CSC 221 – Introduction to Software Engineering

professional ethics

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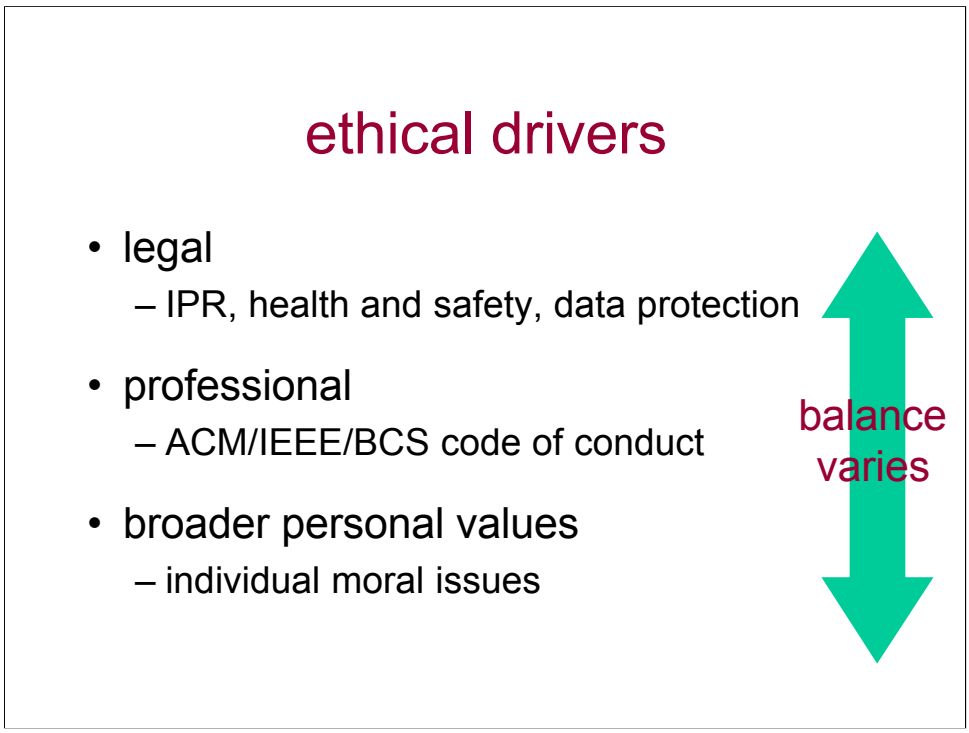


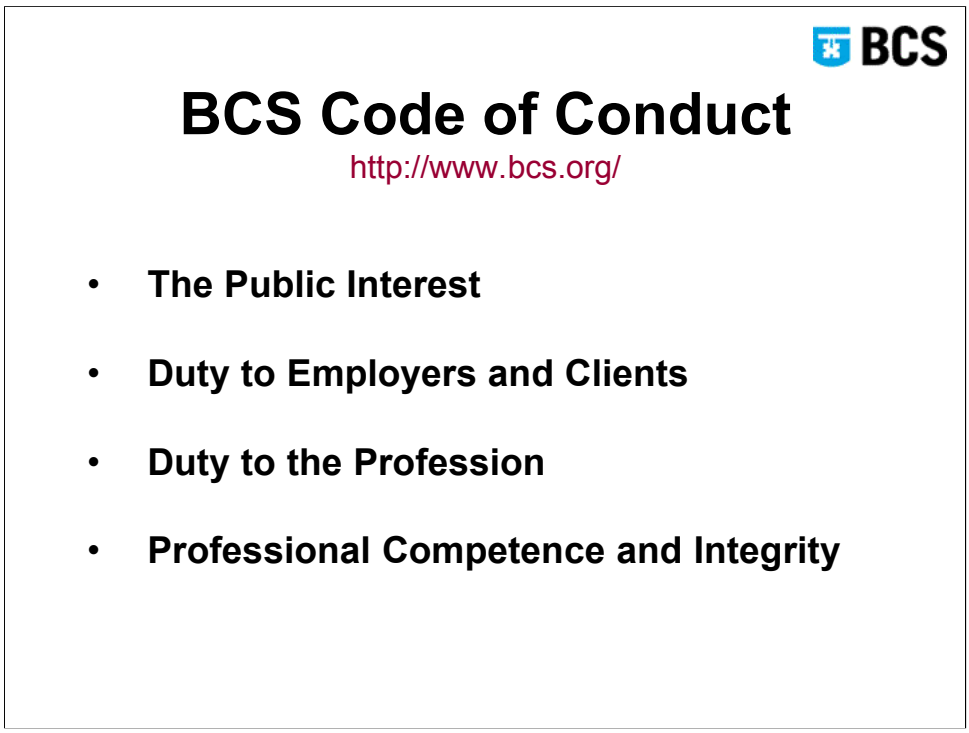
There are various things that may drive one to consider ethical issues:

There are laws in areas such as intellectual property: Napster collapsed because it violated copyright law, US and European patent law now allows the protection of software and business processes. Law can also be used to make software open. e.g. the GNU Public Licence uses contract law to ensure this.

Professional bodies such as the ASCM, IEEE and BCS also have their own codes of professional practice.

As individuals we also bring our own sets of values which may determine what kinds of work we will accept (e.g. military work) and the way in which we conduct our affairs.

In different aspects of computing we may find different balances of legal, professional or personal issues.



The BCS code of conduct is focused on relationships - who is affected

The Public Interest is about the broader interests of society

Employers and clients: giving a fair and appropriate service to those who pay!

The profession - maintaining the good name of computer science

Professional competence and integrity - includes aspects of all these if you can't do the job you say you can then you do a disservice to everyone. It is interesting that this reminds you that things like keeping up-to-date are also part of your professional duty.

ACM Code of Ethics and Professional Conduct

http://www.acm.org/constitution/code.html

1. General Moral Imperatives.
2. More Specific Professional Responsibilities.
3. Organizational Leadership Imperatives.
4. Compliance with the Code.

And the ACM headings are even more vague :-)

This does show how difficult it is to talk about issues like this in the abstract.

In contrast, the IEEE adopt something closer to a Hypocratic oath for engineers.

This is quite specific, but where would it help you think about an issue such as whether to produce software that would help users rip CDs, or help make viruses?

Proposed Joint ACM/IEEE Code of Ethics 1999 principles (from Sommerville, ch 1)

1. PUBLIC
2. CLIENT AND EMPLOYER
3. PRODUCT
4. JUDGEMENT
5. MANAGEMENT
6. PROFESSION
7. COLLEAGUES
8. SELF

Ian's book mentions this joint ACM/IEEE code, but I can't find any evidence for it having been ratified by either body.

Note however, it focuses, like the BCS code, on who is affected as well as some other broad issues (product, judgement, management).

There is a real problem in creating such schemes - things are either terribly vague, or so precise they don't help in real situations.

Also real ethical problems often involve conflicts - your employer says to do a dirty fix to some code that you know will eventually cause problems and lead to costly maintenance - is your responsibility to your employer higher than that to your client?

computer ethics

	legal	professional	broader
generic			
computer			
internet			
societal			

To look at a few issues in more detail we can look at the three ‘drivers’ mentioned at the beginning. Also we can look at how specific the issues are.

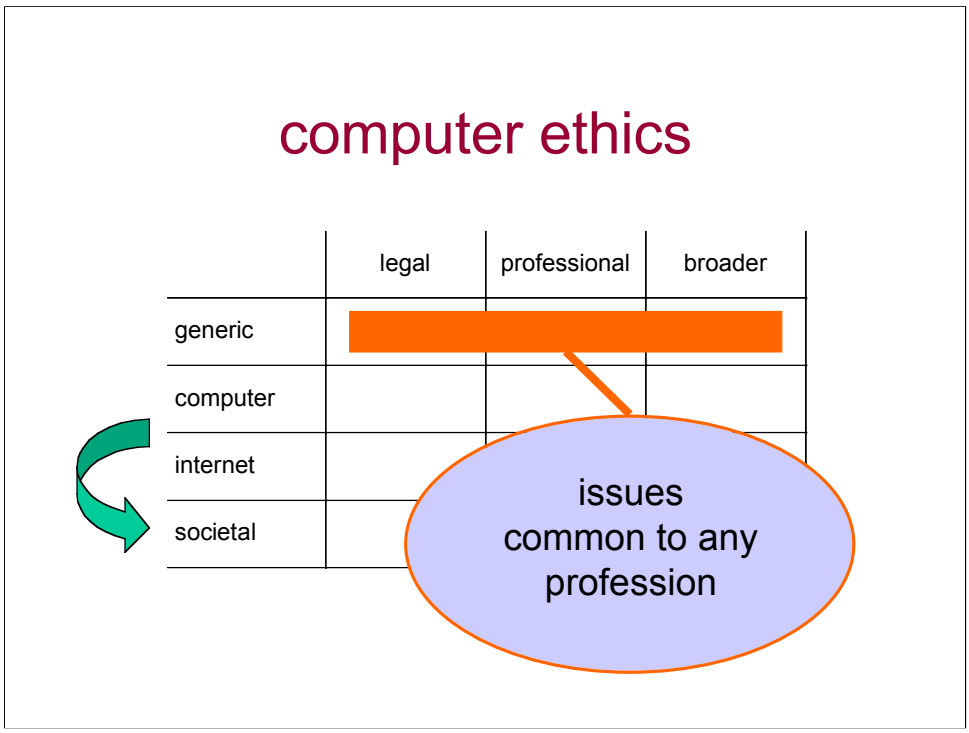
Some are nothing particularly to do with computers - just generally about technology or professional life.

Some are specific or especially important for computer systems.

Some have become important because of the internet and web.

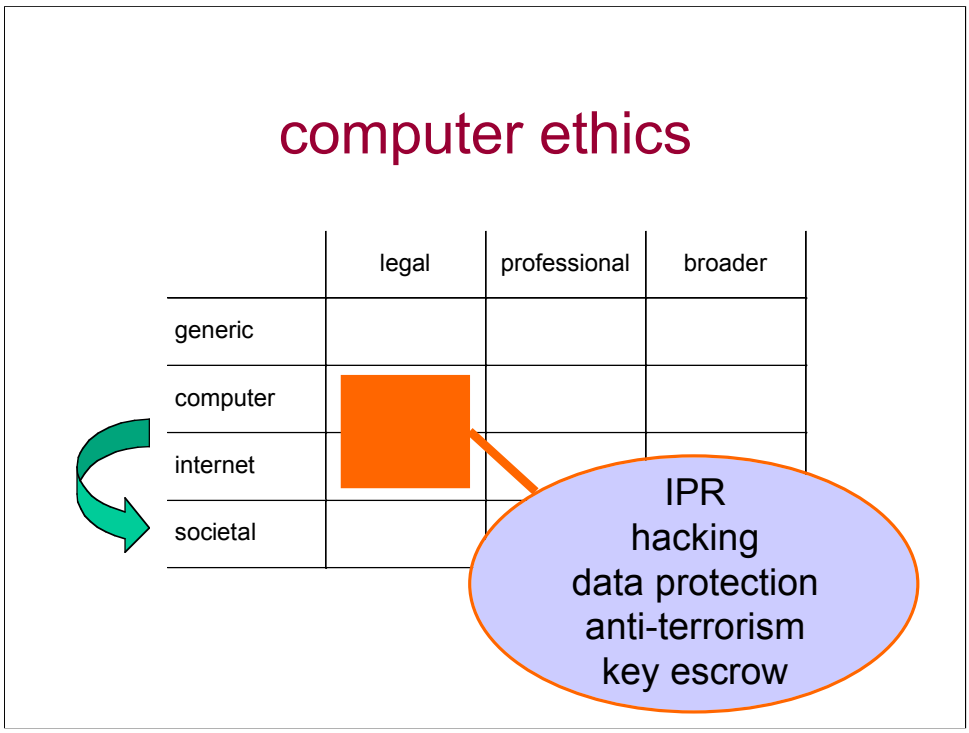
As well as issues connected with specific software or technology the broad effects of a computer and net focused world have effects on society as a whole.

IT and the internet has affected every corner of life. As practioners we are part of this change with both its positive and negative consequences.



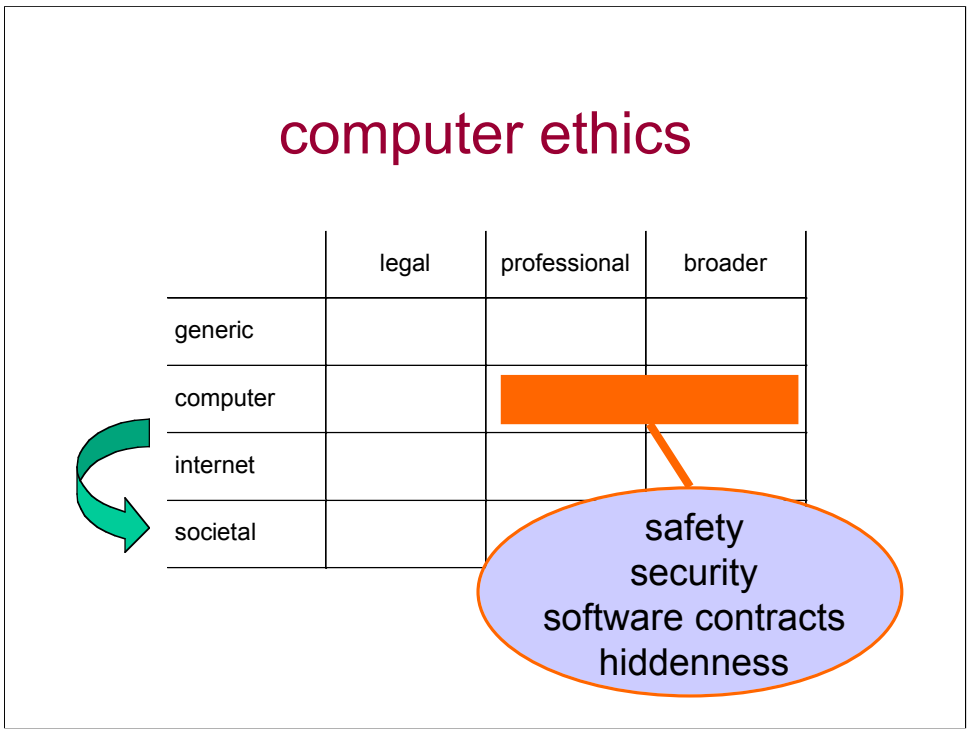
At a generic level we are concerned with issues that are common to all professions:

fair and legal contracts, serving clients interests, being careful about conflicts of interests, etc.



In the legal area there is an increasing amount of legislation concerning computers and networks.

IPR legislation on copyright and patents have already been mentioned. There are specific laws forbidding hacking (before this all you could do was sue for use of electricity!). In the UK the Data Protection Act means you cannot use personal data except when explicitly given permission and then only for the reasons given. The internet has also become a tool of terrorist and criminal activities both as a means of secret communication (web, email, etc.) and also as a means of attack itself as the world becomes more reliant on the net (e.g. attempts to attack the White House web server last year). In both the UK and US legislation forces certain types of data to be ‘open. In the UK a system manager must be able to decrypt all files if required by the police. In both the UK and Us there has been considerable controversy over Key Escrow - requiring copies of all cryptographic keys to be lodged where they cane be accessed by police and security services.



Looking at general computer issues. Computers are more an more heavily used in safety critical applications (e.g. airbus). To what extent can one feel confident that code is safe - what precautions should you use to ensure it is? Similarly security is problematic. Note that in some ways computer security is not more of a problem than any kind. However, if someone steels paper files there are physical limits as to how much they can take and it is usually clear that it has happened. With breaches of computer security the effects can be bigger, faster and less clear (recall complexity of effect from early SE lectures). The complexity of software makes contracts more difficult. If you are an architect asked to design a house the client will know the sort of size, budget, rooms, etc. that are wanted and there is a common understanding of what is reasonable. If, when the house is built, the client finds there is no bathroom there would be grounds to complain. With an IT system the client may not really understand what the system could be like or the complexity (and cost) of different options.

hiddenness on next slide …

computer ethics - example
hidden rules

nice technologies ... neural-nets etc. ...

- learn rules from examples
- automate activities
  - industrial control, stock buy/sell
  - credit vetting, job applicant pre-sorting

but hidden rules

  - 'weights' on neural connections
- are they legal/ethical/safe

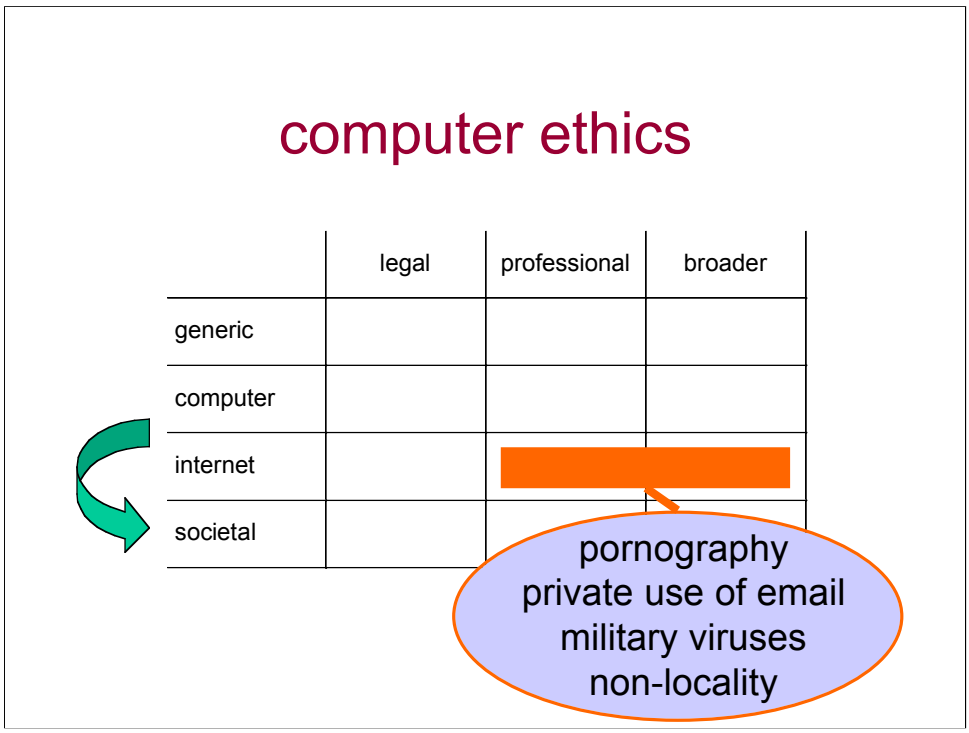
http://www.hcibook.com/alan/papers/neuro92/

Recall one of the difference between the physical world and computers is to do with hidden-ness. With physical things the state is external and obvious - with computers it is in internal memory and hidden.

One example are technologies such as neural networks that learn rules from examples, but represent them in ways that are both hidden and incomprehensible to humans.

Imagine training such a system to help vet job applicants. How do we know that the rules it learns are legal - not sexist or racist?

Similarly would we be happy with such system controlling a plane or nuclear power plant?



The Internet has become a major medium for the sex industry: some legal (but perhaps not wanted for children or thrust upon yourself in spam mails) and some illegal (e.g. child pornography). The fact that the internet is non-national makes it hard to track those using the net for illegal purposes and individual countries find it hard to enforce legislation when servers are outside their borders in countries with different standards and laws. Is it moral to allow someone to mount a site that you know will be used to circumvent the laws and moral norms of another country?

You may think it immoral (and illegal) to steal a computer form your employer, but is it ethical to use email (time, storage etc,) for personal purposes? Some companies have fair use policies (as for phones) others ban private email and web use totally.

We've already mentioned terrorist uses of the internet. Would you be prepared to work on military viruses to attack 'enemy' computer systems or are the risks of viruses getting 'out of control' similar to germ warfare?

Notice that all these issues depend on the non-locality of networks.

computer ethics - example

preventing Trojan horses

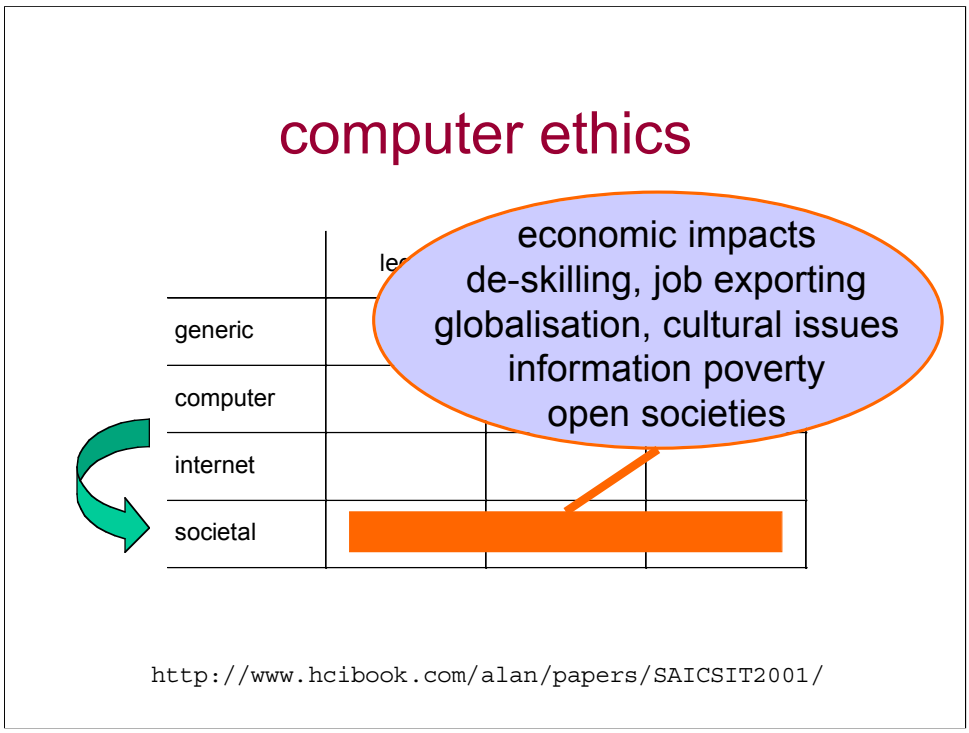
aQtive onCue
- component-based
- needs frequent updating

so ... automatic internet update
- potential for Trojan horse
- hacking – normally new downloads only
- automatic update ⇒ all existing users
- needs v. stringent crypotographic security

aQtive onCue was an ‘intelligent toolbar’ that looked at what users copied into their clipboard and then suggested interesting web services.. The rules and links to services were built over a flexible component architecture. Because of the changing nature of these services it was important to update it frequently, but this would mean users continually downloading new versions.

So we really needed an automatic update mechanism (getting increasingly common in software). We designed a mechanism involving update files on the web server with the onCue tool periodically checking the server and downloading new versions as they became available. But, imagine what would happen if someone hacked into the web server! They could replace our download with one containing a Trojan Horse. In some ways this is similar to what would happen if we have software to download on demand. But in that case only the new users would be affected. With automatic update every user would simultaneously get new corrupt versions!! The speed and non-locality changes the nature of things. Furthermore, the new user would have explicitly chosen the download and know about it. the automatic may have been enabled by the user but is in a way ‘hidden’ and so strange behaviour would not be attributed to it allowing such a Trojan horse to wreak even more havoc.

Thinking both of our users (and them suing us!!) we developed stringent cryptographic checks (digital signatures etc.), but in fact never deployed the automatic update mechanism because we were never certain enough.



Whole classes of jobs have disappeared - once every office had a typing pool, now dictation has given way to many doing their own word processing, using email instead of letters. Other jobs become de-skilled. These effects tend to disproportionately hit the lower end of the job/skills market. Where lower level jobs still require human input the ease of moving information means that information work (including programming) may be exported to where the labour is cheapest (and possibly unregulated). This may be good for the countries concerned of course - a global trade in intellectual as well as physical goods.

The trans-global internet has made it easier for multi-nationals to organise their business, this threatening local businesses. Also the global reach of the web means that 'western' values and culture are flooding the world (although TV had already largely achieved this!). As access to computers and networks becomes essential for day-to-day life, those without become more and more disadvantaged. This is like car poverty where those without cars buy from local shops (which is of course good for those shops) that may be more expensive and have less choice - effectively becoming more poor.

There are lots of good things too!! the internet has been used by those suffering persecution or those in the middle of conflict situations to have access to external news and to broadcast their plight Networked work can open new markets to disadvantaged countries (if they can afford the infrastructure). Networks can be used to bring people together from disadvantaged groups to increase collective buying power.

Ethical dilemmas

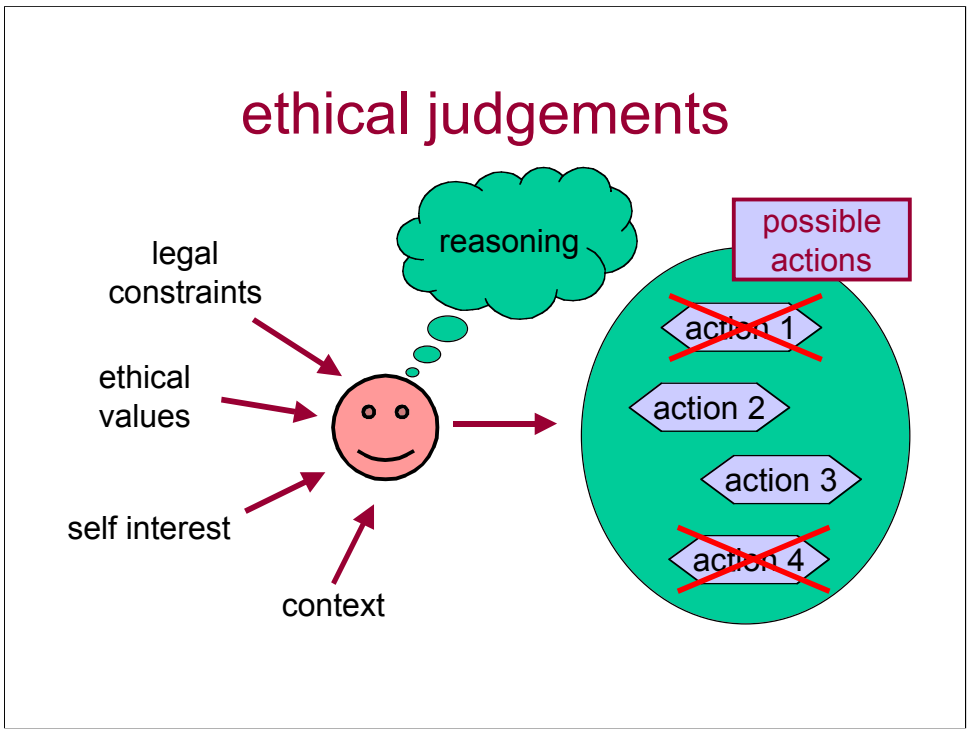
(from Sommerville, ch1)

- Disagreement in principle with the policies of senior management
- Your employer acts in an unethical way and releases a safety-critical system without finishing the testing of the system
- Participation in the development of military weapons systems or nuclear systems

As noted it is often the case that different ethical principles or standards conflict with one another …

Ian gives some examples in his book

Sometimes you have to make your own choices in such circumstances, sometimes it is possible to come to agreement by discussing things with others (perhaps change a company policy, or perhaps become persuaded yourself by others arguments)



When we make an ethical judgement we bring in various things, such as knowledge of legal consequences, our own ethical values.

Unless we are totally selfless we will also take into account our own self interest and that of those close to us (although hopefully not totally driven by self interest either)

Also we take into account the particular circumstances and context.

We then in some way weigh these up and use it to select possible actions - and then often choose one of them to do.

reaching agreement

- may agree on ethical principles
  - but disagree on implications
  - and different personal interests
- may agree on actions
  - even if for different reasons
- may agree on rules
  - laws, code of practice
- understand others' views

Different people come to different decisions, but by understanding the way we make decisions we may be better able to discuss them with others and reach agreement.

We may agree on the underlying principles, but perhaps have applied them differently. In this case we need to discuss the reasoning we have used and hopefully see that some course of action is reasonable based on the ethical basis. Often the reason for different interpretations lies in our personal interests, which we may not agree on, but at least if we understand this it helps.

Even if we have totally different ethical positions there may be some actions that we find are consonant with both our positions, but for completely different reasons.

Or at very least we may agree on what the basic legal and professional rules are (e.g. lawyers arguing a case).

If we at least understand each other's views we have the basis to try and seek something acceptable to us all!!!

last word

if you think it will be perfect

things will fail

accept you aren't

and things may work

In the ethical world, just as in the world of software. If you believe everything will be perfect things are likely to fall completely apart.

If you understand that there will be conflicts of viewpoints, sometimes compromises that allow things to progress despite deep disagreements etc. … then things may just muddle along