- **Introduction to Legal Concepts**
  - historical perspective;
  - the system of courts;
  - important legal concepts;
  - European law.

- **Intellectual property, copyright and patents**
  - introduction to copyright, patents and law of confidence;
  - the law of designs, trade marks and passing-off;
  - Copyright Designs and Patents Act 1998;
  - Copyright (Computer Programs) Regulations 1992;
  - reverse engineering,
Contracts
- contracts for bespoke software;
- licence agreements for off-the-shelf software;
- shrink-wrap licensing;
- contracts between software authors and publishers.

Liability
- liability for losses caused by defective software;
- exclusion clauses;
- the consumer protection act;
- negligence;
Introduction to ethics

definitions

Western ethical thought

Moral Philosophy

ethical problem solving

Professional ethics for computer scientists

ACM and BCS professional codes;

arguments for and against professional codes;

moral philosophy.
Privacy and the freedom of information

privacy in the computer age
transborder date flows;
the Data Protection Act 1998;
Computer misuse and computer crime
report of the Scottish Law Commission;
Computer Misuse Act 1990,
example cases.
IT and the quality, quantity and organisation of work
IT and unemployment;
telecommuting;
1 Technological and Social Change
2 IT and Employment Change
3 Impact of IT on working conditions
4 Information management
5 Computers and social relationships
1) Technological and Social Change

- We consider the way in which formal work, managerial styles and organisational structures have changed with the advent of information technology (IT).

- Technological change and social change evolve together.

- The course of technological development is determined by social factors on both the supply and demand sides, often called the technology push and the demand pull.

- What factors govern the supply of new technology?

- What factors govern the demand for new technology?
Technological determinism

- View that a society’s technology drives the development of its social structure and social values.
- Term coined by Veblen (1857-1929) an American sociologist

"the uses made of technology are largely determined by the structure of the technology itself, that is, that its functions follow from its form" (Neil Postman)
- Instrumental conception of technology
- Technological artefacts are value neutral
- They acquire positive or negative value through their use by humans.
Luddites

- A social movement of 19th-century English textile artisans who protested – often by destroying mechanised looms – against the changes produced by the Industrial Revolution.
- They felt mechanisation was leaving them without work.
- Now "Luddite" is a term describing those opposed to industrialisation, automation, computerisation or new technologies in general.
- Utopian view: computing will make work easier, workers happier, and increase productivity

- Dystopian view: computing will deskill workers, replace workers with machines, and enable electronic monitoring of work.
1.1 Technology-push demand-pull

1.2 The argument for computerisation

The argument for introducing IT into the workplace is that it will increase demand by creating new products, or by reducing costs while improving quality.

As a result of increased demand:

Output increases;

Employment increases;

Profits increase prompting investment in research and product development, thus creating even more jobs.

What about unemployment caused directly by the introduction of IT?

Job losses in one part of the economy resulting from an introduction of IT may be compensated by retraining, and by demands for engineers, programmers etc.

Some evidence in support of claims that automation does not create unemployment, e.g. Japan and Sweden have the largest number of industrial robots per employee, but very low levels of unemployment.
1.3 The pay-off of computerisation

- Current evidence indicates that the huge investment made in computer technology has not paid off.

- US investment in computers grew at a rate of 24% per year during the 1980s, but there is no evidence of increased productivity in the economy over this period.

- Productivity paradox
Some critics argue that this 'productivity paradox' actually results from:

- inappropriate ways of measuring productivity;
- steep learning curve of the new technology.

Others argue that real problems with computers underlie the productivity paradox:

- software is often poorly designed;
- benefits can be lost in an organisational context.
1.3.1 Example: word processing

Word processing provides obvious benefits:

- Mistakes can be easily corrected;
- Documents and templates can be saved and re-used;
- Spell checking.
However, there are problems:

- Users make many more revisions than they otherwise would do, but apparently without improving quality;

- Difficult to master (for average user);

- Too many features, many of which are never used;

- Little compatibility between packages.

- Features may be of less use than they appear. Spell checkers cannot detect every error, so do not obviate the need to read through the document.

- Disk failures and crashes can be catastrophic; computer systems are not as reliable as paper-based systems.
I have a spelling checker
It came with my PC
It plainly marks four my review
Miss steaks aye can knot sea
Eye ran this poem threw it
I’m sure your pleased too no.
It’s letter perfect in it’s weigh,
My checker tolled me sew
Jerrold H. Zar
1.3.2 Problems with computer software

Software can be hard to use because computer-literate designers lose the perspective of novice users.

Software often facilitates tasks that are marginal:

- small business use computerised databases when they would be better served by a card index;
- spreadsheets are used to experiment with different scenarios (e.g. effect of inflation on business forecasts) but often these are of little utility.
People are resistant to automation of some activities:

E.g. meeting schedulers that keep diaries for a group of people.

Total reliance on computer software can be dangerous. Up to 95% of spreadsheets in use contain errors.

In a company buy-out, the buyer overspent by 10 million dollars due to a spreadsheet error

(see Computing 28th August 1997).
1.3.3 Organisational issues

Productivity may not be increasing because of the way that computers are used in the workplace.

A lot of time may be spent creating high-quality internal reports - without productivity gains.

Email is (often) slower than a phone call.

If people are doing the wrong things when they automate, they simply do the wrong things faster.

Conclusion: application of computer technology does not inevitably lead to productivity gains.

Getting results usually involves redesigning the work process before computerisation - see later.
1.4 IT and power

'knowledge is power'

IT does tend to increase the differences between those with power and wealth and those without.

In corporations: managers can monitor keyboard activity, phone conversations, emails of employees and can use data mining to profile customers, employees and potential recruits.

BUT does IT benefit customers and employees in the same way?

- Globally: access to IT technology not universal.

IT can have good or bad social consequences, depending how it is used.
2 IT and Employment Change

- Forecasts of the consequences of IT for employment levels are controversial. However, the following trends are generally agreed:

- Shift of employment from the primary economic sector (agriculture/forestry/fisheries) to the secondary sector (extractive industries such as mining) to the tertiary sector (manufacturing).

- Reduction in 'core' manual and production occupations (construction, mining, farming), increase in 'peripheral' ancillary, administrative and professional jobs.

- Continued reduction in lifetime working hours.

- The 'information sector' (which produces information goods and services as final output) now dominates employment (more than half of all workers in the US).
2.1 Job losses due to IT

It is hard to quantify the impact of IT on employment.

Most case studies analyse employment changes in existing sectors of the economy: they often predict reductions in employment, or 'jobless growth' (reduced costs and increased productivity without increased employment).

But future employment may be boosted by new areas of economic activity due to IT.

Until quite recently, relatively few job losses can be attributed directly to technological change. Other factors are more influential, such as heightened competition and falling demand during periods of recession.

In most countries, only 10-15% of the working population are employed in the manufacturing sector. Hence, the trend towards automated manufacturing will not cause a major increase in unemployment.
Sheffield steel

Decline of steel industry in 1980’s
  (Full Monty movie 1997)
  Now more steel produced than before
    But with fewer employees
2.2 Retraining and redeployment

- Job losses due to IT may be offset in the long term by retraining and redeployment.

- Problems with retraining:
  - Not all people can be re-trained;
  - Successful retraining requires government funding;
  - During 1980s, estimated that 400,000 needed retraining in US: only half could be retrained by federal programs, whose budget has subsequently been halved.

- In service sectors of the economy, the pattern of employment is likely to change significantly as IT becomes more integrated.

- Emphasis will probably be placed on 'front-office' personal attention, while the traditionally information-intensive 'back-office' activities will be automated.
2.3 Women and IT

Concentration of IT in clerical jobs is likely to have a disproportionate effect on women, since it is traditionally in this area that women have found part-time and full-time work.

Gender imbalance
- Computing tends to be a male dominated profession.

This problem may be traced back to education:
- At 'A' level in England and Wales, males taking computer studies outnumber females by 4:1;
- In the US, males taking secondary school courses in computing outnumber females by 2:1 across all states.

Intriguingly, the mathematical and computer skills of women tends to improve when they are taught in a single-sex setting.
Tracy Camp (2001):

- 1984: 37.1% of US Computer Science degrees awarded to women.
- 1989-1990: 29.9%
- 1997-1998 26.7%

57% of 2010 undergraduate degree recipients who were women

18% of 2010 Computer and Information Sciences undergraduate degree recipients who were women

14% of 2010 Computer Science undergraduate degree recipients at major research universities who were women

37% of 1985 Computer Science undergraduate degree recipients who were women

79% decline in the number of first-year undergraduate women interested in majoring in Computer Science between 2000 and 2010
Robots and unemployment

November 2015 Andy Haldane, Bank of England’s chief economist warns that roughly half of the workforce in the UK and the US are likely to eventually lose their jobs to robots, as technological automation trends spread across all industries and service sectors, the Bank of England’s chief economist has warned.
Chart 28: Average probability of automation by occupation

Average probability of automation across population

- Managers, Directors and Senior Officials
- Professional Occupations
- Associate Professional and Technical Occupations
- Skilled Trades Occupations
- Process, Plant and Machine Operatives
- Administrative and Secretarial Occupations
- Caring, Leisure and Other Service Occupations
- Elementary Occupations
- Sales and Customer Service Occupations

Decreasing median pay
Service industry:

- ATMs
- Self-service tills in supermarkets
- Fast food industry
  - e.g. San Francisco startup company Momentum Machines: fully automated gourmet burgers
  - Japan’s sushi restaurant chain: robots make the sushi and conveyor belt replaces the waiters

office drone jobs at greater risk:
“Some of the people most threatened are what we might call office drones: people who sit in front of computers doing relatively routine, formulaic things. If your job is to produce the same kinds of reports again and again, software is getting smarter and better at doing that. We already have lots of examples, even in journalism. There’s smart software that is able to write basic news stories. Lots of white-collar jobs held by college graduates are going to be threatened.”
Economic Policy Unit 2013: growing disconnect between productivity and wages since 1973
Effect on world economy?

“As you eliminate workers and people become unemployed or their wages fall, consumers will have less purchasing power to buy the products and services produced by the economy. As a result, there will be less and less demand.”
3 Impact of IT on Working Conditions

3.1 Quality of work

3.1.1 Taylorism and deskilling

In the 1890s F. W. Taylor performed 'time and motion' studies of work processes. These involved:
- splitting tasks into component actions;
- timing each action;
- redesigning actions to reduce the time requirement.
'Taylorism' results in production systems in which individual jobs are simple and relatively unskilled.

The introduction of IT into the workplace can have a similar effect as Taylorism; previously skilled tasks effectively become 'de-skilled'.
Taylorism

Frederick Taylor

(1856-1915)

“Scientific management”
Effects of IT and automation

- Deskilling:

- Conceptual tasks built into computer algorithms, or transferred to a few specialists
• Upgrading:
  • Automation of routine and repetitive tasks
  • Growth of white collar work, and lowest level clerical workers retrained
3.2 Performance monitoring

Employee performance monitoring is inherent in the Taylorism approach; human operators are measured in the same way as raw materials or components.

Now, performance monitoring is also seen as a means of identifying 'time thieves'; employees who take too many breaks or leave work early.

Estimated that 'time thieves' cost US industry 100 billion dollars per year.
The simple timing advocated by Taylor has now been replaced with more sophisticated monitoring:

- closed circuit television;
- keystrokes per hour (US company 'Electronic Banking Systems' sets target of 8500 keystrokes per hour);
- rate of scanned goods in supermarket checkouts;
- monitoring of telephone calls;
- 'active badges' which track individual employees.
3.2.1 Problems with monitoring and deskilling

- Monitoring may not improve productivity at all:
  - increased stress and atmosphere of mistrust;
  - absenteeism is increased;
  - higher turnover of employees;
  - staff may work at minimum acceptable level for fear that better performance will lead to raised expectations.

- Deskilling reduces employee motivation; work is monotonous and dispiriting.
Taylorism is now widely regarded as flawed. So-called 'Hawthorne Studies' of late 1920s demonstrated importance of social relationships in the work place.

The Hawthorne studies were carried out by the Western Electric company at their Hawthorne plant in the 1920's. Initially, the study focused on lighting.

Two things emerged from the initial studies:

1. The experimenter effect, and 2. A social effect.

The experimenter effect was that making changes was interpreted by workers as a sign that management cared, and more generally, it was just provided some mental stimulation that was good for morale and productivity.

The social effect was that it seemed that by being separated from the rest and being given special treatment, the experimentees developed a certain bond and camaraderie that also increased productivity.
Conclusion: it is the way that computerisation is used which is important, not the use of computers per se.

Computers can be employed in a sensitive and useful way, e.g. the drudgery of bookkeeping has been removed by spreadsheets, so that accountants can concentrate on analysis and financial modelling.
3.3 The location of work

The impact of the car on society has been significant, allowing people to live in a suburban setting some distance from their office. Now, IT is having similar consequences.

Alvin Toffler (1980) predicted that personal computers and telecommuting will make work at home more common, 'electronic cottages'
  - strengthen bonds of family and community
  - provide employees with greater control over their work
  - benefit the environment by reducing pollution.
3.3.1 Remote working by sub-contractors

- Software development and data entry can be done remotely; so such work can be sub-contracted to Third-World companies with cheaper labour costs.

- Many US companies contract out their data processing to Caribbean offices with low-paid local staff.

- Indian software industry grew into a 1.2 billion dollar concern in 10 years, with hundreds of companies employing 100,000 software developers.

- Although some work can be contracted out in this way, other activities cannot because they require knowledge of local rules or laws (e.g., auditing work).
3.3.2 Teleworking

Teleworking is a new form of work practice, which enables the decentralisation of office work.

Advances in IT allow individuals to work from home, or from a local base which is linked to the headquarters of the organisation by telephone.

Organisations establish regional work centres near the principal concentrations of its employees’ residences. Regional centres are connected, so that accountants, marketers, salespeople, data entry clerks and managers can communicate.

There are now approximately 25 million tele-workers in the US alone.
3.3.3 Is teleworking really catching on?

Home working is certainly on the rise. A survey of firms by the Confederation of British Industry showed that the number offering at least some teleworking rose from 14% in 2006 to 46% in 2008.

Much experimentation with teleworking; but staff often abandon it and return to conventional work programmes.

Some companies use teleworking in addition to conventional work. IBM pay connection costs for employees; they are able to work as much as they want from home as long as they put in a standard working week in the office.

Effects of family life on teleworking are complex. One study (Kraut, 1994) suggests that employees with a partner are more likely to work at home, but having children makes them less likely to work at home.
Advantages of teleworking?

Disadvantages?
Advantages include:
- No commuting time
- More control over working environment
- More family friendly

Disadvantages include:
- Loneliness
- Loss of motivation?
- Being ‘out of the loop’
4 Information Management

Exploiting IT to the full will require new ways of thinking and working.

The poor productivity pay-off from computerisation has led many managers to re-examine 'people' issues.

Successful information management requires the development of skills in planning, configuring and operating IT-based systems, which take into account fundamental changes in organisations (such as the decentralisation that accompanies telecommuting).

Match the technology and organisation of work to get as close a fit as possible.

American managers are finally learning what the Japanese learned years ago. The solution to fading competitive ability, sluggish production growth and poor quality cannot be found in the mythical black box of a miraculous technology. To realise the full potential of automation, leading-edge companies are integrating workers and technology in 'sociotechnical' systems that revolutionise the way that work is organised and managed.
4.1 Sociotechnical systems design

The 'sociotechnical systems' concept of work design originated in experiments at British coal mines during the 1940s. Subsequently adopted by motor industry.

1946 British coal industry doing poorly – frequent labour disputes and high absenteeism.

Eric Trist noted successful solution:

Autonomous work groups of miners that interchanged roles and shifts and managed themselves with little supervision.
Sociotechnical systems:

- Integrating social requirements of people doing the work with technical requirements to keep work viable.
Conventional way of designing a car production plant:
- Technical design comes first;
- Assembly line that allows only one social system: workers stay at fixed stations and perform same task;
- Repeat same task every 30 seconds.

Sociotechnical way:
- Involve workers in planning the new plant;
- Teams assemble entire subunits of a car from parts moved through the plant;
- Team members are free to move around, rotate jobs, and have longer cycle of work.

Advantages:
- Workers have more control over quality;
- If things go wrong, workers have a greater appreciation of the whole system and can give a flexible response.
5 Computers and Social Relationships

Home computers: studies show they reduce interactions (television more social).

Computer games: do they reduce opportunities for social interaction?

But games can be designed for sociability and cooperation.

And can result in 'flow experiences' (Csikszentmihalyi and Larson, 1984); high levels of concentration, rules of interaction, feedback, suspension of self-consciousness, and a sense of belonging to something larger than themselves.
Computer addiction?

Weizenbaum (1976) Computer Power and Human Reason

“Whenever computer centers have become established ..... Bright young men of dishevelled appearance, often with sunken glowing eyes, can be seen sitting at computer consoles, their arms tensed, and waiting to fire, their fingers already poised to strike at the buttons and keys on which their attention seems to be as riveted as a gambler’s on the rolling dice. When not so transfixed, they often sit at tables strewn with computer printouts over which they pore like possessed students of a cabalistic text. They work until they nearly drop, twenty, thirty hours at a time....... Their rumpled clothes, their unwashed and unshaven faces, and their uncombed hair all testify that they are oblivious to their bodies and to the world in which they move. They exist, or at least when so engaged only through and for the computers. These are computer bums, compulsive programmers. They are an international phenomenon.”
“there are few women hackers. This is a male world. Though hackers would deny that theirs is a macho culture, the preoccupation with winning and of subjecting oneself to increasingly violent tests makes their world peculiarly male in spirit, particularly unfriendly to women”
Internet addiction?

http://news.bbc.co.uk/1/hi/8551122.stm

2010: South Korean couple let their 3 month old baby starve to death whilst raising a virtual baby online.

12 hour sessions in internet cafe

"Online game addiction can blur the line between reality and the virtual world," Professor Kwak Dae-kyung of Seoul's Dongguk University told press. "It seems that taking care of their on-line game character erased any sense of guilt they may have had for neglecting their daughter."
5.1 Virtual communities:

- Computer-mediated communication

- Email has disadvantages - reduced human contact, open to misinterpretation, flame wars.
  - But can also have advantages
  - Interest and research in virtual communities; geographical closeness not required.
  - Can be used by disadvantaged and marginal groups (e.g. the homeless) for social and political change
  - But can also be used to strengthen unacceptable groups.
Social network systems

Good points

- Can strengthen and maintain friendships and relationships
- Can help with loneliness
- Dissemination of information
  - “Arab spring”
Social networking sites

Points of concern

Privacy
- Not clear what is visible to whom
- Third party violations of privacy

Surveillance
- Employers? Government? Future employers?
- Arab spring versus UK riots

Cyber-bullying, and stalking

Addiction
- Reduction in social contact
6 Summary

- Technological and social changes evolve together.

- Productivity pay-off of technology is disappointing.

- Technology is not causing mass unemployment. There is some short-term redundancy, which may be offset by redeployment and retraining in the longer term.

- Women are disproportionately affected by the exploitation of IT in the services sector of the economy.

- IT affects the quality of work, as well as the quantity of work (e.g. deskilling)

- Telecommuting offers benefits and disadvantages; the growth in home-working has not been as rapid as expected.

- Exploiting IT to the full requires new ways of thinking, working and managing.
7 Further Reading

This has been a brief foray into a large field of study. The following additional reading is recommended:


- Forester (1990) Computers in the human context. Blackwell. Particularly the chapters by:


- There is also a short section on social issues in one of the course texts, Ayres (1999).