducing some general concepts relating to computer ethics. We have shown how discussions of ethics, and the major ethical theories, are relevant to debates surrounding the use of computer technology, and the decisions that face today's computing professionals.

An important part of this chapter is the ability to recognise what is an ethical issue, rather than just a decision between taking one action and another. Recognising an ethical issue, identifying stakeholders (those affected), and the winners and losers in a given situation is not always easy; even if we understand the issue, it can be difficult to know what the right course of action might be. We have outlined aspects of two of the major ethical theories and have discussed the role played by professional codes of conduct in the decision-making process.

Finally, we brought together ethical theory, social norms (the approved conduct of a society that is laid down by that society), the law, and professional codes of conduct as guiding principles for forming an opinion, and making an informed and rational judgement that can be understood by others.

This first (actual) ethical dilemma relates to this statement.

> *Several years ago, a colleague of the editor of this book was faced with an ethical dilemma specifically relating to the impact of computer equipment on the environment. One morning, on the way to her computer science department, she noticed two enormous industrial refuse containers loaded with a sizeable mountain of computer workstations. Upon enquiry she found that these computers were destined for the local rubbish dump. The university was disposing of its large network of SUN™ workstations. During the course of the morning, two additional rubbish containers arrived and over a hundred workstations were soon ready for disposal.*
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> *She was well aware that, although the metallic and plastic components that form the workstations would gradually decompose, the lead glass from which the displays were constructed and the toxic materials (heavy metals) contained therein represented an environmental hazard; certainly in the case of the glass this hazard would not lessen with time.*
>
> *Given the large number of computers being disposed of, this person decided to act in an ethical manner – within the scope of the BCS Code of Conduct. She began by visiting the university's Health and Safety department, only to be told that at that time there was no legislation in place concerning the disposal of computer systems: in short, the university was acting within the law. She attempted to explain the ethical nature of the problem and the negative impact of this bulk disposal on the environment. The only response was a further reassurance that the university was acting within the law. Subsequently she discussed the matter with the head of computer science and several colleagues. Nobody seemed to be particularly interested*

Is this an ethical issue of importance? Do you feel that she should have taken this matter further and, if so, what should she have done? What would you have done? Was the university acting in an unethical way by disposing of computer equipment in this manner simply because at the time there was no law precluding the dumping of computer systems?

In the final chapter of this book we draw some conclusions from some of the 'ethical dilemmas' described in the chapters.

1.7 A framework for ethical decision making

Many ethical issues are complex; deciding on the best course of action can be difficult. We have briefly outlined aspects of the relationship between ethics and the law, the role of codes of conduct, and have introduced two ethical theories. These ideas, coupled with social norms and that remarkable human attribute 'common sense', can help us to develop a rational approach to making an ethical choice.

Ethical choices are not made with absolute certainty; they are not deductive, in the same way as mathematical problems and solutions. Ethical decisions are made through judgement and by validation through a rational appeal to a number of principles (see, for example, Table 1.1). There is often no unique correct solution to a moral dilemma. However, in assessing moral positions, a person can rationally examine alternative options and choose the correct one for themselves. This does not mean others will necessarily agree with them but, by rationalising their point of view, individuals can be confident that they have thought thoroughly about the issue, and are not simply 'following the crowd'.

Guiding principles	Questions to consider
Law	Is there a law applicable to this issue? What does it say? Is it a good law?
Codes of conduct	Do professional codes of conduct have anything to offer on this issue?
Ethical theories	What solution does a Kantian approach offer? What solution does a consequentialist approach offer? Are their conclusions the same? If not, which provides the most convincing argument?
Social norms and other arguments	What do social norms say about this? Are the arguments valid? Are there other arguments that might help – for example, economics?

Table 1.1 A framework for understanding ethical issues, and making informed decisions

In subsequent chapters we refer to laws, to professional codes of conduct and to ethical theories. By and large, though, we do not focus on social norms – these are formed by the society in which we live and work, and may be heavily influenced by culture or religion. It is important to bear in mind that what is normal and acceptable to one society may be very different in another.

1.8 Summary

This chapter has set the context for the module as a whole by introducing some general concepts relating to computer ethics. We have shown how discussions of ethics, and the major ethical theories, are relevant to debates surrounding the use of computer technology, and the decisions that face today's computing professionals.

An important part of this chapter is the ability to recognise what is an ethical issue, rather than just a decision between taking one action and another. Recognising an ethical issue, identifying stakeholders (those affected), and the winners and losers in a given situation is not always easy; even if we understand the issue, it can be difficult to know what the right course of action might be. We have outlined aspects of two of the major ethical theories and have discussed the role played by professional codes of conduct in the decision-making process.

Finally, we brought together ethical theory, social norms (the approved conduct of a society that is laid down by that society), the law, and professional codes of conduct as guiding principles for forming an opinion, and making an informed and rational judgement that can be understood by others.

Intellectual property rights

Overview

This chapter explores one of the most topical issues in the computing field, that of intellectual property. The mass downloading of 'free' music from the Internet, the rampant software piracy that exists in many countries – these issues have dominated the news in the computing field in recent years. Computing technology, and specifically the Internet, has transformed the way intellectual property is distributed and consumed, raising a number of important ethical, legal and professional questions, some of which we review in this chapter. In particular, we shall be looking at what constitutes intellectual property in the computing field, and what legislation exists to protect it. The issue of software piracy will be examined, including arguments for and against the copying of software, as well as the related issues of free software and open source code. The issue of intellectual property touches on a number of long-standing philosophical and ethical debates about ownership of ideas, and we shall be looking at opposing viewpoints in this debate.

Learning objectives

At the end of this chapter you should be able to:

- Define intellectual property
- Have an overview knowledge of copyright, patent and trademark law
- Appreciate the debate between intellectual ownership and shared knowledge
- Understand the application and implications of technical approaches to protecting intellectual property.

4.1 Introduction

This chapter explores the issue of intellectual property. We begin by defining and looking at some examples of intellectual objects. Subsequently, we look at the impact of computing technology on intellectual property, particularly in the area of digital rights management. We outline the existing forms of legal protection for intellectual property, in the form of copyrights, patents and trademarks, and the role of fair use provisions. In Section 4.4, we investigate the issue of software piracy and copyright infringement in fields such as music. We look at the evidence on the nature and extent of software piracy, then present the arguments for and against the practice of copying software. We briefly discuss the position of the free software movement, and its advocacy of open source code. Professional duties to honour intellectual property rights will also be highlighted. Finally, we outline some of the philosophical and ethical debates surrounding the ownership of ideas and the nature of intellectual creativity.

4.2 The nature of intellectual property

According to the United Nations' World Intellectual Property Organization (WIPO), intellectual property is defined as: 'the rights to, among other things, the results of intellectual activity in the industrial, scientific, literary or artistic fields'. Intellectual property takes the form of 'intellectual objects', such as original musical compositions, poems, novels, inventions, and product formulas. Intellectual objects are non-exclusive because many people can use them simultaneously and their use by some does not preclude their use by others. Furthermore, although the initial development of intellectual property objects may be time-consuming and costly, the cost and effort associated with the reproduction of intellectual objects is usually marginal. These non-exclusive and reproducible features of intellectual objects have made the issue of ownership rights especially problematic and all the more difficult to define. Protecting intellectual property from unauthorised copying, defining who are the creators and who are owners (as two distinct parties), deciding how their interests should be protected legally, and balancing these interests with those of the public, are contentious issues.

But what has been the impact of computing technology on intellectual property? Certainly computing technologies, and the Internet specially, have made the copying and distribution of intellectual objects much easier, but they have also raised a number of new legal and ethical issues about intellectual property rights in general.

Computing technology and intellectual property

Computer technologies have made high-quality copying and high-quantity distribution of intellectual property extremely easy and cheap. Some of these technologies are as follows:

- Storage of all sorts of information (text, sound, graphics) in standard digitised formats
- High-volume, relatively inexpensive digital storage media, such as hard disks, CD-ROMs, and DVDs (digital versatile discs, also called digital video discs)
- Character scanners and image scanners, which simplify converting printed text, photos, and artwork to digitised electronic form
- Compression formats, such as MP3, that make music and movie files small enough to download, copy, and store
- The ease of copying digitised material and the fact that each copy is a 'perfect' copy
- The ease of distributing digitised material over computer networks
- The World Wide Web, which makes it easy to find and download material
- Peer-to-peer technology, which permits easy transfer and exchange of files among large

In response to these new challenges to intellectual property protection, the entertainment and software industries have implemented a number of technical measures to protect their interests. These fall under the general heading of digital rights management technologies which attempt to prevent or deter unauthorised copying and distribution of films, music, software and other products. Many of these technologies attempt to use encryption, with varying degrees of success, to prevent copying of DVDs and CDs. For example, music and films are released in 'protected' formats that can only be played on particular hardware, or will not play on older or incompatible machines. These measures have included attempts to create copy-protected CDs, using 'digital watermarks' that prevent unauthorised copying of audio files. They have also included content scrambling systems which prevent DVDs from being copied or viewed on any other hardware than DVD players.

In 2001, Microsoft irritated customers with its 'activation' feature which required users installing Windows XP to undergo an intrusive registration process in order to prevent the operating system being installed on other machines. Future software in Microsoft operating systems will automatically detect 'unauthorised' media files and check their copyright status. Many of these measures have failed, partly because of consumer resistance, and because software has quickly been produced that has 'cracked' these anti-copying protections.

Digital rights management has also involved a move away from a 'sale' paradigm where an intellectual product, once sold, is the property of the owner to do with as they wish, to a 'licensing' paradigm, where the user enters into a licensing agreement with the owner of the copyright. In this paradigm, a licensing contract places restrictions on uses, such as time limits. Some critics of this trend have argued that it is a restrictive tool that prevents fair uses of intellectual property, for example in educational institutions and libraries.

What happened to SDMI?

Using the recommended texts shown under 'further reading' at the end of this section, or a suitable search engine, research the Secure Digital Music Initiative (SDMI). What was SDMI, what did it attempt to do (in the context of digital rights management) and why did it fail?

4.3 Intellectual property legislation

As summarised in Figure 4.1, three main categories for which legal protection of intellectual property exists are:

- **Copyrights**
- **Patents**
- **Trademarks.**

The relevant legislation governing intellectual property in the UK is the Copyright, Designs and Patents Act, 1988. The US equivalents are the Copyright Act, 1976 and 1980, and Digital Millennium Copyright Act, 1998.

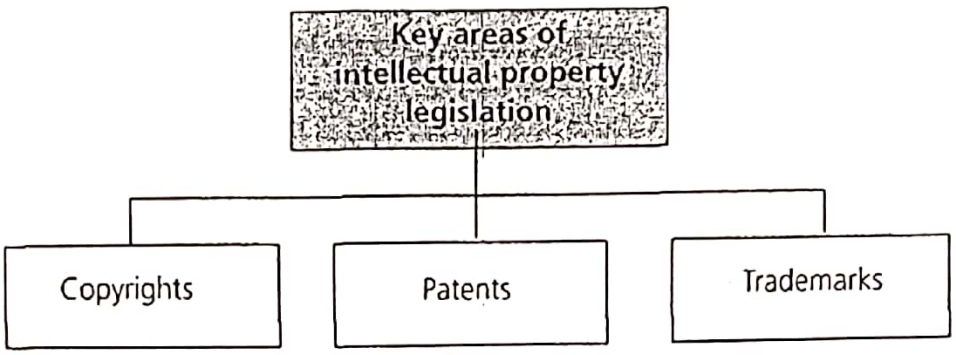

Figure 4.1: Three key areas of intellectual legislation

Copyright and copyright protection

In principle, copyright can be used to protect literary, musical, dramatic, artistic, architectural, audio or audio-visual works from being reproduced without the permission of the copyright holder. Copyright literally means the right to make and distribute copies to perform or display the work in public, and to produce derivative works, such as translations into other languages.

Changes to copyright law were implemented on 31 October 2003. These amended the Copyright, Designs and Patents Act, 1988 to comply with an EU Directive on the harmonisation of certain aspects of copyright and related rights in the information society.

To be eligible for copyright protection, the work in question must be original; in other words, independently created by its author. The work must also be embodied in some tangible medium of expression. When thinking about intellectual property, an important distinction needs to be made between the idea and the expression of that idea. In most cases, copyright protection is granted to the expression of an idea, but not the idea itself. Thus, a musical sound cannot be copyrighted, unless it is written down as sheet music, or recorded in a specific medium.

Copyright laws do not protect concepts or principles. Copyright is easier to obtain than patents (discussed below) and has a much longer duration, usually lasting for an author's lifetime plus seventy years. In the US the copyright law was revised in 1980 to cover some forms of computer software.

Works protected by copyright law include computer databases and computer programs that exhibit 'authorship'; that is, they contain original expressions of ideas.

The Copyright Licensing Agency (CLA)

The CLA was established in 1982 to protect the rights of copyright holders, by allowing organisations which are likely to need to make copies (such as business, education and the government) to purchase a licence to reproduce material from books, journals, periodicals and magazines. **(www.cla.co.uk)**

Federation Against Software Theft (FAST)

FAST was the world's first anti-piracy organisation, working to protect the intellectual property of software publishers. It was formed in 1984. **(www.fast.org.uk)**

Patents and patent protection

The primary candidates for patent protection are original, useful and non-obvious inventions such as mechanical processes and designs, or compositions of matter such as a new pharmaceutical product. Examples of patented technologies in the computer field include hardware components (e.g. circuits, sound cards and microprocessors) and some forms of software (such as online shopping systems). In principle, patented designs or inventions are legally protected, and cannot be used by other manufacturers without a licence, or payment of royalties to the patent owner. A patent is generally awarded for a period of seventeen years and usually after this time the invention will become 'public domain'. Formulas and scientific principles, however, belong in the public domain and cannot be patented.

The UK Patent Act, 1977 requires the following conditions to be satisfied for a patent to be granted for an invention:

- The invention is new
- It involves an inventive step
- It is capable of industrial application.

In addition, the Patent Act 1977 states that anything that consists of the following is *not* an invention for the purposes of the Act:

- A discovery, scientific theory or mathematical method
- A literary, dramatic, musical or artistic work, or any other aesthetic creation whatsoever
- A scheme, rule or method for performing any mental act, playing a game or doing business, or a program for a computer
- The presentation of information.

In some industries, patents have been the object of much criticism, because they are seen as giving a virtual monopoly on a product or invention, enabling the producer to benefit from that monopoly by charging high licensing fees. There has also been a prolonged legal debate over whether software programs, and the algorithms that they incorporate, should be eligible for patent protection.

In the 1972 decision *Gottschalk v Benson*, the US Supreme Court ruled that algorithms could not be patented. This ruling was reversed in the 1981 landmark case *Diamond v Diehr*, when the court ruled that a patent claim for a process should not be rejected merely because it includes a mathematical algorithm or computer program. The process itself must be original and hence patentable, and if computer calculations are part of the process, then they are included in the patent protection.

Trademarks and trademark protection

Another type of legal protection for intellectual property objects are trademarks. These are words, phrases, or symbols, which uniquely identify a product or a service. Examples include logos such as the famous bitten apple image crafted by Apple Computer, or the Microsoft Windows logo. To qualify as a trademark, the mark or name must be truly distinctive and, strictly speaking, the names should always be accompanied by the official trademark symbol, such as Microsoft Windows™. A trademark is acquired when someone is either the first to use the mark publicly or registers it with the Patent Office.

Trademarks are generally violated in one of two ways: they can be infringed upon, or they can be diluted.

- **Infringement** occurs when someone else uses the trademark in connection with the sale of its goods or services.
- **Dilution** is applicable only to famous trademarks that are distinctive, of long duration, and usually known to the public through extensive advertising and publicity. Dilution is the result of either *blurring* or *tarnishment*.
  - *blurring* occurs when the trademark is associated with dissimilar products; we can encounter descriptions such as a 'Rolls Royce product', meaning 'high quality'.
  - *tarnishment* occurs when the mark is portrayed in a negative or compromising way or associated with products or services of questionable value or reputation; Hoover (vacuum cleaners) and Bic (ballpoint pens) are regularly (incorrectly) used generically rather than with reference to each specific manufacturer's products. In the field of computing, Google takes pains to remind users that the word is a registered mark and should not be used generically with the meaning of 'to search the web'.

The Digital Millennium Copyright Act

The Digital Millennium Copyright Act (DMCA) of 1998 was designed to implement the treaties signed in 1996 at the World Intellectual Property Organization's (WIPO) Geneva conference.

Provisions in the DMCA significantly curtail fair use of copyrighted material, and increase the penalties for copyright infringement. For example, the Act makes it illegal for consumers to make copies of any digitally recorded work for any purpose. In addition, the Act:

- Makes it a crime to circumvent anti-piracy measures built into most commercial software
- Outlaws the manufacture, sale or distribution of code-cracking devices to illegally copy software (except for the purposes of encryption research, or to test the security of systems)
- Requires that 'webcasters' pay licensing fees to record companies.

Some of the practical consequences of the Act are that Internet service providers that misuse copyrighted materials, or host websites that do the same, face severe penalties. This means, for example, that a university which knows students are exchanging MP3 files on the campus network – and does nothing to stop them – can be sued. It also means that copyright protection is now extended to music broadcast over the Internet, requiring royalty payments to be made to copyright holders.

The Act has been the focus of some controversy. On the whole, the software and entertainment industries have supported it, for protecting their economic and legal interests. However, librarians, universities and other organisations have opposed the Act's ban on circumvention methods because it criminalises such actions which can be interpreted as 'fair use' of copyrighted material for research and education. Researchers, in particular, oppose the ban because it hinders open discussion of technologies such as encryption.

Fair use provision

US and UK copyright laws both contain important 'exception clauses' which allow for the reproduction and use of copyrighted works, under certain conditions. These are the provisions for 'fair use' of copyrighted material. Fair use provisions attempt to balance the intellectual property interests of authors, publishers and copyright owners with society's need for the free exchange and free flow of ideas.

The fair use provision of the US Copyright Act, 1976 and the fair dealing exception to copyright infringement in the UK Copyright, Designs and Patents Act, 1988 both allow reproduction and other use of copyrighted works for purposes such as those summarised in Figure 4.2.

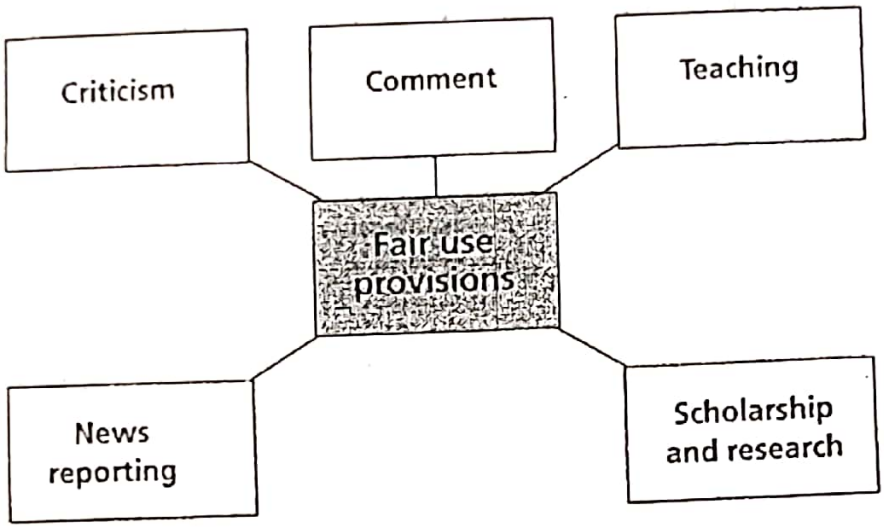

Figure 4.2: Examples of 'Fair Use' provisions in the US Copyright Act and the UK Copyright, Designs and Patents Act

Other factors are taken into account in defining what constitutes 'fair use'. These include the purpose and nature of the use (whether it is for commercial, non-profit or educational use); the amount and significance of the portion being used; and the effect of the use on the potential market for, or value of, the copyrighted work.

The UK copyright legislation also lists the following exceptions, where use of copyrighted material is permissible:

- Parliamentary and judiciary proceedings
- Royal commissions and statutory inquiries
- Material open to public inspection or on official register
- Material communicated to the Crown in the course of public business
- Public records and acts done under statutory authority.

In the US, additional provisions of the law allow uses specifically permitted to further educational and library activities. Representatives of libraries and educational institutions argue that the preservation and continuation of 'fair use' is essential to the free flow of information and to the development of an information infrastructure that serves the public interest. Taken together, fair use and other public rights to use copyrighted works promote the dissemination of knowledge, while ensuring authors, publishers and copyright owners appropriate protection of their creative works and economic investments.

Fair use

Consider the following scenario:

A lecturer puts some journal articles on reserve in the library and makes them assigned reading for her class. These articles are copyrighted material. Some students in the class complain that they cannot get access to the articles because they are always on loan to other students. The professor scans them and posts them on her website. The professor gives the students in the class the password they need to access the articles. What factors need to be considered in deciding whether this constitutes 'fair use' of copyrighted material?

4.4 The extent and nature of software piracy

Software piracy refers to the large-scale and organised copying and distribution of counterfeit software. There now exists a vast international trade involving the production, transport and sale of illegal software, along with counterfeit documentation and packaging. Millions of web pages now exist, offering links to, or providing downloads of 'warez', the Internet code word for illegal software; or 'appz' a term for pirated applications. Hacker sites offer serial numbers, access codes and software 'patches' (known as 'cracks'). These bypass or circumvent encryption or other technical protections that the copyright owner may have applied to its products. Virtually every software product now available on the market can be located on one or other of these sites, from games to operating systems and popular desktop applications, many of which appear before their official release.

Illegal software is advertised, posted or made available for downloading on websites, newsgroups, IRC channels, and other bulletin board areas. Some of these sites operate free of charge, while others require a form of barter, a person first has to offer a product for others to take in order to have the right to download products already posted. Many sites fund themselves by providing advertising space to advertisers of pornography. Today, it is the norm for pirate software web pages to be crowded with advertising (usually in the form of pop-up banners) for various forms of pornographic materials.

Illegal software has also become the core business of some auction sites. Items are offered for sale on such sites for a fraction of their legal retail price. When a sale is made, the pirate simply makes a copy of the software, and ships it to the buyer. Some key statistics on the extent of software piracy are as follows:

- In 2000, Microsoft found that 90% of its products offered for sale on auction sites in Europe, the Middle East and Africa were illegal copies
- The Business Software Alliance (**www.bsa.org**) estimated the value of pirated software worldwide to be between 11 and 13 million dollars per year
- In the United States, pirated software is estimated to be 35% of the total software market, and industry losses are estimated at $2.3 billion per year
- Many European countries have a higher piracy rate than in the US (57% in Germany and 80% in Italy, for example)
- The highest piracy rates are in Asia. It has been estimated, for example, that 99% of the software sold in Vietnam is illegal.

Copying software: the case against

Predictably, the most vocal campaigners against software piracy are representatives of the software industry, particularly bodies such as the Business Software Alliance (BSA) and the Software and Information Industry Association (SIIA). The main argument of the software industry is that software piracy is in every respect a criminal and unethical activity, sometimes engaged in by misguided students, but increasingly engaged in for substantial profit by professional thieves. The impact of software piracy extends far beyond the confines of the software industry. It harms economies worldwide in the form of greatly diminished tax revenues and leads to substantial numbers of lost jobs.

The time and trouble involved in producing good software, the industry argues, is far greater than the average user may appreciate. If developers do not make a profit, they can no longer develop software, and this may have adverse consequences for the user. Software companies will not want to invest as much in developing new products, because they cannot expect any return on their investment in certain parts of the world. The argument can be summarised as: 'remove the income from software sales, and you remove the incentive for developing the software in the first place'. The continuing loss of revenue will, it is claimed, result in software of declining quality as there will be diminished resources for development.

Copying software: the case for

The copying of software remains an area of considerable conflict and disagreement. Stealing may be morally wrong but, if software suppliers are to be believed, most consumers have used bootleg software at one time or another. Possibly because of the physical and emotional distance of the application from its real owner, to most users the copying of software seldom appears to be stealing. People who would never dream of shoplifting are prepared to casually borrow and duplicate copyright disks and to photocopy manuals.

Software is still largely seen as 'overpriced' by many consumers, perhaps because the sale price does not always bear an obvious relationship to development costs. The situation is complicated further by the escalating cost of software – some commercial packages for personal computers cost up to a thousand pounds. If buying a single package involves such high expenditure, users may understandably want to sample it first. Small groups of users may justify clubbing together to buy a single copy of software in order to share it between themselves.

Software may therefore be pirated because it is seen as unnecessarily expensive, hard to evaluate, more troublesome to buy, and perhaps because to do so is seen as challenging. Using pirated software certainly lowers the cost of personal computing, and realistically, there is little likelihood of being caught.

There is also an important international dimension to this debate. Piracy rates in most Asian countries, such as Indonesia, Thailand, China and Vietnam, are estimated to be nearly 100%. In these countries, pirated software is sold openly on the streets, along with photocopied manuals, for a few dollars. Explaining why there are such high piracy rates in these countries remains a matter of debate. Poverty and economic development are certainly one set of factors, but in a number of reports, the Software Publishers Association and others have connected software piracy directly to culture and attitude. They argue that people in some countries regard the practice as less unethical than inhabitants of other countries.

Some countries view copyright as simply a means for companies in richer nations, such as the US, to protect their global economic and technological dominance in the computing industry. Copyright is no more than a legal veil to protect what are virtually global monopolies in the

In the late 1980s, Brazil led a group of countries who opposed US moves to extend copyright protection for US software. The US, through GATT (the General Agreement on Tariffs and Trade), attempted to extend copyright protection for US software in a number of developing countries, including Thailand, South Korea and Brazil. These countries opposed the US on the basis that extending copyright protection would only strengthen the hands of transnational computer companies. It would also inhibit countries like Brazil from building up their own IT industries. The effect, these countries, argued, would be to restrict people's access to software in poorer countries, especially for education and training.

In 1988 the US government responded by imposing 100% import duties on $39m worth of Brazilian goods Forester and Morrison (1990). Under similar pressure from the US in 1991, China passed laws to protect intellectual property rights, particularly for foreign works, but the laws were not enforced. Some of the copying of software was reportedly undertaken in government factories, Baase (2003).

These cases highlight the global inequities of access to computing technology, and the uneven development of IT industries in different countries. In particular, they suggest that notions of copyright and intellectual property cannot be assumed as universal legal and ethical principles.

Debating software piracy

Assume the position of one of the following:

- A representative of the Business Software Alliance
- A computer science student in a developing country.

What is your position on 'software piracy'? Provide at least three major arguments, backing them up with ethical theories, the law, codes of conduct, and any other appropriate principles.

Representing developing countries

You have been chosen to be the representative leading a group of developing nations who oppose US moves through GATT (the General Agreement on Tariffs and Trade) and the WTO (World Trade Organization) to extend international copyright protection to US software.

Prepare a case for your decision to refuse copyright protection to US software. Assume that you are to introduce your reasons to all the member states present at the talks, justifying your stance.

Digital music: from Napster to KaZaA

The late 1990s saw the emergence in the computing market of a new standard for compressing audio signals that had previously been used in the film industry: MP3. This is a file compression format that reduces the size of audio files by a factor of 10 to 12, making it possible to download a song via the Internet in a matter of minutes. By 1999, MP3 players were being manufactured and sold, and hundreds of websites had appeared making thousands of songs available for download in the MP3 format.

By far the most well-known of these was Napster.

Napster opened on the Web in 1999 as a service allowing users to copy songs in MP3 files from the hard disks of other users. By late 2000, an average of 98 million MP3 files were available via the service. There were a number of reasons for Napster's popularity (Baase, 2003). These are indicated in Figure 4.3 and are summarised below:

- Free music
- The opportunity to download individual songs, without having to buy a whole CD
- The opportunity to sample music and so determine personal appeal
- Access to a huge database of songs, including songs that were not commercially available
- Convenience of online access to music and being able to download and play a song from anywhere without the need to a use physical CD
- Ease of download: users could chat online while downloading music in the background.

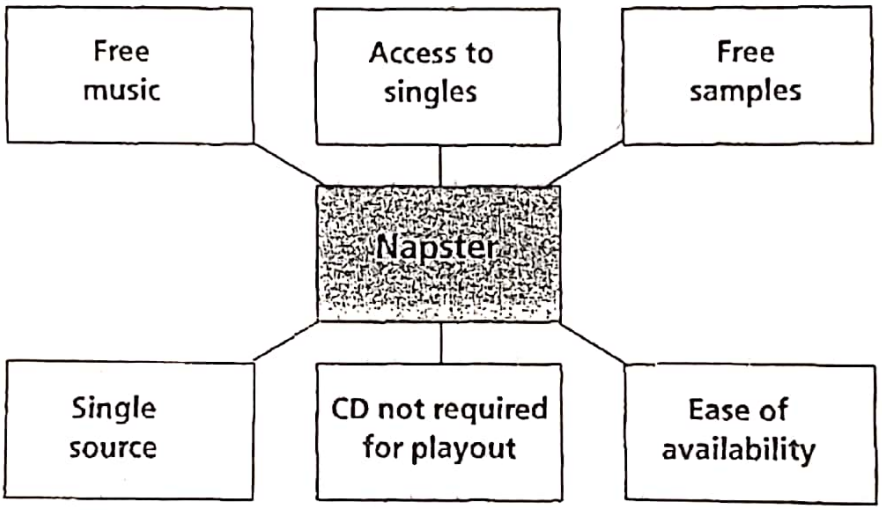

Figure 4.3: Napster's key features

Needless to say, the record industry was not happy with this state of affairs, and the major record companies, through their trade organisation, the Record Industry Association of America (RIAA), issued Napster with a lawsuit. At issue in the legal case was a) whether the copying and distribution of music by Napster users was legal under the 'fair use' guidelines, and b) whether Napster was responsible for the actions of its users.

Many legal observers thought the large-scale copying on Napster was indeed illegal copyright infringement – not fair use – and after a lengthy case that is how the court ruled. On the second issue, Napster argued that it did not keep copies of songs on its computers. It provided lists of available songs and lists of users logged on at any time; users transferred songs from each other's hard disks using peer-to-peer software downloaded from Napster. Napster's defence was that it was not responsible for users of its software who infringed copyrights. The court, however, ruled that Napster 'knowingly encourages and assists in the infringement of copyrights'. Napster was ordered to remove, from its listings, song titles which infringed copyright. It faced civil suits that would require payments of billions of dollars in damages. After some ineffective attempts to manage its song lists, Napster closed.

However, the death of Napster did not signal the end of free file-sharing on the Internet. Other peer-to-peer networks took Napster's place. One of the most popular peer-to-peer networks was KaZaA. Because of the way KaZaA was designed, with a different implementation of peer-to-peer file sharing, it proved much more difficult to shut down than Napster. Whereas Napster relied upon a central computer to maintain a global index of all files available for sharing, KaZaA distributed the index of available files among a large number of 'supernode' computers. Any computer with a high-speed Internet connection running KaZaA Media Desktop had the potential to become a supernode. The use of multiple supernodes made searching for content slower, but it also made it much more difficult for legal authorities to shut down the file-sharing network, because the creators of KaZaA argued that they were unable to control, and hence should not be held responsible for, the actions of the people who were using KaZaA.

KaZaA proved to be highly popular. By mid-2006, nearly 240 million copies of KaZaA Media Desktop had been downloaded, and by the third quarter of 2002 its monthly user base was about 9.4 million.

The RIAA's response was to identify the IP addresses of the most active KaZaA supernodes, leading it to the ISPs of users who had stored large numbers of copyrighted files. It then either sued the ISPs or forced them to identify the names of customers suspected of running these KaZaA supernodes. A new tactic was adopted by the RIAA in September 2003 when it sued 261 individuals for distributing copyrighted music over the Internet. A month later the RIAA sent letters to 204 people who had downloaded at least 1,000 music files, giving them an opportunity to settle before being taken to court.

In the wake of recent lawsuits and unfavourable publicity, the number of users of such sites has fallen considerably

4.5 Ethical and professional issues

Professional codes of conduct

We have previously noted the clause in the BCS code of conduct (see Chapter 1) which states that 'members shall ensure they have knowledge of and understanding of relevant legislation ... and that they comply with such requirements'.

In the section on Duty to Employers and Clients, the BCS Code of Conduct also states that 'members should seek to avoid being put in a position where they may become privy to or party to activities or information concerning activities which would conflict with their responsibilities'. In any broad interpretation of these responsibilities, such activities could be taken to refer to copyright infringement.

It is difficult to reconcile unauthorised copying of software, in either a private or professional context, with the professional codes of conduct defined by bodies such as the BCS or its US equivalent, the Association for Computing Machinery (ACM). The ACM Code of Ethics and Professional Conduct contains a number of general moral imperatives that refer specifically to the issue of intellectual property. General Moral Imperative 1.5, for example, states 'Honor property rights including copyrights and patent' and goes on to say:

> Violation of copyrights, patents, trade secrets and the terms of license agreements is prohibited by law in most circumstances. Even when software is not so protected, such violations are contrary to professional behaviour. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned

General Moral Imperative 1.6 states 'Give proper credit for intellectual property' and adds:

> Computing professionals are obligated to protect the integrity of intellectual property. Specifically, one must not take credit for other's ideas or work, even in cases where the work has not been explicitly protected by copyright, patent, etc.

There are sound reasons why companies buy software legitimately, rather than copying it, or using illegal software. First and foremost, they need to keep within the bounds of the law in their business practices and day-to-day operations, in order to maintain their professional and business reputation. Otherwise they risk fines, expensive settlements or serious legal action. More than this, legitimately purchased software comes with important benefits; technical support, patches, upgrades and documentation, things that do not generally accompany pirated software.

In defence of intellectual property

Many countries (at least in principle) have a tradition that defends the notions of private ownership and property.. Probably the most famous justification of property in general comes from John Locke (1632–1704), who argued that people have a natural right to the things they have removed from nature through their own labour.

The philosopher Hegel (1770–1831) argued that property enables an individual to put their will into something. For Hegel, property was an expression of an individual's personality in the world. As human beings freely externalise their will in various things, such as novels, works of arts and craftsmanship, they create property to which they are entitled because it is an expression of their 'being', and as such belongs to them.

These arguments have even more force when applied to intellectual objects, which are seen as an expression of the author's or creator's personality. Surely the author should have the right to control his or her individual expression, to prevent its misappropriation and misuse? Hegel's conception of property provides a rationale for why the end product should belong to its creator. Labourers are entitled to the fruits of their intellectual labour.

Another argument that has frequently been used in support of intellectual property is the notion that private ownership is necessary as an incentive to create and to work. This idea dates back to David Hume (1711–1776), who argued that a person's creations should be owned by them to encourage 'useful habits and accomplishments'. Intellectual work adds value to the end product. Incentive to add value is greatly enhanced if some of that value is attributed to the creator of the work, personally.

Another justification for property is based on the notion of reward. In this argument, a producer or creator deserves to be rewarded for their production or creation in return for their effort. This argument does not necessarily imply ownership, but ownership is often thought to be a just reward. It can be time-consuming and costly to generate and develop ideas, so there must be some reward for those who do this. If there is not, nobody will bother to create. If we assume the most important reward is financial, then without financial reward, society's supply of new ideas will dry up. It follows that there must be some system of copyright and patent regulations that protects intellectual property. At the very least, to enjoy the financial fruits of one's creative work means being able to support oneself, providing an income, and a means of doing further creative work. How else would artists, musicians and writers survive?

James DeLong (1997) puts forward another point of view, defending ownership rights in terms of value. He observes that unless we have clear ownership rights, and unless we pay for the goods that we need, those goods will become devalued and abused.

Having to pay for things forces us to think about what is really valuable and what is not. If all goods were free, these goods would be abused and diluted. History and experience has taught us that people do not value things that do not have 'value' (that is, which are cheap or free). The abuse of free things, such as land, air, and water has already led to serious environmental degradation. Similar tragedies could arise if property rights are diluted and ownership shifts too dramatically from the private to the common.

Against intellectual property

There is an equally long tradition of philosophical and ethical arguments against the notion of the private ownership of ideas. One key argument has been to question the assumption that an idea can be 'owned' by solely one individual. Probably any idea that we have is not ours alone. Most of our ideas come from someone or somewhere else. What is originality if not the combining of existing ideas in new ways? At best, when someone is 'original', they are expressing an idea in a new way, perhaps seeing new associations between ideas that were not noticed before. Anything creative that is achieved is the adding of something to pre-existing ideas, which have been obtained from others.

On this point, the renowned scientist and philosopher Sir Isaac Newton, referring to his original idea on gravity, wrote: 'If I have seen further it is by standing on the shoulders of giants', thereby acknowledging all those scientists who had come before him, and upon whose knowledge and discoveries his own contribution to science had drawn.

It can be argued that if all ideas were in the public domain, and if anyone could work on and develop anything, regardless of where the idea originated, we would all be better off because more would be developed. To say that the source of new and innovative ideas would dry up without copyright and patent protection to facilitate financial reward is little more than an article of faith. Artists, academics and scientists frequently create without such reward. They do so for other reasons; acknowledgement, recognition, gratitude, fame and improving the lives of others. Perhaps, in some circumstances, creation is its own reward.

Like physical property rights, intellectual property rights imply that someone has the right to certain concepts, knowledge, or information. But there are obvious difficulties with the notion that one has property rights in an idea because this would mean the right to exclude others from using and building upon those ideas. By placing a monetary value on intellectual property are we not controlling who can use and enjoy it?

In a more fundamental sense, assigning property rights to intellectual objects seems to go against many of the goals and traditions of a free society. Ownership of ideas can be seen to restrict progress and the free exchange of ideas in the scientific or artistic fields, by withholding new knowledge and preventing the free dissemination of ideas to the public.

At the heart of the issue, perhaps, is finding a balance between ensuring that innovators are duly acknowledged and rewarded for their creative ideas, while still allowing those ideas to be shared for the benefit of the community and for human progress.

ACTIVITY 4.5

Counter-arguments to copying

Consider the following scenario:

A friend of yours has downloaded a 'cracked' (that is, pirated) version of a moderately expensive image-editing application called PictureShop, and is now circulating copies of the software, free, among his friends and fellow students. You have to convince your friend that what he is doing is unethical.

He uses the following arguments; how would you counter each one?

- I cannot afford to buy the product
- The company is a large, wealthy corporation that can afford the losses
- I wouldn't buy it at the retail price anyway
- Making a copy for a friend is just an act of generosity
- This violation is insignificant compared to the billions of dollars lost to piracy by dishonest resellers making big profits
- Everyone does it. You would be foolish not to.

4.6 Free software and open source code

Free software is a concept and ethic that is advocated by a loose-knit, but large group of computer programmers who let people copy and modify their software, often without charge, and encourage others to do so. The 'free' in free software implies freedom – not necessarily lack of cost – although there is often no charge. Free software enthusiasts advocate the unrestricted copying of programs and making the source code (the human-readable form of a program) available to everyone. Software distributed or made public in source code is called 'open source', and the open source movement is closely related to the free software movement. Perhaps the best-known advocate of free software, and open source code is Richard Stallman, president and founder of the Free Software Foundation.

Richard Stallman has argued, with great insistence, that all software should be free. Stallman claims that ownership of software programs is obstructive and counterproductive. Hence, software should be in the public domain, freely available to anyone who wants to use it, modify it, or customise it. He regards software licensing fees as an enormous disincentive to using programs because it excludes many worthy users from enjoying many popular programs. Ownership also interferes with the evolution and incremental improvement of software products. According to Stallman, software development should be an evolutionary process, where a person takes a program and rewrites parts of it for one new feature, and then another person rewrites parts to add another feature. Software development could continue in this manner over a period of several years. The existence of 'owners' prevents this kind of evolution, making it necessary to start from scratch when developing a program. If information is distributed openly, it is argued, developers will not have to reinvent the wheel, or needlessly design from scratch something that already exists elsewhere. Software development, for Stallman, works best when programmers pool their knowledge to create better quality software. Stallman concludes that because the ownership of programs is so obstructive and yields such negative consequences, this practice should be abolished.

During the past few years, there has been a noticeable trend among major software vendors to make their code more openly accessible on the Internet. In 1998, Netscape surprised the software industry when it released the source code for its Navigator web browser. In addition, the open source code movement has been energised by the limited success of programs such as PERL and LINUX operating systems, a variation of UNIX that runs on personal computers. Any user can download LINUX free of charge.

Open source code gives computer users direct access to the software's source code, enabling them to fix bugs or develop incremental enhancements. The premise is that the collective programming wisdom available on the Internet will help create software that is of better quality than any single individual or group of indiyiduals working within a company could construct.

Researching open source software

Visit the Linux website at **www.linux.org**

Using the information available on this site, describe the key features of Linux, briefly explaining how it developed and evolved. Try to find some other examples of open source software.

4.7 An ethical dilemma

As we have discussed, the law relating to copyright provides – at least in principle – a way in which a creative person can gain recompense for their original work. Let us now take a simple example of how this can operate in practice.

Consider the case of Alice who was writing a textbook. She wishes to include in her book material from various sources – particularly a few key diagrams that have previously been published in other books. Some of these books are quite old, dating back to the 1930s and 1940s.

In the intervening years, the original publishers of these books have been taken over several times but , following some fairly extensive research, she is finally able to track down the names of companies who currently own the rights to the books from which she wishes to reproduce diagrams. Following this exercise, she contacts these companies, and asks for permission to reproduce diagrams from these works.

The majority of companies respond and indicate that she can reproduce the diagrams – providing that she pays a fee (ranging from £40 through to £2,000 per diagram reproduced). Payment is deemed necessary because, although the diagrams are quite old, the copyright has not expired (typically, copyright for material that is published in a book continues for 70 years after the death of the book's author). Alice decides that she cannot afford the permissions costs (these total an amount which is far in excess of the revenue that she will get from her book once it is published).

Although copyright serves to reward people for their creative work, in practice this does not always happen. For example, only relatively recently have authors' contracts with publishers contained clauses to the effect that they will receive royalty payments for materials reproduced from their work. Consequently, in the case of old books, there is little, if any, chance that an author (or their estate) will receive any remuneration when

With this in mind, Alice decides to scan the relevant diagrams, make a few alterations to them – so they looked a little different – and then use them in her book without having obtained any permissions to reproduce them.

This raises a number of ethical issues. In the case of older books, should publishers require significant fees to be paid to them if material from one of their books is reproduced elsewhere? To what extent should this be underpinned by consideration of fair use? Is it reasonable for publishers to require significant amounts of money to be paid in relation to the reproduction of material from an old book – particularly when they know that this will not be passed on to the author, or their estate? To what extent is it appropriate to simply make modifications of diagrams, and therefore avoid the payment of permissions fees? By way of a simple example, consider Figure 4.3. Let us suppose that this is 'edited' by Alice and reproduced in her book in the form illustrated in Figure 4.4 To what extent (if any) is Alice guilty of plagiarism? One point to note: by not paying permissions fees, it follows that the author will not acknowledge the original source of the diagram – thus, the original creative person does not receive any credit.

To what extent do such considerations apply to software? For example, is it permissible to take another person's code, make limited modifications to it, and represent it as one's own work?

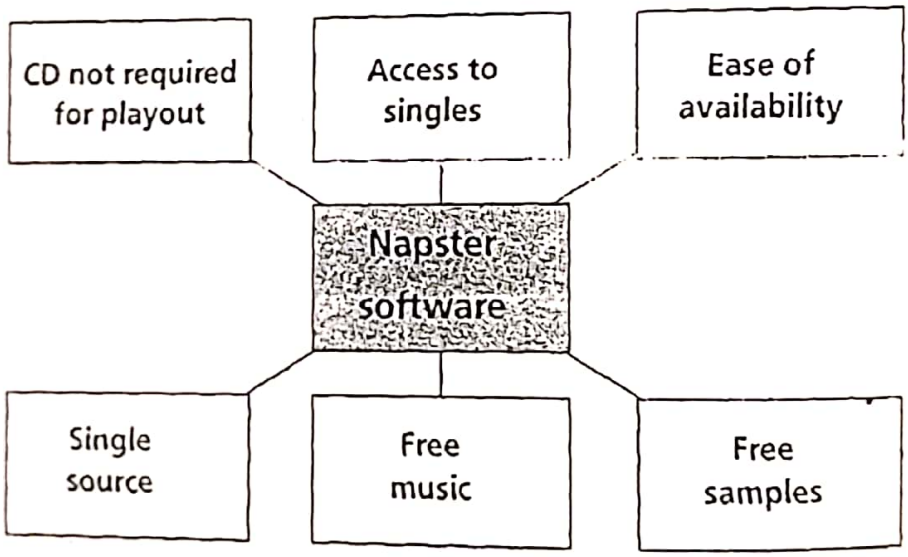

Figure 4.4: Alice 'edits' Figure 4.3 and represents the diagram as her own work. See the 'Ethical Dilemma' for discussion

4.8 Summary

In this chapter we have explored the issue of intellectual property, particularly focusing on issues that relate to the field of computing.

We began by defining intellectual property and looking at some examples of intellectual objects. Subsequently, we briefly considered the impact of computing technology on intellectual property, particularly in the area of digital rights management, focusing on the manner in which the Internet has transformed the way intellectual property is distributed and consumed.

We outlined the existing forms of legal protection for intellectual property, in the form of copyright, patent and trademarks, and the role of fair use provisions. We then explored the issue of software piracy and copyright infringement in fields such as music. In this context, we looked at some of the evidence on the nature and extent of software piracy, then we presented the arguments for and against the practice of copying software. We have outlined some of the philosophical and ethical debates relating to the ownership of ideas and the nature of intellectual creativity. Finally, we briefly discussed the position of the free software movement, and its advocacy of open source code.

4.9 Review questions

Review question 4.1

Give examples of intellectual property and explain what is meant by the non-exclusive and reproducible features of intellectual objects.

Review question 4.2

Name three computer technologies that have enabled relatively cheap and simple high-quality copying and high-quantity distribution of intellectual property.

Review question 4.3

Name the three principal forms of legal protection for intellectual property, explaining the differences between them, and giving examples of each from the computing field.

Review question 4.4

Which groups generally oppose the Digital Millennium Copyright Act and why?

Review question 4.5

List the conditions under which the 'fair use' provision of the US Copyright Act allows copying. What is the purpose of the fair use provision?

Review question 4.6

What technical aspects of peer-to-peer file sharing used by KaZaA have made it more difficult to shut down by the authorities – as compared to Napster?

Review question 4.7

List the main philosophical arguments against intellectual property and the private ownership of ideas.

Review question 4.8

Give four reasons why the open source movement is considered to be better for the computing industry than commercially protected software.

4.10 Feedback on activities

Feedback on activity 4.1

The Secure Digital Music Initiative (SDMI) was an effort to create copy-protected CDs and secure digital music downloads that would play only on SDMI-compliant devices. About 200 entertainment and technology companies joined together in a consortium, which worked for three years to develop 'digital watermarks' that would make unauthorised copying of audio files impossible. The SDMI was unsuccessful for three reasons.

- First, before any copy-protection technologies could be put in place, the number of music files being copied on the Internet mushroomed
- Second, some of the sponsors of the SDMI (consumer electronics companies) started making a lot of money selling devices that became more attractive to customers as access to free MP3 files got easier. Their sales could be hurt by restrictions on copying
- Third, the digital watermarking scheme was cracked. In September 2000, SDMI issued a 'Hack SDMI' challenge. It released some digitally watermarked audio files and offered a $10,000 prize to the first person to crack them. Princeton computer science professor Edward Felten and eight colleagues picked up the gauntlet. Three weeks later the team had successfully read the audio files.

Feedback on activity 4.2

Factors to consider include.

- Purpose of the use (whether it is educational or commercial)
- Nature of the work being copied (whether it is fictional, or factual news)
- Amount of material being copied (whether the whole articles have been copied, or portions of those articles, and whether students are able to make multiple copies)
- The effect the copying will have on the market for journal sales. Will it infringe the market for the journals from which these articles are taken?
- Has permission been sought from the authors or publishers of the articles? In this instance, such permission must be granted for the use of any copyrighted material.

Feedback on activity 4.3

Possible arguments for a representative of the Business Software Alliance:

- Legal: software piracy is a criminal activity under international law and copyright agreements
- Economic: the time and trouble involved in producing good software is far greater than the computer student may appreciate. If developers do not make a profit, they can no longer develop software. Software companies will not want to invest as much in developing new products, because they cannot expect any return on their investment in