

Professional, Legal, Ethical and Social Issues

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Objectives

1. To instill a professional attitude toward the application of computer technology
2. To provide an appreciation of the law as it relates to computing
3. To introduce methods for the rational resolution of ethical problems
4. To ensure awareness and encourage deliberation of the relationship between computer technology and society

Contents

- Professionalism
 - British Computer Society
 - Institution of Engineering and Technology
- Rights & Wrongs
 - Codes & Standards
 - Computer Law
 - Ethical Decision Making
- Risks & Threats
 - Safety Critical Systems
 - Societal Impact on Technology

Professionalism

- What is a professional?
- Competence-Responsibility-Trust
- When do you become one?
- What is a profession?
- Guarantor of C-R-T

Professional Bodies

- UK
 - British Computer Society (BCS)
 - www.bcs.org
 - Institution of Engineering and Technology (IET)
 - www.theiet.org
- USA
 - Association for Computing Machinery (ACM)
 - www.acm.org
 - Institute of Electrical & Electronics Engineers (IEEE)
 - www.ieee.org
- Business related
 - Chartered Institute of Marketing (CIM)
 - www.cim.co.uk
 - Chartered Institute of Management Accountants (CIMA)
 - www.cimaglobal.com

Professional Recognition

- Your degree course might be accredited by one or more of the following –
 - British Computer Society
 - For exemption from membership examinations (MBCS) and listing on the register of Chartered Information Technology Professionals (CITP)
 - Institution of Engineering and Technology
 - For exemption from membership examinations (MIET)
 - Engineering Council
 - For listing on the register of Chartered Engineers (CEng)

British Computer Society

The Chartered Institute for IT

The British Computer Society

3 Newbridge Square

Swindon

SN1 1BY

<https://www.bcs.org>

Royal Charter 1984 –

To promote the study and practice of Computing and to advance knowledge therein for the benefit of the public.

Institution of Engineering and Technology

Represents the professions of Electrical, Electronic, Manufacturing and Systems Engineering

Institution of Engineering and Technology (IET)

Michael Faraday House

Six Hills Way

Stevenage SG1 2AY

<https://www.theiet.org>

Royal Charter 1921 –

To promote the general advancement of science, engineering and technology and to facilitate the exchange of information and ideas on these subjects amongst the members of the IET and otherwise.

Engineering Council

The Engineering Council regulates the engineering profession in the UK by licensing engineering institutions to put suitably qualified members on the Register of Chartered Engineers

Engineering Council
10 Lower Thames Street
London
EC3R 6EN

<https://www.enqc.org.uk>

The Engineering Council's mission is to set and maintain realistic and internationally recognised standards of professional competence and ethics for engineers, technologists and technicians, and to license competent institutions to promote and uphold the standards.

BCS Code of Conduct

<https://www.bcs.org/membership/become-a-member/bcs-code-of-conduct/>

- Public Interest
 - You make IT for everyone
- Professional Competence and Integrity
 - Show what you know, learn what you don't
- Duty to Relevant Authority
 - Respect the organisation or individual you work for
- Duty to the Profession
 - Keep IT real. Keep IT professional. Pass IT on

ACM Code of Ethics and Professional Conduct

<https://www.acm.org/code-of-ethics>

- General Ethical Principles
- Professional Responsibilities
- Professional Leadership Principles
- Compliance with the Code

Standards

“Professional Guidelines”

- There are many international standards providing guidance and stating best practice on computer-related matters
 - Quality
 - Quality Management and Quality Assurance (ISO9000/TickIT)
 - Safety
 - Functional Safety of Electronic Systems (IEC 61508)
 - Security
 - Information Security Management Systems (BS 7799)

Computer Law

- In most countries there is a considerable body of law that can apply to computer professionals
 - Contract Law
 - Intellectual Property Law
 - Data Protection Law
 - Computer Misuse Law
 - Computer Evidence

Contract Law

- Contractors versus employees
 - Intellectual property
 - Package licensing versus bespoke software
- Contractual duties
 - Fidelity
 - Confidence
 - Culpability
 - You CANNOT contract out of “reasonable” liabilities

Intellectual Property Law

- Moral rights
 - Right of paternity, right of integrity
- Copyright
 - Protects original works, sound recordings, typographical layouts
- Patents
 - Protect ideas which are novel and not obvious
- Design rights
 - Protect designs such as circuit board layout

Data Protection Law

- The subject of personal data has the right to view and correct that data
- Personal data should be accurate, adequate, relevant and kept up to date
- Personal data should not be kept for longer than is necessary
- Appropriate technical and organisational measures should be taken against unauthorised or unlawful processing of personal data and against accidental loss or destruction of personal data

Computer Misuse Law

- Unauthorised access
 - Systems
 - Programs
 - Data
- Unauthorised modification
 - Editing
 - Deleting
- Jurisdictions

Computer Evidence

- Rules govern what evidence is permissible in courts of law
- Viewing log files with an editor after an intrusion will invalidate the logs as evidence
 - They might have been altered after the event
- Following audit trails back to the place of origin of an attack is a task for specialists
 - Amateurs could invalidate evidence or unwittingly tip off perpetrators

Ethical Decision Making

- Not just about right and wrong
- Moral systems and principles
- Stakeholder analysis
- Six useful tests

Not just Right and Wrong

- Scientists and engineers are generally not very good at explaining their work or justifying their actions in non-technical terms
- When things go wrong the public will seek assurance that the technical decisions which were taken paid due heed to their interests
- It is crucial that technologists can provide clear and understandable justifications for their motives, decisions and actions

Moral Systems and Principles

- Citing moral systems and principles can help to provide assurance that one's motives, etc. were of good intent
 - Theology
 - Religious doctrine
 - Moral philosophy
 - Categorical imperative, utilitarianism, etc.
- Not everybody will be re-assured by such references though

Stakeholder Analysis

- A stakeholder analysis can help you arrive at sound decisions and provide justifications
 - Any person, group or organisation that could be affected by the decision is a stakeholder
 - Stakeholders are not always easy to identify - some are only affected very indirectly
 - Stakeholder analysis tabulates the alternative decisions and the stakeholders, noting the effect of each alternative on each stakeholder
 - e.g. very good, good, neutral, bad, very bad

Tabulating Stakeholders

- An example -

Stakeholder	Choice 1	Choice 2	Choice 3	Choice 4
Yourself	+	--	++	---
Your employer	++		-	+
The public	-	+		++
Your family	+		++	+
Co-workers	++		--	++
Your boss	+++		---	++
Customers	-	+		+++
Suppliers	-	+		+++
Etc.				

Six Useful Tests

- The Golden Rule
(Other Person's Shoes Test)
- Legality Test
- Smell Test
- Parent Test
- Media Test
- Market Test

Safety Critical Systems

USSR early warning system

- In 1983 the early warning system of the USSR nearly started WW III when it reported that the USA had launched 5 ballistic missiles
- Fortunately the duty officer had “a funny feeling in his gut” that the USA would launch more than 5 missiles if this was a genuine attack
- The cause was a fault in the software that was supposed to filter out false missile detections caused by satellites picking up sunlight reflections from the tops of clouds

Safety Critical Systems

Therac-25

- The Therac-25 was a new version of a radiation therapy machine with more software control
 - Between June 1985 and January 1987 overdoses of radiation were given to six people
 - Three of them died
- Causes
 - Poor safety design - lack of safety interlocks
 - Software errors - insufficient testing and debugging
 - Inadequate reporting and investigation of accidents
 - Overconfidence

Safety Critical Systems

Ariane 5

- In June 1996, 40 seconds after initiation of its flight sequence, at an altitude of about 3700m, the Ariane 5 rocket veered off its flight path, broke up and exploded
- The cause was an internal variable related to the horizontal velocity exceeding the maximum value that a 16-bit integer could hold
- This software was, in fact, unnecessary for Ariane 5 but necessary in its predecessor, Ariane 4
- It had been retained in the inertial reference system of Ariane 5 for reasons of commonality

Societal Impact on Technology

Commercial Interests

Gas Refrigerator

- Hardly any mechanical parts
- Silent
- Gas was more prevalent (it had been around longer)
- Supported by (in USA)
 - Servel
 - SORCO
- LOST

Electric Refrigerator

- A compressor and a motor
- Very noisy initially (and still hums!)
- Electric services were limited
- Supported by (in USA)
 - General Electric
 - General Motors
 - Westinghouse
- WON

Societal Impact on Technology

Political Desires

Record/Playback Machine Tools

- Relatively cheap
- Skilled metal-worker needed
- Support bought out
- LOST
- WON

Numerically Controlled Machine Tools

- Very expensive
- Skilled metal-worker not expected to be needed (McCarthyite concerns about reliability of union labour)
- Supported by USAF (who actually paid for installation of machines in subcontractors factories)

Societal Impact on Technology

Cultural Attitudes

The AR-15 and M-16 Rifles

- AR-15 was
 - most reliable
 - lethal
- infantry rifle invented by time of Vietnam War
- M-16 was
 - developed from AR-15
 - deployed in Vietnam
 - useless!
- How did this happen?
 - The (very conservative) US Army ordnance bureaucracy made three modifications to the AR-15 -
 - Added manual bolt closure
 - Unnecessary extra weight
 - Increased twist of barrel
 - Greater accuracy but less lethal
 - Changed the gunpowder
 - 1000 rounds/minute and it jammed

Societal Impact on Technology

Computer Industry

- Intel and Motorola
 - Intel 8086/8088 versus Motorola 68000
- IBM and Apple
 - IBM PC versus Apple Macintosh
 - IBM PC based on Intel 8088 and MS DOS
- Microsoft
 - MS Office versus Lotus 1-2-3
 - MS Windows versus Apple Mac OS
 - MS Windows versus GNU/Linux
 - MS Internet Explorer versus Netscape (Mozilla)

Summary

- We have looked at what it means to be a computing professional
 - What a professional is and the role of professional bodies
- We have considered the main branches of law that affect the practise of computing
 - Contracts, Intellectual Property, Data Protection, Computer Misuse and Computer Evidence
- We have examined methods for the resolution of ethical problems
 - Moral systems, stakeholder analysis and the six useful tests
- We have studied some examples of the relationship between computer technology and society
 - Safety Critical Systems, how society affects technological choices