Professional Issues

Lecture Notes

CONTENTS

Professional Issues Note 1

Arguments: General Rules (Chapter 1 of Weston)

- Conclusion: we should deploy more robots in healthcare (what you'd like to argue)
- Premises: the reasons why we want to draw this conclusion
    - Robots make fewer mistakes than humans
        - They don't get tired
        - They are more precise
    - You don't have to pay robots
- Arguments
    - We should deploy more robots in healthcare because they make fewer mistakes than humans (conclusion first)
        - They make fewer mistakes because they are more precise and do not get tired
        - We may be able to reduce the cost of healthcare provision because we do not need to pay robots (one-time cost)
    - Think if a reliable accurate robot doing your operation
        - So much better than a human and very cheap to employ
        - We should have more of them
- Premises
    - Are they reliable?
    - Looking at the premises is part of assessing how strong an argument is
        - Premise: you don't have to pay robots
            - Counter: robots have upkeep cost and initial cost
        - Premise: robots don't get tired
            - Counter: robots can wear out/fault
        - Premise: robots are more precise
            - Counter: no human intuition to make decisions that are not 'programmed in'/unexpected situations
    - Be concrete and concise
        - A surgical robot is a wonderful thing
            - It looks so clean and shiny and can cut to incredible accuracy
            - It seems like so much more of a reliable thing than a doctor who might be covered in germs
            - If we deploy them everyone will be much more content
        - Surgical robots can cut to micron accuracy and always operate to peak efficiency and are cheap to run and we should deploy more of them

Professional Issues Note 2

Digital Transformation

- IMF paper

  Digital platforms are recasting the relationships between customers, workers, and employers (doesn't say how they are recasting them) as the silicon chip's reach permeates almost everything we do - from buying groceries online to finding a partner on a dating website. As computing power improves dramatically and more and more people around the world participate in the world economy, we should think carefully about how to devise policies that will allow us to fully exploit the digital revolution's benefits while minimising job dislocation.

- OECD paper

  Digital technologies are transforming our lives and our economies. They change the way firms produce goods and services, innovate, and interact with other firms, workers, consumers and governments. These technologies seem to offer a vast potential to enhance firm productivity and ultimately living standards. For example, cloud computing gives firms access to flexible data storage and processing capacities, online platforms can make their interactions with consumers more fluid, and artificial intelligence enables them to automate increasingly complex tasks.

  - Concrete examples are given (unlike the IMF paper)

- WEF paper

  The world is being transformed by new technologies, which are redefining customer expectations, enabling businesses to meet these new expectations, and changing the way people live and work. Digital transformation, as this is commonly called, has immense potential to change consumer lives, create value for business and unlock broader societal benefits.

Professional Issues Note 3

Argument By Example

- Use more than one example and representatives
    - "The network is OK"
        - I can connect to it (but maybe that's because I am system admin)
    - "The network is OK"
        - I can connect to it
        - Jo who is a standard user can connect to it (there is nothing in their profile to distinguish them from other users)
        - Sam, a guest, can also connect to it (typical visitor with no special privileges)
    - Here the individuals are used as **representatives**
- Background Rates are Important
    - We guarantee to respond within 10 ms
    - But what is the distribution of responses from other suppliers?
    - This might sound good but it could be terrible
    - 'Relative' background rates, i.e. you have to know what's going on
    - E.g. Government spending given in money terms rather than rise and fall over
- We need to be careful with statistics
    - There are many examples where statistics are misinterpreted
    - *"One in three road accidents happen a mile from home, survey says"*
    - Look in the article: hitting parked cars was a majority of it
- Base Rate Fallacies

      Over half of car accidents occur within five miles of home, according to a report by a Progressive Insurance in 2002

    - You may recall having heard this statistic before, or something similar, and being surprised
        - After all, it only takes minutes of driving to travel five miles from home
        - How could an accident occur so quickly?
    - However, if you think through this statistic a little further, it's really not so shocking at all. How often do you drive more than five miles from home?
    - If you're like most of us, it's not an everyday occurrence (daily drive to work, etc)
        - It's no wonder most of our car accidents occur within five miles from home - that's where most of our driving occurs
    - They're neglecting the base rate of driving, false positives (e.g. mammogram), etc.
- Use counterexamples productively
    - If you can't find a counterexample, maybe it is hard for an opponent

- If you can find a counterexample - make your argument narrower
- Ask other people because they have different experiences from you
    - “All swans are white” because I’ve only seen white ones
    - “I’ve never experienced discrimination in Scotland so racism doesn’t happen in Scotland”

Professional Issues Note 4

Professions and Professionals

- The Bell Pottinger Case

Bell Pottinger was expelled on Monday from the UK's Public Relations and Communications Association (PRCA), which decided the campaign it ran for the Guptas - a family of Indian-born tycoons who are close to President Jacob Zuma - "was by any reasonable standard of judgement likely to inflame racial discord in South Africa".

South Africa's main opposition party, the Democratic Alliance (DA), had complained to the PCRA about the campaign, which portrayed opponents of President Zuma as agents of "white monopoly capital" and coined slogans referring to "economic apartheid".

- PCRA Code of Conduct
    - 2 Conduct towards the Public, the Media and other Professionals

A member shall:

2.1 Conduct their professional activities with proper regard to the public interest
2.2 Have a positive duty at all times to respect the truth and shall not disseminate false or misleading information knowingly or recklessly, and to use proper care to avoid doing so inadvertently
2.3 Have a duty to ensure that the actual interest of any organisation which they may be professionally concerned is adequately declared
2.4 When working in association with other professionals, identify and respect the codes of these professions and shall not knowingly be a party to any breach of such codes
2.5 If a member of either House of Parliament, member of a Local Authority or of any statutory organisation or body, record that material in relevant section of the PRCA Public Affairs and Lobbying Register
2.6 Honour confidences received or given in the course of professional activity
2.7 Neither propose nor undertake any action which would constitute an improper influence on organs of government, or on legislation, or on the media of communication
2.8 Neither offer nor give any inducement to persons holding public office or members of any statutory body or organisation who are not directors, executives or retained

consultants, with intent to further the interests of the organisation if such action is inconsistent with the public interest

- What is a profession?
    - Wikipedia: *"A profession is a vocation founded upon specialised educational training, the purpose of which is to supply disinterested counsel and service to others, for a direct and definite compensation, wholly apart from expectation of other business gain."*
    - Obligations of profession, might act against the interest of the company (e.g. whistleblowers)
- What is a profession?
    - *"To me, the essence of professionalism is a commitment to develop one's skills to the fullest and to apply [them] responsibly to the problems at hand. Professionalism requires adherence to the highest ethical standards of conduct and a willingness to subordinate narrow self-interest in pursuit of the more fundamental goal of public service."* -
        - Justice Sandra Day O'Connor (US Supreme Court)
    - "*Doing things right and doing the right thing."*
        - Chambers 20th Century Dictionary
    - *"An employment not mechanical and requiring some degree of learning; habitual employment; the collective body of persons engaged in any profession."* (Lawyers, doctors, architects, surveyors, accountants, engineers, etc.)
- Krishna's lessons for Arjuna ('professional warrior')
    - Think with a calm mind
    - Give up on results
    - Treat everyone equally
    - Don't give in to stress
    - Act with conviction
    - Set high standards
- The collective body
    - Controls entry to the profession
    - Self governing and self regulatory, in the sense that it establishes and enforces a code of conduct on its members
    - Established either by a Royal Charter or an Act of Parliament which defines the extent of its authority and requires it to undertake certain duties and responsibilities
- Professional bodies
    - Promote and set standards in education
        - Accredit courses (e.g. Professional Issues is by BCS)
    - Promote continuing personal development

    - Promote advancement of the subject
    - Promote exchange of knowledge
    - Give official advice
- USA: Engineer
    - More strictly applied
    - State licensing boards
    - Applying strict regulation to software engineers would cripple the sector
    - Due to a lot of civil engineering projects went wrong (e.g. bridges falling down)
- BCS Code of Conduct
    - Sets out the professional standards required by the Society as a condition of membership
    - Covers public interest, duty to relevant authority, duty to the profession, professional competence and integrity
- BCS Code of Good Practice (no longer maintained)
    - Describes standards of practice relating to contemporary demands found in IT
    - Covers practices common to all disciplines plus some specific to IT, business, education
    - As the discipline has grown a universal code of good practice is harder to state and maintain
- IFIP: no code of conduct
    - Trans-national regulations, e.g. GDPR
        - Attempts were criticised as being from the perspective of white well-off males
        - Instead it issued guidelines but left this to member organisations
        - E.g. on viruses: IFIP urges
            - Computer professionals to recognise the disastrous potential of viruses and not to distribute viruses knowingly
            - Educators to impress upon students the dangers of viruses
            - Publishers to refrain from publishing details of virus programs
            - Developers of virus detectors not to distribute viruses as tests
            - Resources to be devoted to R&D of protection mechanisms
            - Governments to make distribution an offence
- ACM Code of Ethics and Professional Practice
    - US version
    - Did not have one until a few years ago
- EU - FEANI
    - Mobility directives
        - Allow movement and professional recognition between countries
        - Federation Europeene d’Associations Nationales d’Ingenieurs

        - Members can use prefix Eur.Ing.
- Practices common to all Engineering Disciplines
    - Maintain your technical competence
    - Adhere to regulations
    - Act professionally as a specialist
    - Use appropriate methods and tools
    - Manage your workload efficiently
    - Participate maturely
    - Respect the interest of your customers
    - Promote good practices within the organisation
    - Represent the profession to the public
- Practices covered by the BCS
    - Information technology
    - Programme/project management
    - Relationship management
    - Security and safety
    - Change management
    - Quality
    - Business processes
    - Research and development

BCS Code of Conduct

1. **Public Interest**

   You shall:

   - Have due regard for **public health, privacy, security** and wellbeing of others and the environment
   - Have due regard for the **legitimate rights of Third Parties**
   - Conduct your professional activities without **discrimination** on the grounds of sex, sexual orientation, marital status, nationality, colour, race, ethnic origin, religion, age or disability or of any other condition or requirement
   - Promote **equal access to the benefits of IT** and seek to promote the inclusion of all sectors in society wherever the opportunities arise

2. **Professional Competence and Integrity**

   You shall:

   - Only undertake to do work or provide a service that is **within your professional competence**
   - Not claim any level of competence that you do not possess
   - **Develop your professional knowledge, skills and competence** on a continuing basis, maintaining awareness of technological developments, procedures, and standards that are relevant to your field
   - Ensure that you have the knowledge and understanding of **Legislation** and that you will comply with such Legislation, in carrying out your professional responsibilities
   - **Respect and value alternative viewpoints** and seek, accept, and offer honest criticism of work
   - **Avoid injuring others**, their property, reputation, or employment by false or malicious or negligent action or inaction
   - Reject and will not make any offer of **bribery or unethical inducement**

3. **Duty to Relevant Authority**

   You shall:

   - Carry out your professional responsibilities with due care and **diligence** in accordance with the Relevant Authority's requirements whilst **exercising your professional judgement** at all times
   - Seek to avoid any situation that may give rise to a **conflict of interest** between you and your Relevant Authority
   - Accept **professional responsibility** for your work and for the work of colleagues who are defined in a given context as working under your supervision

- **NOT disclose or authorise to be disclosed**, or use for personal gain or to benefit a third party, confidential information except with the permission of your Relevant Authority, or as required by Legislation
- **NOT misrepresent or withhold information** on the performance of products, systems, or services (unless lawfully bound by a duty of confidentiality not to disclose such information), or take advantage of the lack of relevant knowledge or inexperience of others

4. Duty to the Profession

You shall:

- Accept your personal duty to **uphold the reputation of the profession** and not take any action which could bring the profession into disrepute
- **Seek to improve professional standards** through participation in their development, use and enforcement
- **Uphold the reputation and good standing of BCS,** the Chartered Institute for IT
- **Act with integrity and respect in your professional relationships** with all members of BCS and with members of other professions with whom you work in a professional capacity
- **Notify BCS if convicted of a criminal offence or upon becoming bankrupt or disqualified as a Company Director** and in each case give details of the relevant jurisdiction
- **Encourage and support** fellow members in their professional development

Professional Issues Note 5

Digital Divide and Digital Harms

- What's the problem with some people not being online?
    - 'Data Society' brings new factors to social exclusions and new harms
    - Policy domains
        - Social and employment policy
            - Unemployment
            - Social cohesion
            - Immigration
        - Education policy
        - Cultural policy
        - Health policy
        - Industrial policy
            - Skilled workforce
            - Consumer market
            - New industrial sector growth
- Folk Theory: Digital Natives
    - Digital native - a person that grows up in the digital age, rather than acquiring familiarity with digital systems as an adult, as a digital immigrant
- Are differences in access, skills and use a policy problem?
    - 1990s
        - Information society vision empowerment
        - Technical fix for economy and society
        - New routes to employment, education, and health
            - Information society policy
            - Information superhighway
        - Critique:
            - Some people not joining in the new economy
            - People will be left behind or excluded
                - Will not be workers or consumers in the digital economy
                - Will not be able to access public services online
            - 1990s digital divide
                - An individual exclusion problem
                - A national policy problem
                - Continues today, e.g. AI and robots taking jobs
- Group exclusion: Women and the IT labour market
    - Women are a minority in many 'IT' jobs
        - Very low participation of women in engineering and IT professions, especially in the West

    - Girls do not engage with IT as much as boys: lack of interest and basic skills
    - Exclusion from best jobs
    - Not part of the 'Creation of the Digital Future'
    - But...
        - High in far east
        - Media starts to dominate and female dominated professions
        - Women in the network society question
- Levitas et. al

  Social exclusion is a complex and multi-dimensional process. It involves the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole
- Social exclusion
    - We are the unequal but free agents with opportunity
    - Dimensions
        - No access to work/labour market (economics)
        - Consumer (participation and culture)
        - Identity (culture)
        - Community (social)
        - Citizenship (politics)
    - Issues
        - Relative in society
        - Role of personal agency
        - Dynamic and fluid
        - Individual, family or community
    - Excluded groups
        - Disabled, ethic minorities, immigrants, religious groups, 'women', homeless
        - Not just the poor vs working class
- Bristol social exclusion matrix (at risk: 1 or more, social exclusion: 3 or more)
    - Resources
        - Material/economic resources (income from work, access to free/cheap stuff)
        - Access to public and private services (online only services, booking, discovery)
        - Social resources (support, community)
    - Participation
        - Economic participation (access to work - finding work, skills, personal pricing)
        - Social participation (exclusion from social networks, communities)
        - Culture, education and skills (education, cyberculture)
        - Political and civic participation (community, media, issue groups, campaigning)
    - Quality of life

        - Health and well-being (health info, wellness tools, community support)
        - Living environment (social sorting and filtering)
        - Crime, harm and criminalisation (new forms of crime, e.g. phishing, identity theft)
- Daily Telegraph headline 2017: Fraud and cyber crime are now the country's most common offences
- Internet users' concerns: child exploitation, scams, strangers contacting children, processing personal data without consent, bullying, hacking, loss of privacy
- Online security measures not performed by older generations
- Why people are not going online
    - No physical access
    - Low resources (time, money, experience, social network for support, and community)
    - No relevant content and services
    - Poor literacy and skills
        - Basic literacy
        - Information age literacy
    - Low personal motivation
        - Social and individual issues
        - Life stage
            - E.g. identity
    - Local exclusion
- Early academic analysis
    - Individual gap model
    - Primarily needs to be addressed at individual level
    - Some identification of community for provision of services to close gaps
    - Taken for granted that being online is important
- Three levels/ages of 'Digital Divide' analysis
    - Level 1: binary of internet access/non-access explained by economic resources, local connectivity
    - Level 2: included skills and engagement, attitude, relevant content
    - Level 3: focuses on inequalities in outcomes from internet skills, access, platforms, services, etc.
- Exclusion and inclusion by design
    - Excluded by product/service design
            - Feminist studies of technology design
            - Human computer interaction research
        - Hardware design and user interface
        - Software and system design algorithmic models
        - User understanding of the interaction and system logic
        - User understanding of how other people and organisations are using the systems
    - Excluded by policy/socio-technical system design

        - E.g. 2010s exclusion by data and algorithm welfare system design
- New harms: the data poor and data justice
    - We are increasingly living in a world where opportunities and decisions are being made that impact us based on data held by corporations and governments
    - What we are offered, and the prices we are offered on e-commerce is calculated individually based on a marketing profile
        - Older rural people and Apple device owners can be shown higher prices
    - If you are not able to provide data to social security systems in a correct form and timely manner you are deprived of benefits ('I Daniel Blake'; Virginia Eubanks - Automating Inequality)
    - Recruitment to jobs is largely handled by screening algorithms that you need to know how to match, and may use the information you have no control over
    - Access to financial credit shaped by your credit score - now being extended to use more data and used beyond
- Two forms of data poverty
    - **Too much data** held on you by organisations that can have a considerable impact on your life, where you have little control (agency) over that data (registered refugees, people on benefits, the lock term sick) i.e. the most vulnerable
    - **The data invisible**, i.e. there is no data held about you, you are not on required databases, therefore you do not have a credit score (30% of the US population), can be excluded from work, housing, study, health for 'not existing' digitally
- Increases in precarious working
    - Growing fear that low paid work is becoming increasingly precarious
        - Zero hour contracts
        - Working as 'self employed' via online work exchanges and employment platforms (e.g. Uber, Deliveroo, Upwork, AMT, and many more)
        - No benefits, sick pay, no guaranteed hours, no training, low pay and insecure income - all key factors in social exclusion and poverty
    - Typical of a great deal of 'data economy' work
        - Including unpleasant work content monitoring
    - Adopted in low-level service work - delivery, home care, etc.
- Policy responses
    - "Design for all"
        - User-centred design
        - Keyboard, GUI, touch screen, metaphors
        - 'Privacy by design'
    - Digital inclusion policies
        - Access, skills, and accessibility policy
    - "Algorithm activism"
- What should and can policy do?

    - Whose responsibility is the 'digital citizen'? Individuals, families, companies that provide services, NGOs, government
    - Who should the government be responsible for? What - digital welfare
    - What things are better done collectively?
    - When are individuals, organisations and policy makers failing?

- How might these different interpretations lead to different policy interventions?
    - Passive: Rely on S-curve
        - Market will supply
        - New easier cheap tech will be developed (advertising funded)
        - Mobile brings everyone internet
        - Young people will get older, non-using old people will die
        - Young people will help old people
        - There are so many problems, people don't have enough food, crime is up, why should the government spend money on this?
    - BUT
        - Not just about cost of access
        - Business does not address social excluded/poor - no money
        - Need to ensure network infrastructure is built
        - People need to learn skills, and change attitudes, not just get access
        - People need local or warm expert support
        - Lots of bad stuff is happening that is hard for individuals to cope with
        - Problem: a policy area without a home (distributed problem)
- Active policy approaches
    - Policy levers: awareness, coordination, regulation, leadership, subsidy, tax, standards, R&D
    - Ensure affordable and accessible internet and computers
    - Ensure training and skills development
    - Build confidence in the internet
    - Support content and services
    - Partnerships for implementation
        - NGOs (e.g. Telecentres)
        - Schools (curricula)
        - Support national and local experts - change agents (digital champions)
        - Government-industry partnerships

Professional Issues Note 6

Analogy and Authority

- Two things are similar in some respects, so they are similar in all (or most) respects
    - Hotel booking systems have proved to be very effective in booking hotel rooms
    - Hotel booking and seat booking for events is very similar
        - But event booking have peaks, hotels have small peaks (e.g. holidays) but relatively constant
    - Analogies are useful, but they require **relevantly** similar examples
- Authority
    - Example: singularity is going to happen, i.e. machines are going to be smarter than us
    - Cite your sources (cite your authority and some documents to back them up)
    - Seek informed sources (are they referred by other authoritative sources? How is the source reviewed by other people?)
    - Seek impartial sources (potential conflict of interest with the impartiality of the expert? Personal benefit?)
    - Cross-check sources (not wise to depend on a single expert)
    - Build your internet savvy (is there a consensus across experts? Do not depend on single expert!)

Professional Issues Note 7

Privacy, Security, and Legitimate Rights

Law

- Separation of Powers
    - Executive: government (e.g. the home office controls policing and implements)
    - Legislature: parliament - makes law
    - Judiciary: court systems - decides cases
    - The developed administrations have similar structures
        - E.g. in Scotland Scots Law differs fundamentally from English Law
- Law making
    - Green paper - consults
    - White paper - advocates
    - Bill - proposes
    - Act - enacts (first reading, second reading and third reading)
- Criminal law
    - Relates to offences and breaches that negatively affect society as a whole, rather tahn just one person
        - Burglary, theft, arson, and criminal damage
        - Assault, sexual assault and battery
        - Murder
        - Fraud, money laundering and drug dealing
- Civil law
    - Rights and property of individual people or organisations
    - Settles disputes between individuals and organisations
    - No one is sent to prison but may be left out of pocket if liable
    - Examples
        - Family disputes, e.g. divorce, childcare arrangements
        - Personal injury cases, such as road traffic accidents, medical and clinical negligence and slips, trips, and falls
        - Breach of contract or promise, such as cases where money is unpaid or a contract isn't honored
        - Employment law, for example where an employee suffers discrimination
- Criminal law seeks to punish for an offence, civil law seeks to achieve a remedy (e.g. compensation) for the injured party
- Criminal law (state vs. somebody), civil law (party A vs. party B)

Proof

- In civil cases, the **burden of proof** (duty to produce sufficient evidence to support an allegation or argument) lies with the **plaintiff** (person bringing the case)
- The **standard of proof** is preponderance of evidence

- In criminal cases the burden of proof is within the **prosecution** (usually the crown)
- The standard of proof is to establish guilt beyond reasonable doubt

Common and Statute Law

- **Common Law** is that body of law derived from judicial decisions of courts and similar tribunals (i.e. collected wisdom, looking at the pattern of decisions)
- **Tort** in common law jurisdictions, is a civil wrong that causes a claimant to suffer loss or harm resulting in legal liability for the person who committed the tortious act
- **Statute Law** is one that has been codified by the legislature rather than arising from the practice of courts

Privacy

- Scotland
    - Privacy and Electronic Communications Regulations (PECR)
    - Human Rights ACt Section 1(2)
    - Protection from Harassment Act 1997
    - Scots law in confidentiality
    - GDPR in 2018
- England
    - No overarching cause of action for 'invasion of privacy'
    - However, the European Convention on Human Rights (ECHR) has been implemented into domestic law by the Human Rights Act 1998
- European convention of human rights
    - Privacy (Article 8)
    - Freedom of expression (Article 10)
    - Tension between the two
        - E.g. Naomi Cambell photographed leaving rehabilitation (Naomi's privacy vs. Media's freedom of expression)
        - E.g. Edward Snowden flew to Hong Kong after leaving his job as an NSA facility in Hawaii, and in early June he revealed thousands of classified NSA documents to journalists and fueled debates over mass surveillance, government secrecy, and the balance between national security and information privacy
            - US response
                - Snowden caused tremendous damage to national security
                - Not a whistleblower
                - Snowden might have had grievance towards past employers

Professional Issues Note 8

Equality Act 2010

- Applicable to
    - Associations, clubs and societies
    - Businesses
    - Criminal and civil justice
    - Health and social care
    - Criminal and civil justice systems and national security
    - Local council and central government and immigration
    - Parliaments, politicians and political parties
    - Voluntary and community sector organisations, including charities
- Who is protected? (Protection from unlawful discrimination)
    - Age
    - Disability
    - Gender reassignment
    - Pregnancy and maternity (includes breastfeeding)
    - Race
    - Religion and belief
    - Sex
    - Sexual orientation
- Discrimination
    - An individual or organisation that provides services to the public must not treat someone **worse** just because of one or more **protected characteristics** (this is called **direct discrimination**)
        - However, in the case of direct age-discrimination, this will be permissible if a service provider can show that what it has done is **objectively justified**
        - Examples
            - A shop will not serve someone because of ethnic origin
            - A night club charges a higher price for men to enter
    - An organisation must not do something to someone in a way that has a worse impact on them and other people who share a particular protected characteristic than it has on people who do not share that characteristic
        - Unless the organisation can show that what they have done is **objectively justified**, this will be what is called **indirect discrimination**. 'Doing something' can include making a decision, or applying a rule or way of doing things
        - Examples
            - A shop decides to apply a 'no hats or other headgear' rule to customers to prevent theft. If this rule is applied in exactly the same way to every customer, Sikhs, Jews, Muslims and others who may cover their heads as part of their

religion will not be able to use the shop. Unless the shop can **objectively justify** using the rule, this will be indirect discrimination.

- Victimisation
    - A service provider must not treat someone badly or victimise them because they have complained about discrimination or helped someone else complain, or done anything to uphold their own or someone else's equality law rights
    - The provisions relating to association, perception and victimisation can apply to anyone, even if they do not have the relevant protected characteristic themselves
        - Example
            - A customer complains that a member of staff in a cafe told his friend that she was not allowed to breastfeed her baby except in the toilets. Because he has complained, the cafe tells him he is barred altogether.
- Harassment
    - A service provider must not harass someone
        - Example
            - A member of staff in a night club is verbally abusive to a customer in relation to a protected characteristic
- Disability
    - Service providers must not treat disabled people unfavourable because of something connected to their disability where they cannot show that what they are doing is objectively justified
    - Example
        - No dogs rule - blind people who need assistance dogs
        - A bank asks a customer to come to the bank the next day to discuss an unauthorised overdraft, but the customer said she is low and anxious and nervous to leave the house and asks if she can move the appointment to next week so she can see her mental health nurse. This is enough to provide the bank with knowledge of the customer's disability and it might be a reasonable adjustment to move the appointment
    - Reasonable adjustments
        - Equality law recognises that bringing about equality for disabled people may mean changing the way in which services are delivered, providing extra equipment and/or them removal of **physical barriers**
        - This is the duty to make reasonable adjustments
            - Aims to make sure that a disabled person can use a service as close as it is reasonable possible to get to the standard usually offered to non-disabled people
            - When the duty arises, a service provider is under a positive and proactive duty to take steps to remove or prevent these obstacles
        - Example: shops to introduce disability equality training
    - Reasonable adjustments can be

        - A change in provision, criterion or practice - this changes the rules to eliminate a disability discrimination
        - Overcoming physical features of the environment, e.g. step-free access, high light levels, signage adapted to visually impaired people
        - Providing auxiliary aids or services that help the disabled persons make use of a service
- ICT example
    - A credit ratings agency has a very large collection of data that it uses to provide a credit-worthiness score for individuals based on their past history of repaying loans. People who do not borrow get very low scores because they have no history.
        - Who might this discriminate against? Young people (age)
        - Is it direct or indirect? Indirect
    - A bank decides that it wants to move its entire retail banking operation online and does this by introducing a new iPhone and Android app.
        - Who might be in difficulties with this move? Blind people, the elderly, people without internet
        - Is it discrimination? Yes
        - What would you do to accommodate these groups? UI/UX designers use gloves to mimic mobility of old people
- Requirements of Information Society Service Providers (ISSP)
    - They do not allow discriminatory advertisements and information to appear on their website (whatever the advertisement is for)
    - They do not accept requests for the placing of information that unlawfully discriminates against people because of a protected characteristic in using a service
    - They make reasonable adjustments to make sure that their website is accessible to disabled people
- Websites reasonable adjustments
    - Text to speech software
    - Must think in advance about what people with a range of impairments might reasonably need
    - Must make website as fully accessible to as many people as possible
- Public sector equality duty
    - Public sector employers must have what the law calls ‘due regard’ to the need to eliminate the types of conduct which are prohibited under the Equality Act 2010
    - They should advance equality of opportunity and foster good relations between those who have particular protected characteristics and those who don’t
    - This is called the **public sector equality duty**; other bodies who carry out public functions on behalf of public authorities also have to comply with the public sector equality duty, in relation to those particular functions

Professional Issues Note 9

Equality and ICT Professionals

- Types of activity Prohibited
    - Discrimination
        - Direct: denial of service based on the protected characteristic
        - Indirect: action/measure that has a discriminatory effect based on the protected characteristic
    - Harassment: unacceptable treatment on the basis of a protected characteristic
    - Victimisation: unacceptable treatment of someone intervening to assert the rights of an individual under the equality act
- Age
    - Issues: age related loss of hearing? How could this affect an ICT professional?
        - Building meeting software or lecture closed captioning (CC)
- Disability
    - Issues: manual dexterity (UI designers to use gloves), vision (text to braille, text to speech), hearing (volume adjustments, closed-captioning), cognitive capacity (reduce complexity of systems)
- Gender reassignment
    - Having male/female/prefer not to say option
- Pregnancy and maternity
    - Advertising baby-related products to a woman (based on her previous buying behaviour) who just had a miscarriage can be deemed as harassment
- Race
    - Issues in language: no translation for a certain language/dialect for a website/system
    - Issues in data: advertising to only a particular race, data used to train algorithms is bias, sentencing to african-americans more severe than others
- Religion and belief
    - Email calendars only includes popular religious holidays
- Sex
    - Issues in language: gender-neutral pronouns
    - Issues in data: data collection are biased against women
- Sexual orientation

Professional Issues Note 10

Arguments 4: Causes

- Causal arguments start with correlations
    - Example: people who write successful computer programs are often male, therefore male are great programmers
- Correlations may have alternative explanations
- Work towards the most likely explanation
    - E.g. girls in high school did not take computing in high school
- Expect complexity
    - It is rarely the case that there are single causes
        - For the women in computing case, there are several factors:
            - Social conditioning into typical ‘female’ roles
            - Women disliking employment where they are surrounded by men
            - Schools failing to recruit women into the relevant qualifications
            - Gender bias in recruitment
            - Role models in advertising

Professional Issues Note 11

Standards

- What are standards for?
    - A standard typically establishes a criteria or processes that should be followed in order that a particular product or service can be sold in a sector
    - Focus on international standards but most countries have internal organisations (e.g. BSI in UK, DIN in Germany)
    - There are a variety of standards organisations that operate internationally (e.g. ISO, IEC, ITU)
    - Some standards are ‘generic’ and span many sectors but inside each sector there can be quite elaborate standards structures
- What do standards do?
    - Promote industrial and market efficiency
        - Provide a ‘level playing field’ for companies to compete on
        - Companies cannot compete unfairly by producing inferior products/services that do not meet the standard
    - Foster international trade
        - Internationally agreed standards supports international trade
            - Accepted in all countries that agree to the standard
    - Lower barriers to market entry
        - Build markets around the agreed standards
        - Makes it easier for entrants to gain funding to develop services/products and starts to build tools and techniques to build products/services to standard
    - Diffuse new technologies
        - De-risks the purchaser
            - There are alternate products/services and suppliers that fulfill the role of the new technology
    - Protect human safety/security and the environment
        - By ensuring products and services are not harmful to humans or the environment
        - Often involves balancing cost against the level of harm
- ISO 9001:2015 - Ageneric Standard
    - ISO: International Organisation for Standardisation
    - 160 member National Standards Organisations
    - Some key standards:
        - ISO 9001: Quality Management Systems (QMS)
        - ISO 14001: Environmental Management Systems (EMS)
        - ISO 27001: Information Security Management Systems (ISMS)
    - ISO 9001

    - International consensus on good practice; focuses on meeting customer requirements and other stakeholders; places requirements on organisations; covers any organisation regardless of size, sector, culture, etc.
- ISO 9001:2015 in operation
    - Sets goals for WHAT must be achieved
    - Standards are more prescriptive (does not say HOW to achieve these goals)
    - QMSs will vary significantly across organisations
    - Is a tool for management to manage quality effectively
    - QMS that comply with ISO 9001 are often preferred or mandated when other organisations procure products or commission services. In particular if the procuring organisation is ISO 9001 compliant this will require compliance in suppliers (this can be a significant competitive advantage).

Professional Issues Note 12

Information Privacy, Accountability and Ethics

- Accountability
    - GDPR, Article 5(2): 'The controller shall be responsible for, and be able to demonstrate compliance with [the data protection protection principles in] paragraph 1 ('accountability')'
    - GDPR, Recital 85: 'As soon as the controller becomes aware that a personal data breach has occurred, the controller should notify the personal data breach to the supervisory authority… unless the controller is able to demonstrate, in accordance with the accountability principle, that the personal data breach is unlikely to result in a risk to the rights and freedoms of natural persons.'
    - Main takeaway: accountability involves (at least) demonstrating something
- What is accountability about?
    - Reporting (stories, narratives) about substantive actions (accountability for what?)
        - Functions, performance, events (e.g. data processing, data breaches, data sharing)
    - Relationships (accountability to whom?)
        - Within organisation
        - Outside organisation (agents, customer, society)
    - Procedural; GDPR's 'demonstration' (how is accountability done?)
        - Communications, documents, reports
- Consider substance
    - Compliance with privacy/data protection law is very important
    - Is the data controller's processing of personal data (the act/performance) ethical?
        - Need to specify criteria for judging 'good', 'bad', 'right'
        - Rules? Principles? 'Contextual norms'
    - Ethical quality of act/performance of data processing
        - If there are shortcomings, what are the reasons?
            - Many interests
            - Many motives
            - Counter-pressures against ethical performance
    - If performance is ethically dubious, stories cannot clean it up
- Consider stories
    - Ethical quality of story about data-processing performance
        - Honesty, truthfulness, fidelity to rules of accounting
        - No secrecy
        - No spin
        - 'Genuine' equality-based relationship between account-giver and audience
        - Willingness to admit error
    - Acceptance of need
        - To report

        - For transparency and openness
        - For dialogue (don't give a story and run away)
    - Ethical value
        - Formal respect for rights, needs, interests of others
        - Extra-legal and human civility
    - Could say 'here is how i fell short substantively (e.g. in protecting your privacy), but I am transparent about that'
        - This is procedurally but not substantively ethical unless it leads to improved performance
        - It is about confession (and maybe about apology); shame and guilt
        - It is open to criticism about persuasion
- Persuasion
    - Aim of explaining substantive performance in privacy-protective processing, or of putting the performance in a good light, is to convince you
        - But could be propaganda, manipulation, rhetorical skill, misinformation, disinformation, incomplete, bullsh*t
    - You then evaluate the validity of the explanation
        - But your acceptance could reflect
            - Your gullibility
            - Your lack of information
            - Your lack of ways to evaluate it
            - Your desire for the goods or services
            - A culture of preparedness to forgive ethical failure
- Data Controller's Accountability to YOU
    - With reference to your interest/stake
        - As a customer
        - As a citizen
    - For the ethics of the substantive data-processing performance
    - For the ethics of the storytelling about it
- Data Controller's Accountability to the Society
    - For the ethics of the substantive performance as a data processor
    - For the ethics of the storytelling about it
    - Why?
        - Because society, not just you, depends on the robustness of those two cultures, which have to do with the ethics of actions as well as the truth
    - What does this suggest?
        - Information privacy and other rights and values is a common, social and public good not only an individual right
        - Society has a stake in truth, truthfulness, trust, trustworthiness

        - Therefore society has an interest in the substantive performance and the storytelling
    - Story about the data processing must be open to inspection, rebuttal, and dialogue by everyone
    - All should be entitled to inform and decide to reject or accept the story, and to debate with data controller
    - All might have other information, interpretations, or insight about data controller's honesty, performance, account
    - You and others could therefore give an alternative story, to be debated alongside data controller's
- Data Controller's Motives for Ethical Substantive and Procedural Performance
    - Easier, cheaper
    - Reputation-building and maintenance
    - Reduce likelihood of being found out
    - 'Honesty is the best policy'
    - 'Dishonesty doesn't pay'
    - But what if it did 'pay'?
        - Data controller can get away with it
        - No one cares what data controller does or says
        - Social, legal or ethical institutions are weak
- Accountability Project: Enter Values and Ethics
    - GDPR incorporates ethical principles, related to 'fairness', 'transparency' and 'accountability', but their prominence, explicitness and clarity are intermittent and fragmentary across various Recitals and Articles
    - A prominent accountability project now talks more explicitly about values and ethics as a foundation for the development of practical processes
    - Context: 'big data'
    - This bears further investigation
- The five key values of the unified ethical frame (based on the Big Data Ethics Project)
    - Beneficial - benefit the society as a whole
    - Progressive - fewer risks
    - Sustainable over reasonable time frame
    - Respectful of all the interest of all the parties
    - Fair
- Precedents and parallels
    - Big data analytics and accountability are discussed regarding the public sector and regulatory regimes
    - Information or surveillance ethics have been looked at long before now
    - Today's accountability/ethical projects could compare and learn
    - Principles-based approaches are part of this
        - Legislation typically lags behind technological advancement

        - Legislation is loosely followed/enforced
- So what is ethics about?
    - Good and bad
    - Human rights
    - Right and wrong conduct; standards for judging these (moral principles; normative)
    - Duty/obligation ('ought')
    - Inherent morality or consequentialism
    - Absolute or relative
    - Procedural or substantive
    - Applied (e.g. business/professional)
- Ethics in the accountability debate
    - '[A] reasoned articulation of what is right and wrong include[s] principled arguments for how to produce good (and avoid bad) results. This… is necessary to maintain a cohesive society in a world with an unimaginable array of decisions, actions, and judgements. Looking at various formulations of ethics from a diverse set of cultures provides evidence that there… needs to be, different approaches based on cultural context that arrive at the same outcome.'
        - Information Accountability Foundation, *Artificial Intelligence, Ethics and Enhanced Data Stewardship*, September 20, 2017
    - Consequentialist ethics
        - Focuses on the expected outcome of various decisions, conducting a moral calculation that maximizes the benefits and minimizes harms on the various stakeholders impacted
    - Non-consequentialist ethics
        - Focuses on the actor's intent and duty, setting forth imperatives that a decision or action must satisfy for it to be deemed moral
    - Virtue ethics
        - A specific set of characteristics, or virtues, that individuals attempt to cultivate in order to guide moral decision making
    - Eastern ethical constructs
        - Social harmony, where the benefits of the society can trump the benefits for the individual, is stressed

Professional Issues Note 13

DO-178C

- DO-178C
    - Sequential processes
        - Planning
        - Development
        - Verification
        - Submittal
    - Integral processes (keep going along all the time)
        - Software quality assurance
        - Configuration management
        - Certification liaison
- DO-178C planning
    - The primary planning documents
        - The Plan for Software Aspects of Certification (PSAC)
        - Software Development Plan (SDP)
        - Software Verification Plan (SVP)
        - Software Configuration Management Plan (SCMP)
        - Software Quality Assurance Plan (SQAP)
    - Other planning activities
        - Lifecycle Environment Planning
        - Software Development Standards
            - Coding
            - Requirements
- DO-178C Development
    - The primary development phases
        - Requirements (code to requirement one-to-one mapping)
        - Design
        - Coding
        - Integration
        - Traceability (explain why things are there based on requirement)
- DO-178C Verification
    - The Verification Process
        - Reviews and Analysis
            - Requirements/Code/Tests
        - Software Test
            - Test environment
            - Normal range
            - Robustness

        - Test coverage analysis
            - Requirement coverage
            - Structural coverage
- FAA stages of involvement (SOI)
    - Planning review
    - Development review
    - Verification review
    - Final review
- DO-178C Supplement Documents
    - DO-248C Supporting Information for DO-178C and DO-278A
    - DO-330 Software Tool Qualification Considerations
    - DO-331 Model-Based Development and Verification Supplement to DO-178C and DO-278A
    - DO-332 Object-Oriented Technology and Related Techniques Supplement to DO-178C and DO-278A
    - DO-333 Formal Methods to Supplement to DO-178C and DO-278A

Professional Issues Note 14

Functional Safety Overview

- Standards for process control
    - Example: UL 991 (2004), “Tests for Safety-Related Controls Employing Solid-State Devices”
- Demand drivers for functional safety
    - A functional safety assessment determines whether your products meet standards and performance requirements created to protect against potential risks, including injuries and even death
    - Compliance is driven by customer requirements, legislation, regulations and insurance demands
- What is functional safety?
    - IEC 61508: part of the overall safety relating to the EUC and the EUC control system that depends on the correct functioning of the E/E/PE safety-related systems and other risk reduction measures
    - IEC 61508: A standard in seven parts
        1. General requirements that are applicable to all parts
            - System safety requirements
            - Documentation and safety assessment
        2. Additional and specific requirements for E/E/PE safety-related systems
            - System design requirements
            - Software design requirements
        3. Additional and specific requirements for E/E/PE safety-related systems
            - System design requirements
            - Software design requirements
        4. Definitions and abbreviations
        5. Guidelines and examples for part 1 in determining safety integrity levels
        6. Guidelines on the application of parts 2 and 3
            - Calculations, modeling, analysis
        7. Techniques and measures to be used
            - To control and avoid faults
    - EUC + EUC control system: fairground rides, manufacturing robots, large-scale press for aluminium/steel, petroleum plant
- Why is there something called functional safety?
    - Emerged recently with the advancement of complex programmable electronics: we can do much more than what we can do before
- Functional safety as per IEC 61508
    - Mandates an overall safety approach, could also be referred to as a system safety approach or holistic approach (accounts also for the whole life cycle of a system)

Professional Issues Note 15

Data Protection (1998 Act)

- Motivation for the DPA
    - To protect individuals from:
        - The use of inaccurate, incomplete or irrelevant personal information
        - The use of personal information by unauthorised people
        - The use of personal information for purposes other than the purpose for which it was gathered
        - Also some sensitivity to transborder data flows and the need to avoid data havens in unregulated jurisdictions
    - Rough timeline:
        - Concerns surface in the 1970s (Lindop report more or less says 'free text systems should not be used')
        - First act in 1984 - protect people from misuse of data by organisations
        - European directive on Data Protection 1995 - protection from misuse of data on the internet
        - Revised act repeals the first act in 1998 - balancing freedom to process against personal privacy
- Definitions
    - Data: information in electronic or manual form
    - Data subject: individual who is the subject of the personal data
    - Personal data: expression of opinion, or fact, email addresses, photos, video footage, new category of sensitive data (e.g. ethnic origin, trade union membership)
    - Data controller: determines why or how personal data is processed
    - Processing: reviewing, holding, sorting, deleting, correlating, modifying, etc
    - Relevant filing system: readily accessible information about living individuals
    - Information commissioner: new name for data protection registrar
- New Provisions in the 1998 Act
    - Broader than the old act to comply with European requirements and new threats
    - Strengthened rights for data subjects
    - Extended to cover manual filing systems
    - Sensitive data is a new category and has stronger processing requirements
    - Rules about export of data to non-EEA countries
- **DPA Principle 1**
    - Non-sensitive personal data must be processed fairly and lawfully and shall not be processed unless one of the below is met
        - Consent - most important
        - Contract
        - Legal obligation

        - Vital interests of subject (life or death!)
        - Public functions
        - Balance of interest
    - Sensitive personal data
        - Racial or ethnic origin
        - Political opinions
        - Religions/similar beliefs
        - Trade union membership
        - Health
        - Sexual life
        - Offences
    - Sensitive personal data can only be held if one of the below is met:
        - Explicit and informed consent
        - Employment law
        - Vital interests of subject
        - Legal proceedings
        - Medical purposes (by medical professionals)
        - Equal opportunities monitoring
    - Consent: "Freely given specific and informed indication of wishes by which the data subject signifies agreement to personal data relating to him/her being processed."
        - Can't use implied consent - must get forms back
        - Can't use blanket consent as a condition of entry
    - Fair processing
        - Must not intentionally or otherwise deceive or mislead subject as to the purpose of data use/collection
        - Must identify to subject data controller/nominated representative
        - Must identify to subject purpose of processing data
        - Exceptions are disproportionate effort (direct marketing not allowed) or legal obligation
- **DPA Principle 2**
    - Data must be obtained only for one or more specified lawful purposes and shall not be further processed in any manner incompatible with that purpose or purposes
        - Purposes are set quite broadly
        - Must not use data for a new incompatible purpose without subject's consent
        - Have a data protection statement that explains why data will be held and requesting consent in the case of sensitive personal data
        - The Information Commissioner must be notified by Data Controllers specifying what data will be collected and for what purpose

- **DPA Principle 3**
    - Personal data must be adequate, relevant and not excessive in relation to the purpose or purposes for which they are to be processed
        - Volume and type of data can only be justified in relation to the purposes registered with the Information Commissioner
- **DPA Principle 4**
    - Personal data shall be accurate and, where necessary, kept up to date
        - Data holdings must be under continuous review and policies need to be in place to delete old data
        - Issues about things like addresses for students
- **DPA Principle 5**
    - Personal data processed for any purpose or purposes shall not be kept for longer than is necessary for that purpose or purposes
        - Establish how long data needs to be retained. Some needs to be retained forever!
        - Ensure that such data is really erased (e.g. from dumps, backups, etc.)
- **DPA Principle 6**
    - Personal data must be processed in accordance with the rights of data subjects
        - This means that you cannot do things that violate the rights given to data subjects under the new act, especially denying access to data
    - Rights of data subjects
        - Must be informed if personal data are being processed and given a description of the personal data
        - Be informed of the purpose for which data is being held and processed
        - Must be informed of people or organisations to whom personal data might be disclosed
        - Be provided with an intelligible description of the specific data held about them
        - Be provided with a description of the source of personal data
        - May prevent processing for purposes of direct marketing
        - May prevent processing likely to cause damage and distress
        - Right to compensation in the case of damage caused by the processing of personal data in violation of the act.
        - Right to see the methods used to score the individual used by credit scoring agencies.
    - Access rights
        - Right to have communicated to him/her in an intelligible form the information constituting the data
        - No right to rifle through filing systems, computers etc.
        - Right to be informed of logic involved in automated processing.
        - Request must be in writing, fee up to £10 may be charged and identity may be thoroughly checked.
        - Data may be withheld if disclosure would disclose data about a third party unless:

        - Third party has consented to disclosure
        - It is reasonable to comply without the third party's consent
        - Duty of confidentiality, steps taken to seek consent, express refusal of third party
        - Witnesses, confidential reports, access to references
    - Don't have to disclose references you have written but must disclose those you have received unless the writer explicitly asked them to be kept confidential
    - 40 days to comply (or state reason for refusal to comply) with requests
    - Don't need to comply with repeat requests until a reasonable amount of time has elapsed
    - Don't need to comply if disproportionate effort would be involved
    - Subject must provide reasonable data you request to assist in finding the data
- Enforced access
    - It is an offence to force subjects to exercise their access rights to data held by others
        - Includes data about cautions, criminal convictions and certain social security records
- Right to prevent processing
    - Unwarranted substantial damage or distress to subject
    - 21 days to comply with request
    - Exemption if processing is necessary for performance of contract with subject or there is a legal obligation, or the vital interests of the subject are at stake
- Exemptions to access rights
    - Prevention and detection of crime
    - Apprehension or prosecution of offenders
    - Collection of tax or other duty
    - Research, history, statistics
    - Exam marks - 40 days after the date of announcement or 5 months of access request
    - Confidential references
- **DPA Principle 7**
    - Appropriate technical or organisational measures shall be taken against unauthorised or unlawful processing of data against accidental loss, damage or destruction of personal data
        - Careful selection of IT staff
        - Appropriate backup policies
        - Use of passwords, encryption, etc.
        - Use of integrity checking

- **DPA Principle 8**
    - Personal data shall not be transferred to a country or territory outside the EEA unless that country or territory ensures an adequate level of protection for the rights and freedoms of data subjects in relation to the processing of personal data
        - Websites are problematic in terms of jurisdiction
- Notifying the Information Commissioner
    - Each legal entity intending to hold or process personal data must register with the Information Commissioner
    - The register is public
    - Penalties for failure to comply are substantial
    - The Information Commissioner has strong powers of search and seizure if violations of the DPA are suspected

Professional Issues Note 16

General Data Protection Regulation

- New features of the GDPR
    - Accountability measures: GDPR requires compliance and evidence of compliance
        - Documented policies and procedures
        - Records of consents, etc.
        - Registration with supervisory authorities (e.g. ICO) no longer required
            - Internal record-keeping obligations
            - Supervisory authorities can demand information, conduct audits, order remediation, etc.
    - Territorial scope (Article 3)
        - Extending to non-EU controllers and processors in some cases
        - 'One stop shop': organisations operating in multiple EU member states report to only one main supervisory authority
        - Consistency mechanism to promote harmonisation across EU member states and resolve cross-border issues
    - Amended definitions (Article 4)
        - Expanded definitions of 'personal data' and 'data subject' (catching more types of data and processing operations)
        - New definitions e.g. 'pseudonymisation' and 'profiling'
        - Consent will be more difficult to use as a legal basis
    - Direct statutory obligations (Articles 28, 30, 44-49, 33(2)) and liability (Article 82) on processors, and additional requirements regarding the minimum terms that must be included in personal data processing contracts (Article 28)
    - Tighter rules on international transfers, applicable to both controllers and processors
    - Requirement for data protection impact assessments before initiating certain types of processing or other processing operations likely to result in a high risk to individuals:
        - Must consider at least the issues specified by the Regulation (Article 35)
        - Consultation with the supervisory authority required in some circumstances (Article 36)
    - Controllers and processors required to appoint a data protection officer in certain circumstances (Articles 37-39)
    - Mechanisms for the purposes of demonstrating compliance with the regulation, involving codes of conduct (Articles 40-41) or certifications (Articles 42-43) approved under the Regulation for these purposes
    - Responses to a subject access request will have to be provided within a tighter timescale and free of charge (Article 12)
    - New data subject rights:
        - 'Right to be forgotten' or right to erasure (Article 17)
        - 'Data portability' (Article 20)

- Security breach notification
    - Mandatory 'personal data breach' notifications to the supervisory authority without undue delay (within 72 hours where feasible) (Article 33)
    - Personal data breach notifications to the data subject without undue delay where there is a high risk to their privacy (Article 34)
- The introduction of the Board (Section 3 - Articles 68-76) to replace the Article 29 Working Party, with an enhanced role and powers
- Harsher sanctions and a new framework for fimes (in two tiers), which will be substantially higher than under the DPA (Article 83)
    - DPA: the maximum fine is 500,000 GBP
    - GDPR: two tiers of administrative fines levied by supervisory authorities
        - Up to 20 million EUR or 4% of total worldwide turnover if higher
        - Up to 10 million EUR or 2% of total worldwide turnover if higher

The Freedom of Information Act 2000

- The FOI act 2000 gives individuals the right to access information about certain public bodies by two routes:
    - Publication scheme
    - General right of access
- Any member of the public can apply for access to information held by a public body
- The act has enforcement mechanisms if the body fails to release the information
- Main features:
    - General right of access by any member of the public
    - There are exemptions but disclosure can be forced on grounds of public interest
    - New office of the Information Commissioner with an Information Tribunal with powers to enforce rights of access
    - Public bodies must have a publication scheme that makes release of information routine
- FOI: Public Rights
    - To know whether relevant information exists: the duty to confirm or deny
    - To have the information released (and, where possible, in the manner requested)
    - To be provided with reasons for a decision to withhold information
    - All requests must be in 'permanent form'
    - Reply must be sent within 20 working days
- FOI: Publication Scheme
    - Guide to the information a public body is making available without the need for an FOI request
        - Relatively inexpensive and is a way of avoiding many FOI requests
        - Guide to types of information available, NOT a list of all of it!
    - Scheme has to be approved by the Information Commissioner
    - Model schemes available on the Information Commissioner's website

- FOI: Exemptions
    - Many exemptions, some absolute, some qualified:
        - Commercial interest (you don't have to explicitly say how you're planning to, for example, take over a company)
        - Communicating with the Queen
        - Law enforcement
        - Legal professional privilege (when you talk to a lawyer)
        - Parliamentary privilege (discussions within the congress)
    - Need to apply tests before using Qualified Exemptions
        - Prejudice and adverse effect
        - Public interest (not same as of interest to the public; is it of public interest to release this information?)
    - FOI does not override DPA but DPA is not an excuse not to comply with FOI requests
        - Data protection will often take priority
        - FOI requests may be partially fulfilled avoiding release of personal data
        - Public interest may allow release of personal data
- FOI: Vexatious or Repeated Requests
    - Vexations means:
        - Clearly does not have any serious purpose or value
        - Is designed to cause disruption or annoyance
        - Has the effect of harassing the public authority
        - Can otherwise fairly be characterised as obsessive or manifestly unreasonable
    - Repeated means:
        - More often than a 'reasonable interval'
        - Requests asking if previously requested information has changed are OK
            - Reply can say when information is next to be updated and a request before then would be 'repeated'
- FOI: Key points to note
    - Requests can be received by anyone within the organisation and do not need to refer to the Freedom of Information Act
    - Requests must be in writing (including email, fax, etc.)
    - Requests must be dealt within 20 working days
    - No obligation to provide information which is already in the public domain/accessible by other means (e.g. via the publication scheme or in a book the organisation may hold)
    - No obligation to create information that the organisation does not already hold (e.g. statistical summaries)
    - Organisation may charge a fee for the provision of information
        - Charges must be calculated in accordance with the fees regulations prescribed by the Department for Constitutional Affairs (currently 50 GBP maximum)

Professional Issues Note 17

The Security of Network and Information Systems Directive

- What is the NIS Directive?
    - Adopted by the European OParliament in July 2016 and represents the first EU-wide legislation on cyber security
    - Requires designated essential service operators to implement security measures to manage the risks to the network and information systems used to deliver essential services, and to report incidents affecting the continuity of such services
    - Similar but lighter requirements will be placed on certain Digital Service Providers
    - Member States have until 9 May 2018 to implement the NIS Directive
- Who is in scope?
    - Essential services in the following sectors
        - Water, energy, transport, health, digital infrastructure (TLDs, IXPs, DNS)
        - Banking and finance are excluded under UK proposals (similar legislation already applies in the UK)
        - The civil nuclear sector is also not in scope
    - Digital service providers
        - Online marketplaces, search engines, cloud service providers (with 50 or more staff and/or a turnover of 10 million euros a year)
- Public consultation
    - The Government welcomes views from industry on the implementation proposals set out in the consultation document (important we get these right)
    - Cyber security threat is increasing for businesses across the economy
        - Important that our essential services operators effectively manage the risks to their network and information systems
    - Loss of an essential service or Digital Service Provider would likely have a significant disruptive effect for both individual businesses and UK PLC as a whole
    - Want to find the correct balance between safeguarding the security of our essential services and digital service providers, whilst avoiding undue burdens on business
    - UK Government (DCMS) launched a public consultation on 8 August, setting out the proposed approach to implementation of the NIS Directive. The consultation closes on 30 September, and covers all aspects of implementation:
        - Essential services and identification thresholds
        - National framework
        - Security requirements
        - Incident reporting
        - Digital service providers
        - Penalties (for non-compliance)

Professional Issues Note 18

Organisations

- Becoming a legal entity
    - Types of organisation: commercial, public, not-for-profit
    - Mostly we look at commercial organisations intended to make profits
    - Different kinds of organisations:
        - Sole trader - individual - no legal formalities - the legal entity is the individual
            - If turnover is big enough will need to register for VAT, etc.
            - The individual is liable for company debts - so assets like home, savings are at risk
        - Partnership - this is the form a group must trade under unless it is a limited company
            - Often the required form of organisation for professionals e.g. law, medical, hedge fund, etc. because the liability issues control excesses
            - Liability is joint and several liability - all are fully liable for the debt of the partnership
        - Limited company
            - The preferred form of legal entity for commercial firms
            - Limits the liability of the company to its shareholders
                - If a company goes bust, they owe the shareholders very little
- Limited companies
    - Three principles
        - The company is a legal person separate from the people who own or work in the company
        - Ownership is divided into shares that can be bought and sold by shareholders
        - Owners of the company have no obligation to pay debts incurred by the company - the owners risk is limited to the value of their shares
    - In the UK
        - Public Limited Company (PLC): public can hold shares
            - BA PLC - shares may or may not be listed on the stock exchange
        - Private Limited Company (LTD): shares cannot be held by the public
            - Small Company Ltd
- Setting up a limited company
    - Two documents:
        - Memorandum of association
            - Short and simple - name, location of the registered office, objects of the company, liability clause (saying the limits to liability of the owners), share capital (e.g. 100 shares, value 1 GBP - to be a PLC must have capital over 50,000 GBP)
            - Concludes with declaration of association that list the people setting up the company

        - Articles of association: complex and technical
            - Covers how the company will run, roles of directors, etc.
    - Once a company is registered then the memo of association and articles of association are on public deposit at Companies House
- Directors
    - Sometimes shareholders run the company but in larger companies directors may be employed
    - Directors must:
        - Have regard to the owners and employees' interests
        - Act in good faith and for the benefit of the company
        - Exercise skill and care (be 'professional')
        - Declare conflicts of interest
        - Legally
            - Be aware of the financial position of the company
            - Drawing up annual reports and accounts and filing them at companies house
            - Complies with relevant law
        - Companies have executive (employed) and non-executive (non-employed advisors)
        - Every company has a company secretary responsible for required communications
- Setting up a company
    - Not necessary to employ a lawyer or accountant
    - Easiest way is to buy an 'off-the-shelf' company and tailor it to your needs (change the name, objectives, constitution, etc.)
    - Registering a company yourself costs 100 GBP (same-day service at the Register of Companies) - this is slower because you need to fill in forms, etc.
    - UK and US have similar, easy ways to set up companies
        - Other countries may take several months and cost thousands of pounds
- Non-commercial Bodies
    - Statutory bodies: set up by act of Parliament, e.g. local unitary authorities
        - Responsible for roads, lighting, drainage, education, etc.
    - Royal charter: sets up free-standing bodies that are independent of the state, e.g. universities
    - Not-for-profit organisations (often established as companies limited by guarantee):
        - Charities
        - Professional organisations: BCS, Institute of Physics, etc.
        - Political parties

Professional Issues Note 19

Organizations, Structure, Management

- Organizational Models
    - Organizational Theory (Max Weber) developed the bureaucratic model:
        - Tasks are split into specialist roles and people become expert in these
        - Each rule is precisely specified so one expert can't be substituted for another
        - Each individual is accountable to one manager who directs their work
        - Employees are required to relate to each other and customers in a formal and impersonal way
        - Recruitment is based on qualification, employees are protected from arbitrary sacking, promotion is based on seniority and achievement
    - Organic Model (Likert)
        - "Ensure a maximum probability that in all interactions and relationships within the organisation, each member, in the light of their background, values, desires and expectations, will view the experience as supportive and one which builds a sense of personal worth and importance." - small professional companies
- Matrix Model
    - Accepts that bureaucratic model is too restrictive
    - Work may be project-based
    - Employees may be working on several projects simultaneously
    - Employees may answer to several managers at once
    - Works with big organisations
- Models and principles
    - Organisational models look at the way the work is organised inside a company (organisation of people)
    - Organisational principles look at how the components of organisations are decided and how they are related (structure of the components of the organisation)
    - Organisational structure is usually captured in an organogram
- Some structuring principles
    - Function
    - Geography
    - Ownership
    - Product line
    - Technology
    - Operational structure
    - Depth of hierarchy
    - Centralised versus decentralised
    - What structure is appropriate to the size of company?

- The Manager (replaceable, trainable)
    - Develops plans and timetables
    - Organises
    - Delegates and monitors
    - Exercises control, applies corrective action
    - Communicates
    - Motivates
    - Delivers (predictable)
    - Looks inwards
- Leader can emerge
    - Perceived by group as most competent in leadership functions
    - Task-oriented: coordinating, initiating contributions, evaluating, information seeking and giving, opinion seeking and giving, motivating
    - Socio-economical: reconciling differences, arbitrating, encouraging participation, increasing cohesion
- The Leader (irreplaceable, not trainable)
    - Establishes direction
    - Develops vision
    - Communicates and inspires vision
    - Energises others
    - Innovates
    - Figurehead, spokesman
    - Looks outwards
- Organisation
    - A company is an instrument for maximising value for the shareholders
    - Driven by markets - lack of understanding of market = no customers = no business
    - Driven by resources - lack of understanding = lack of control
    - The more senior you become the more these will be concerns
- Performance areas
    - Market standing
    - Innovation
    - productivity
    - Physical and financial resources
    - Profitability
    - Worker performance and attitudes
    - Manager performance and development
    - Public responsibility

- Markets and marketing
    - Marketing is the business of understanding the market, your place in it, your opportunities, threats, competition and your customers
    - There exist many tools and models to help understand them
- Porter's 5 forces: new entrants (barriers to entry), competitors, suppliers, buyers and substitutes
- Examples
    - New entrants: Ford - Tesla
    - Substitute: Vinyl record - CD - iTunes - Spotify
    - Control of suppliers: Tesco
    - Control of buyers: monopoly
    - Control by buyers: perfect market; eBay?
    - Barriers to entry - semiconductor industry, mobile phones
- P.E.S.T.: Political, Economic, Social, Technological
    - Example: car market
        - Political - emissions reduction targets
            - Works against internal combustion engines
        - Economic - control of rare earth production
            - Raises concerns over electric vehicles
        - Social - family size, behavior
            - 1-parent families - hatchbacks?
            - Millennials: transport as a service (on-demand car, rather than owning one)
        - Technological - new products
            - Hydrogen, hybrids, recyclable materials
- S.W.O.T.: Strengths, Weaknesses, Opportunities, Threats
    - Example: horse-buggy whip manufacturer, 1910 sees horses making way for cars
        - Strength: has supply chain to reach buggy owners/future car owners
        - Weakness: product is horse-dependent
        - Threat: cars make product obsolete
        - Opportunity: reposition as supplier of driver accessories
- Marketing Mix - the 4 Ps
    - Product - quality, features, name, packaging, services, guarantee
    - Price - list price, discounts, credit
    - Promotion - advertising, personal selling
    - Place - distributors, retailers, locations, transport
- Competition
    - Can compete on cost or differentiation
        - Cost: make the same thing cheaper
        - Differentiation: make it different/better/readily available
    - Competitiveness based on core competencies

        - Anyone can make Coca-Cola
            - Only they have a network of licensed manufacturers and distributors (and the brand name)
        - Anyone can put an aircraft in the sky
            - Only the profitable airlines can fill it every time
    - Each survivor is uniquely superior to all others in some way and thus occupies a niche
- Market repositioning/retargeting
    - McDonalds
        - You can get salads now
        - Drives away from the ‘unhealthy junk food’ persona
    - Royal Bank of Scotland
        - Pre-financial cash: one of the biggest banks in the world
        - Now local bank in the highlands
    - Burberry
        - Youth wear to high-street brand
    - Apply
        - Computer company to mobile device company

Professional Issues Note 20

Democracy, Big Data and the Internet

- Ideals that drove the hope for network technologies
    - A new public sphere
        - Made up of private people gathered together as a public and articulating the needs of society with the state
        - Formation of public opinion through rational discourse
        - Unrestricted access and equal voice
        - Ability to debate over rules governing relations
        - Autonomous from state and economic power
        - Aspirational
        - Zuckrman's 'cute cat' theory
            - People go on Facebook to see all these photos of cute cats and babies but then they are exposed to political ideas
        - Ordinary people can broadcast to many, including the mass media
        - Ordinary people can create evidence
        - Confronts 'pluralistic ignorance'
            - When you don't know what other people know
            - Everyone is ignorant about what everyone else knows
    - A network of decentralised power
        - The architecture of the internet is going to bring about several types of democratic activities
        - Beth Simone Noveck: groups and webs of groups can become more effective legal actors than they have in the past
        - Zapatistas (the first eWarriors): raise awareness on their government condition through social media and the internet
        - Social Movement Organisations: WTO Protests in Seattle (1999), Al-Qaeda (1988), #MeToo (2017), #BlackLivesMatter (2013), People Power II Manila (2001), Tunisian Arab Spring (2010)
    - Government 2.0
        - Make governments more accountable and more transparent
        - Bertot, Jaeger and Grimes
            - India: rural property records online removes opportunities for local officials to accept bribes
            - Pakistan: tax system and department was restructured to allow direct payment to reduce requests for bribes
            - Chile: e-procurement system allows citizens to compare costs of bids purchased by the government, preventing price fixing or inflation

        - US: Customs and Immigration Service (USCIS) allows immigrants to track their immigration applications. U.S. Department of State enables passport seekers to track the progress of their passport applications
    - Transparency in government processes and collected datasets
- Is that the full story?
    - Christian Fuchs' Social Media: a critical introduction
        - Is Twitter a public sphere? Not necessarily as it is owned and controlled by an organisation
            - Opinions that are broadcasted the most are the opinions of people who are already popular and well known, i.e. politicians, influencers, celebrities
            - False advertising everywhere (fake news)
    - Percily
        - Liberating, broadcasting potential can also be harnessed by demagogues who appeal to the worst impulses of the mob
        - Anonymity that gives Internet speech its power also enables foreign powers to intervene, bots to go undetected, and trolls to commit racial and sexual harassment
        - Ability to facilitate the targeted delivery of relevant information and foster friendship also leads to filters and echo chambers
    - Journalism
        - Google and Facebook are strangling the free press to death. Democracy is the loser - Barry Lynn
        - 'Pure objectivity' does not exist
        - Social media technologies tend to promote communications that flow along preexisting social and political divisions, rather than across them
    - Digital dystopia: how algorithms punish the poor
        - In Australia, the government contracts with a private company to determine fraud among welfare recipients
        - India's 1.2B citizens have all been assigned a 12-digit number linked to their biometric and demographic data used to claim public assistance
            - Farmers do not have easily detectable fingerprints, therefore there are cases where if the machine can't detect their thumbprint, they can be denied food
        - In the UK the Department for Work and Pensions (DWP) now uses 16 bots to chat with people making welfare claims
- How do democratic ideals shape ICTs?
    - Prefigurative Technologies
        - Civil society (distinct from government and corporate interest)
        - Technology should be designed in such a way it reflects the values of the users

- Boggs 1997: prefigurative politics describes political movements that embody “those forms of social relations, decision-making, culture, and human experience that are the ultimate goal within its ongoing practice”
- Feldman 2014: “to study the successes and failures of these prefigurative movements’ communication and decision-making models is to study a testing ground for emerging forms of democratic communication.”

Professional Issues Note 21

Human Resources

- What are human resources?
    - Hiring the right people
    - Keeping the balance of skills and expertise right for the work of the organisations
    - Administration relating to employment
    - Complying with the law
- Legal Context: HR Responsibilities
    - Ensuring that recruitment, selection and promotion procedures comply with anti- discrimination legislation
    - Staff training and development
    - Setting up and monitoring remuneration policy
    - Setting up and monitoring appraisal procedures
    - Administering dismissal and redundancy procedures
    - Contracts of employment
    - Workforce planning
    - Designing and administering grievance procedures
    - Being aware of new legislation affecting employment rights and advising management of what the organisation must do to comply with it
    - Health and safety
    - Administering consultative committees
- Recruitment and Selection
    - Preparing a job description and further particulars
    - Disseminating the description
    - Selecting
        - Individual interviews
        - Panel interview
        - References
        - Psychometric tests
        - Situational assessment
        - Task assessment
    - Drive is to more ‘evidence-based’ approaches that avoid bias (unconscious or otherwise)
- Edinburgh University Job Description Template
    - Job details
    - Job purpose
    - Main responsibilities
    - Planning and organising
    - Problem solving
    - Decision making

    - Key contacts/relationships
    - Knowledge, skills and experience needed for the job
    - Dimensions
    - Job context and any other relevant information
    - Verification
- Staff training and development
    - Job descriptions often are derived from role descriptions
    - Role descriptions relate to a bureaucratic structure and identify the skills necessary to fulfill a particular role
    - Training and development in part are oriented to fit people to more senior roles so they are eligible for promotion
    - Training can also be linked to development plans for the organisation to take into account the changing environment
- Administrative roles at Edinburgh University
    - Grade 5: senior secretary (minimal supervision), someone who can have initiative
    - Grade 6: student support officer, exercise initiative and judgement
    - Grade 7: technical professional
- Remuneration Policies and Job Evaluation
    - Designing pay structures that reward individuals for work
    - Critical to the retention to key staff
    - Anti-discrimination legislations has led to an emphasis on equal pay for equal value
    - Scales provide overall structure
    - Job evaluation attempts to position roles/jobs in the structure:
        - Non analytical: looks at the value of the role in the company
        - Analytical: attempts to decompose jobs into component skills
- Appraisal schemes
    - Often an annual process
    - Provides a means to give feedback to employees and to encourage a forward look in terms of skills development, aspirations, etc
    - Oriente towards objectives
    - Review against objectives and performance measures
    - Sometimes it is difficult to fit some activities into the framework
- Redundancy, dismissal and grievance procedure
    - Fair dismissal
        - Lack of capability to do the job
        - Misconduct
        - It is illegal for the employer to employ the employee
        - Redundancy

        - ‘Other reasons’ - but many are ‘unfair’, e.g. on the grounds of discrimination, becaus the employee is taking legal action to enforce their rights at work, etc.

- Dismissal
    - Dismissal process:
        - Written statement of why dismissal is being considered
        - Arrange a meeting where both sides can state their case
        - Following the meeting the employee is informed of the decision
        - Right of appeal to more senior manager
    - Other issues: constructive dismissal, takeovers and outsourcing, whistleblowing
- Redundancy
    - Employer no longer requires people to do a particular category of job (or fewer people)
    - Employees entitled to compensation (subject to a legal minimum)
    - Often employer seeks to reduce the number of employees in a particular category
        - Traditionally selection was last-in-first-out
        - Often voluntary redundancy is offered
            - You might lose your most able employees first!
    - UK Statutory Redundancy Pay
        - You’ll normally be entitled to statutory redundancy pay if you’re an employee and you’ve been working for your current employer for 2 years or more
        - You’ll get:
            - Half a week’s pay for each full year you were under 22
            - One week’s pay for each full year you were 22 or older, but under 41
            - One and a half week’s pay for each full year you were 41 or older
            - Length of service is capped at 20 years
            - If you were made redundant on or after 6 April 2019, your weekly pay is capped at 525 GBP and the maximum statutory redundancy pay you can get is 15,750 GBP. If you were made redundant before 6 April 2019, these amounts will be lower
        - Redundancy pay (including any severance pay) under 30,000 GBP is not taxable!
- Human resource planning
    - HR departments often get involved in resource planning
        - Characterizing the skills of the current workforce
        - Characterising the current workload and how effectively the workforce meets that workload
        - Forecasting likely increases in workload and the pattern of workload
        - Forecasting staff losses and gains
        - Predicting the effects of takeovers, etc. on HR

Professional Issues Note 22

Finance

- The role of capital in startups
    - You need to pay your employees
    - Publicity, marketing
    - Office space, equipment
    - Software licensing
    - Legal services
- Startups
    - Reasons: for a very wide range of purposes (e.g. wages, premises, equipment, advertising, marketing, travel, paying interest on loans) to let you effectively make, market and sell your initial product range
    - What you need: a business plan
        - What you are planning to sell, feasibility of the project
        - Assessment of the market size and how much you are likely to capture
        - Financial predictions: projected budgets, cash flows, profit and loss accounts and balance sheets
    - Sources: grants, loans, equity capital
    - Issues: gearing of the company - relationship between equity capital and loans - undesirable to be too highly geared
- Financial accounting - balance sheets
    - Assets: what does the company owns what do they owe
        - Non-current assets
            - Tangible assets
            - Intangible assets: reputation of the company, software
            - Investments in subsidiaries: how much I've invested in subsidiaries
            - Interests in joint ventures: amount of money you're cooperating with somebody
            - Deferred tax
        - Current assets (people who owe you money)
            - Debtors: amounts falling due within one year
            - Cash at bank and in hand
            - Corporate tax
    - Liabilities
        - Current liabilities
            - Creditors: amounts falling due within one year (people you have to pay)
            - Derivative financial instruments
        - Total assets less current liabilities
        - Creditors: amounts falling due after more than one year
        - Provisions for liabilities

        - Capital and reserves (total: shareholders' funds)
            - Called up share capital
            - Share premium account
            - Merger reserve
            - Profit and loss account
- Profit and Loss
    - Turnover
    - Cost of sales
    - Gross profit
    - Administrative expenses
    - Other income
    - Operating profit
    - Interest receivable and similar income
    - Interest payable and similar expenses
    - Profit before taxation
    - Tax on profit
    - Profit for the financial year
    - Other comprehensive income

Professional Issues Note 23

Management Accounting

- Cost of Labour
    - Costs
        - Wage/salary
        - Tax (UK National Insurance Contribution) - usually proportional to salary level, e.g. 10% can be much higher (e.g. 60%) in some countries
        - Superannuation
        - Medical insurance
        - Total is the payroll cost (in Edinburgh University this is 1.21 times the salary cost)
    - Effort
        - 260 weekdays in the year
        - Deduct: public holidays + annual leave + sick leave + unproductive time (at least 40-50 days per year in the UK)
        - Approximately 210 days per year times 7 working hours per day = 1470 hours
    - So someone earning 30,000 GBP at UoE costs (30,000 * 1.21)/1470 = 24.69 GBP per hour
- Overheads
    - Consider a company producing tangible goods (e.g. computers) as well as the production staff that assemble the goods we might also have:
        - Premises costs - rent, heat, light, business rates
        - Management costs
        - Support staff costs (e.g. secretaries)
        - Vehicle costs - running cost, depreciation
        - Advertising
        - Consumables - bandwidth, postage, paper, phones
        - Advertising/marketing
        - Insurance
        - Professional Fees
    - Issue is how to allocate overheads to goods - share equally or make proportional to labour needed to manufacture?
- Budgets
    - Financial plan of expected income and expenditure typically over a year
    - Typical sections are
        - Overhead costs: premises costs, management costs, advertising
        - Operating costs: cost of materials, labour costs, depreciation on plant
        - Income (typically from sales): estimated sales of different items at different costs
    - Typically a budget should show a surplus over the year
    - Budgets are often ‘profiled’ into monthly expectations of spending and income

- Cash flow
    - Monthly predictions of inflows and outflows of cash over the forecasting period 6 or 12 months
    - Calculate the net flow for each month (either negative or positive)
    - Calculate the cumulative cash flow for each month in the period
    - The cumulative cash flow can be used to predict the need for working capital
    - There is a difference between budgets and cash flows, if we sell goods for X GBP to company Y then
        - That counts as X GBP of income in the budget
        - If company Y does not pay the invoice for three months that will be reflected in the cash flow

Professional Issues Note 24

Investment Appraisal

- A means of assessing whether an investment project is worthwhile or not
- Investment project could be the purchase of a new PC for a small firm, a new piece of equipment in a manufacturing plant, a whole new factory, etc.
- Used in both public and private sector
- Types of investment appraisal
    - Payback period
    - Accounting Rate of Return (ARR)
    - Internal Rate of Return (IRR)
    - Profitability Index
    - Net Present Value (discounted cash flow)
- Why do companies invest?
    - Importance of remembering investment as the purchase of productive capacity NOT buying stocks and shares or investing in a bank!
    - Buy equipment/machinery or build a new plant to
        - Increase capacity (amount that can be produced) which means:
            - Demand can be met and this generates sales revenue
            - Increased efficiency and productivity
- Investment therefore assumes that the investment will yield future income streams
- Investment appraisal is all about assessing these income streams against the cost of the investment
- Not a precise science!
- **Payback period**
    - Simple to use
    - Useful for short term decision making
    - Userful if the returns are accurate
    - Income streams not time related
    - Payback method
        - The length of time taken to replay the initial capital cost
        - Requires information on the returns the investment generates
            - E.g. a machine costs 600,000 GBP
                - It produces items that generate a profit of 5 GBP each on a production run of 60,000 units per year
                - Payback period will be 2 years
        - Could occur during a year
        - Can take account of this by reducing the cash inflows from the investment to days, weeks, or years

$$Payback = \frac{Days/Weeks/Months \times Initial\ Investment}{Total\ Cash\ Received}$$

    - Example
        - Cost of machine = 600,000 GBP
        - Annual income streams from investment = 255,000 GBP per year
        - Payback = 36 * 600,000 / 765,000 = 28.23 months or 2 years and 6.75 months
- **Accounting Rate of Return (ARR)**
    - Shows profitability
    - Allows comparison between projects
    - Income streams not time related
    - A comparison of the profit generated by the investment with the cost of investment

$$ARR = \frac{Average\ annual\ return\ or\ annual\ profit}{Initial\ cost\ of\ investment}$$

    - Example
        - An investment is expected to yield cash flows of 10,000 GBP annually for the next 5 years
        - The initial cost of the investment is 20,000 GBP
        - Total profit therefore is: 30,000 GBP
        - Annual profit = 30,000 / 5 = 6,000 GBP
        - ARR = 6,000 / 20,000 * 100 = 30%
- To make a more informed decision, more sophisticated techniques need to be used
- Importance of time-value of money
- **Net Present Value (NPV)**
    - Takes account of changing value of money over time
    - Enables comparisons at different interest rates to be considered
    - Useful for comparing similar projects with the same cost
    - How much would you need to invest today to earn x amount in y years time?
    - Value of money is affected by interest rates
    - NPV helps to take these factors into consideration
    - Shows you what your investment would have earned in an alternative investment regime
    - Example
        - Project A costs 1,000,000 GBP
        - After 5 years the cash returns = 100,000 GBP (10%)
        - If you have invested 1,000,000 GBP into a bank offering interest at 12% the returns would be greater
        - You might be better off re-considering your investment!
    - The principle: how much would you have to invest now to earn 100 GBP in one year's time if the interest rate was 5%?
        - The amount invested would need to be 95.24 GBP
    - Allows comparison of an investment by valuing cash payments on the project and cash receipts expected to be earned over the lifetime of the investment at the same point in time, i.e. the present

- Present value (PV)

$$PV = \frac{Future\ Value}{(1+i)^n}$$

where i = interest rate and n = number of years

PV is also defined as

$$PV = cash\ flow \times discount\ factor$$

  - The PV of 1 GBP at 10% in 1 year time is 0.9090
  - If you invested 0.9090 GBP today and the interest rate was 10% you would have 1 GBP in a year's time
  - This process is referred to as 'Discounting Cash Flow'
  - Example
    - PV of 500 GBP in 10 years time at a rate of interest of 4.25% = 500 * .6595373 = 329.77
    - 329.77 GBP is what you would have to invest today at a rate of interest of 4.25% to earn 500 GBP in 10 years time
    - PVs can be found through valuation tables (e.g. Parry's Valuation Tables)

- **Cash Flows**
  - Income streams
  - Yields from investment
  - Time value of money
  - Profitability versus risk
  - Discounted cash flow
    - Example
      - A firm is deciding on investing in an energy efficiency system. Two possible systems are under investigation:
        - A: yields quicker results in terms of energy savings
        - B: may be more efficient later
      - Which should the firm invest in? Make decisions by calculating the present value over the same number of years for system A and B
        - System A
          - Cash flow: 285,000 GBP
          - NPV: 139,416 GBP
        - System B
          - Cash flow: 285,000 GBP
          - NPV: 108,802 GBP
      - System A represents the better investment
      - System B yields the same return after six years but the returns of system, A occur faster and are worth more to the firm than returns occuring in future years even though those returns are greater

- **Internal Rate of Return (IRR)**
    - Where NPV = 0
    - Time value related
    - Enables comparison to be made of projects of differing value
    - Allows the risk associated with an investment project to be assessed
    - The IRR is the rate of interest (or discount rate) that makes the net present value = 0
        - Helps measure the worth of an investment
        - Allows the firm to assess whether an investment in the machine, etc. would yield a better return based on internal standards of return
        - Allows comparison of projects with different initial outlays
        - Set the cash flows to different discount rates
        - Software of simple graphing allows the IRR to be found
- **Profitability Index**
    - NPV/Initial Capital Cost
    - Allows comparison of the costs and benefits of different projects to be assessed and thus allow decision making to be carried out

$$Profitability\ Index = \frac{Net\ Present\ Value}{Initial\ Capital\ Cost}$$

- Key considerations for firms in considering use
    - Ease of use/degree of simplicity required
    - Degree of accuracy required
    - Extent to which future cash flows can be measured accurately
    - Extent to which future interest rate movements can be factored in and predicted
    - Necessity of factoring in effects of inflation

Professional Issues Note 25

Standards in Information and Communications Technology

- Standard: an agreement between parties - crucial enabler in increasingly large-scale complex multi-actor technological systems
- Different kinds of standards: compatibility, performance, measure and test, management
- A typology of standards
    - De jure - set by official standardisation body
        - E.g. British Standards Institutes, International Telecommunications Union
        - Often ex-ante: underpin joint building of a new system
    - De facto - emerges through choices by players in IT market
        - E.g. MS DOS, MS Windows
        - Often ex-post standards - often proprietary - may be enforced by market dominance
    - Open - all can submit proposals for change
    - Closed - only custodians decide
    - Mandatory standards
    - Voluntary standards
    - Hybrid - growth of private consortia (able to respond more quickly; private interests better articulated)
    - Convergence between public and private standardisation - hybrid models as consortia seek to make their outcomes more impartial and thus more widely acceptable/legitimate
        - E.g. HTML is standardised by W3C (de jure) but de facto variants developed by specific browsers
        - E.g. JavaScript - developed by Netscape - extensions: risk of forking/splintering submitted to ECMA
- Interoperability standards
    - Interoperability a critical early constraint in systems integration
    - Today, a ‘sea of standards’, gateways and standard interfaces
        - Machine-machine communication no longer a problem
        - Not yet plug and play - especially for complex systems (e.g. xls but not SAP)
        - How to ensure that data means the same thing (semantic interoperability)
- Dynamics of standards - varies between contexts and layers
    - Hardware and core functionality (e.g. operating systems)
        - Finite states - can be formally described
        - Economies of scale/network externalities tend to exclude alternatives
    - Industry specific applications
        - Diverse and changing requirements
            - Hard to reconcile
            - Problems of migrating to new standards and of reverse compatibility
        - Multiple centres of coordination

        - Differing standards
        - Linking them - fuzzy standards
    - Big players or groups may not feel compelled to align with standard - forking
- Standardisation in Health IT

  Standardisation efforts must confront:
    - High informational complexity
        - Hard to capture formally range of variables
            - Disease types
            - States
            - Measurement units
        - Difficult to agree data exchange standards
            - Differences in clinical practice between wards, specialties, hospitals, health services
        - Multiple centres of coordination
            - Difficult to align users and suppliers
                - May need to be agreed at intermediate c.f. Central leve
    - Changing clinical knowledge and practices
        - Erode existing standards/units
- IT supply challenges
    - Hospital solutions
        - Dominance of large enterprise solution vendors (e.g. Epic, Cerner)
        - Increasingly expensive mega packages
        - Proprietary solutions do not use standard internal interfaces
        - Obama's unsuccessful attempt to mandate interchange standards
    - Difficult to integrate new apps
        - Barrier limits uptake of new apps
    - Estonia greenfield
        - Mandates interoperability standards
        - Aim to allow competitive supply of component technologies (e.g. patient record)
        - Strategy not available in the UK
        - Many existing legacy systems
- Data harmonisation challenge
    - Patient record system
        - Wanting to codify patient mobility (low, medium, high)
    - Different concepts of mobility
        - Hospital nursing - patient's ability to get to the toilet
        - Community nursing - patient's ability to get to the shops
- BCS 2020 Preparing the NHS for an information revolution
    - Tension between standardisation and innovation

        - Standards required, but overuse could inhibit innovation in immature market
    - Recommend creation and enforcement of clinical standards/guidelines for record-keeping and data sharing
    - Intercollegiate standardisation across Royal Colleges to ensure information is comparable and terminology consistent
- Systematized Nomenclature of Medicine (SNOMED)
    - Mandated for adoption by all NHS care settings by April 2020 in place of existing (ICD-10/Read) classification
    - Need unique and stable identifiers for terms in the face of changing practice
    - E.g. drug identifiers coded on the basis of therapeutic class become unstable when drug is assigned to another class
    - Non-semantic concept identifiers, i.e. identifiers are meaningless
- NHS England Guidelines for Hospitals: Interoperability, Data and Standards
    - Local data-sharing
    - Structured data
    - Dm+d
    - Open APIs
    - SNOMED CT (clinical terminology)
    - Data quality
- Comparing banks and hospitals
    - Banks gradually established cheque clearing mechanisms, increasingly automated from 1960s
    - Numbering systems for branch identification and customer account numbers
    - Transactions very simple in informational terms
    - Still took them decades to respond to opportunities for electronic banking (automatic teller machines seen as replacement for clerk c.f. Start of self-service banking)
- Summary
    - Developers must analyse how this landscape is changing
    - Tensions between existing and emerging practices and schema
    - Tensions between central and regional agreement

Professional Issues Note 26

Equality and Technology: Current Debates

- Example Case: Amazon ditched AI recruiting tool that favored men for technical jobs
    - Neural networks are essentially 'black boxes'
    - You can't really understand it completely
    - Bias in training data
        - More men applying than women (by default)
    - How to solve: remove gender from the training data
        - However it can be implied by certain patterns (name, gaps in CV, previous work experience, usage of masculine words, etc.)
- Algorithmic bias studies
    - Books
        - Weapons of Math Destruction by Cathy O'Neil
        - Automating Inequality by Virginia Eubanks
        - Algorithms of Oppression by Safiya Umoja Noble
- Sociological research insights
    - Technologies emerge and are developed and designed in social and cultural contexts and geographies, as a result inequalities play a role
    - Technology is human, made of human labor, social relations, flows of money and investment interests
    - Technology isn't value neutral - more to the story than 'just math'
    - Technology developments mirror social values or structural interests
    - Using these insights, we can take a look at some current debates that are taking place in and around the tech world
- Debate one: context matters
    - Three key metrics to investigate the patterns of knowledge creation:
        - Spatial distributions of academic articles (traditional knowledge production)
        - Collaborative software development (e.g. GitHub contributions)
        - Internet domain registrations (digitally mediated knowledge production)
    - Digital divides: "our results suggest the factors often framed as catalysts in the transformation into a knowledge economy do not relate to the three metrics uniformly. While connectivity is an important enabler of digital content creation, it seems to be only a necessary, not sufficient, condition; wealth, innovation capacity, and public spending on education are also important factors."
- Debate two: people matter
    - You are not your user
    - Can one social demographic design for a complex world?
    - Why do women leave their tech jobs?
        - They do not feel like they are promoted, so they start their own companies

- Debate three: technology has real/unequal/uneven social effects
    - IBM commercial: police use analytics to reduce crime
        - Crime prediction (trying to pre-empt the crime)
        - Problem: are you a criminal before you commit a crime?
        - Suspicious patterns
        - You want to reduce the risk of crime
    - “We obtained the risk scores assigned to more than 7,000 people arrested in Broward County, Florida, in 2013 and 2014 and checked to see how many were charged with new crimes over the next two years.”
    - Significant racial disparities:
        - In forecasting who would re-offend, the algorithm made mistakes with black and white defendants at roughly the same rate but in very different ways
            - The formula was particularly likely to falsely flag black defendants as future criminals, wrongly labeling them this way at almost twice the rate as white defendants
            - White defendants were mislabeled as low risk more often than black defendants
- Debate four: we see ourselves in our technologies
    - The Omnivore’s Neighborhood: Online restaurant reviews, race and gentrification
        - The study suggests that Yelp reviews not only reflect the impacts and public perception of gentrification, but ultimately help to determine who occupies a neighborhood as well.
        - Indeed, the study concludes that, “intentionally or not, Yelp restaurant reviewers may encourage, confirm, or even accelerate processes of gentrification by signaling that a locality is good for people who share their tastes.”
        - Beyond persuading potential customers to visit a restaurant, social media may in fact be part of the process of actually transforming neighborhoods
    - SketchFactor
        - An app to allow users to report having seen or experienced something ‘sketchy’ in a particular location
        - These reports would then be geotagged and overlaid on a Google map, creating a sketchiness heat map of a neighborhood or city