faculty of
Computing &
Digital Technology

Lecture 3

Professionalism and Information Technology

PROFESSIONAL ETHICS, CODE OF CONDUCT AND MORAL RESPONSIBILITIES

Prepared by:
Ms Anitha Velayutham

Who is a Professional?

- *Professionals* who comprise a given profession also tend to have certain defining attributes and requirements.

- Medical doctors, lawyers, accountants, etc. find themselves in situations in which their decisions and actions can have significant social effects, and have roles and responsibilities that exceed those of ordinary individuals.

- Sometimes these roles and responsibilities *differentiate* professionals from others.

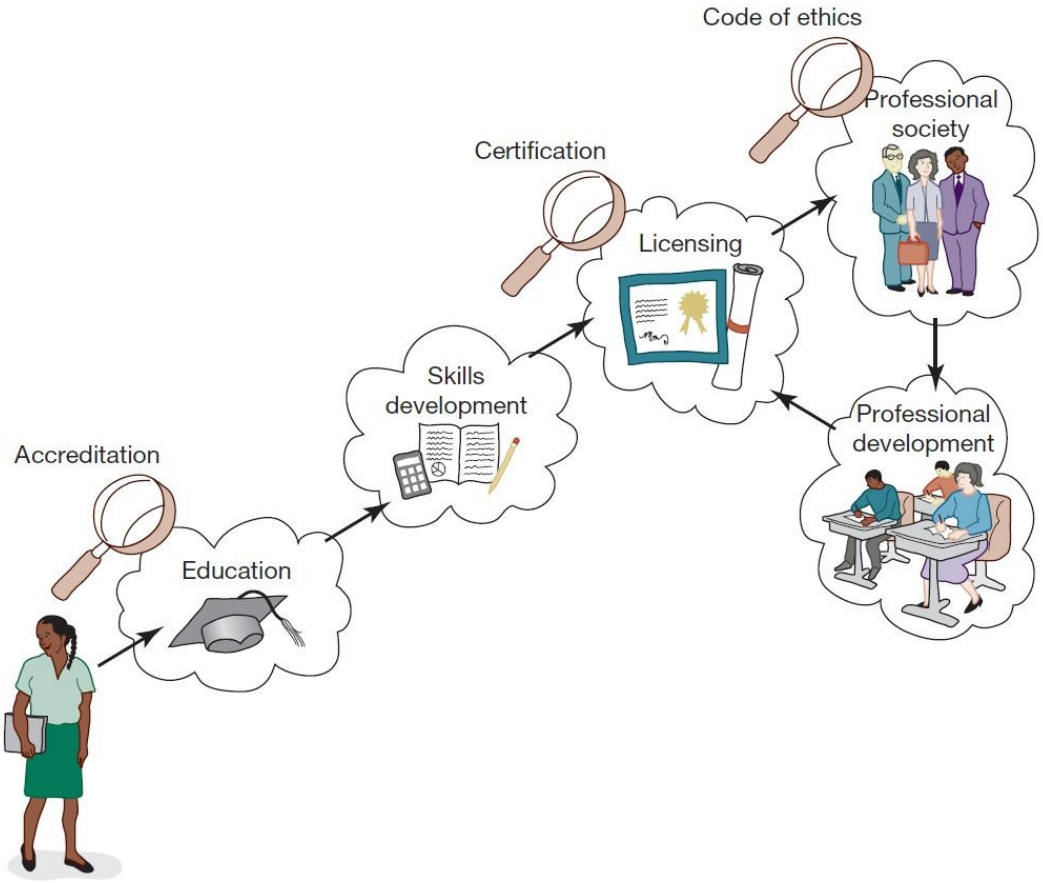
Characteristics of a Profession

- Initial professional education
- Accreditation
- Skills development
- Certification
- Licensing
- Professional development
- Code of ethics
- Professional society

Professional Ethics

When applied to computing, professional ethics is a field of applied ethics concerned with moral issues that impact computer professionals.

Attributes of a Mature Profession



A mature profession has eight attributes that enable it to certify new members and support existing members.

Status of Certification and Licensing

- Software engineer: someone engaged in development or maintenance of software, or teaches in this area
- Path to certification was attempted: similar to path taken by engineers in other disciplines, such as civil engineering
  - Four years of post-college work experience
  - Pass Fundamentals of Engineering (FE) exam
  - Pass discipline-specific Principles and Practice of Engineering (PE) exam
- Only 81 people nationwide took exam in first five years; exam has been discontinued

Why a Separate Category of Professional Ethics?

- The same ethical rules should apply to professionals as well as to ordinary individuals.
- So, if it is wrong for ordinary people to steal, cheat, lie, and so forth, then it is wrong for professionals to do so as well.
- Thus, one might conclude that a separate field of study called "professional ethics" is not really needed.

Who is a Computer Professional?

- A computer professional might be interpreted to mean anyone who is employed in the computer, information-technology, or information/communications fields.

- Or a computer professional might be thought of in more narrow terms, in which case only software engineers would be included.

Definition of a Computer Professional

faculty of Computing & Digital Technology

- A computer professional could be defined in such a way that, in addition to software engineers, software quality analysts, software technical writers, and software managers and supervisors.

- A *software engineering team* *includes* those who contribute by direct participation to the analysis, specification, design, development, certification, maintenance, and testing of software systems.

Do Computer Professionals Have Special Responsibilities?

- Gotterbarn (1999) believes that because software engineers and their teams are have significant opportunities to:

(i) do good or cause harm

(ii) enable others to do good or cause harm

or

(iii) influence others to do good cause harm.

Ability to Harm Public

- Many computer professionals hold responsibilities similar to those held by members of mature professions
- Therac-25 killed or gravely injured at least six people
- Millions rely upon software rather than accountants to prepare their tax returns
- Millions of people rely on system administrators to keep their work-related information secure

Critical-Safety Software

- Gotterbarn suggests that the roles and responsibilities involved in the development of safety-critical systems is a *differentiating* factor.

- A "safety-critical system" is often used to refer to computer systems that can have a direct life-threatening impact.

Safety-Critical Software

- Examples of safety-critical software systems and applications typically include:
  - aircraft and air traffic control systems
  - mass transportation systems
  - nuclear reactors missile systems
  - medical treatment systems.

Additional Safety-Critical Systems

- Bowyer (2002) extends the range of safety-critical applications to include software used in the:
  - design of bridges and buildings;
  - election of water disposal sites;
  - development of analytical models for medical treatment.

Professional Codes of Ethics

faculty of Computing & Digital Technology

- Many professions have established professional societies, which in turn have adopted codes of conduct.
  - The medical profession established the AMA (American Medical Association),
  - The legal profession established the ABA (American Bar Association).
  - Both associations have formal codes of ethics/conduct for their members.

Professional Codes for Computer Societies

faculty of Computing & Digital Technology

- The computing profession has also has professional societies.
- The two largest are:
  - The Association for Computing Machinery (ACM)
  - The Institute for Electrical and Electronics Engineers – Computer Society (IEEE-CS).

Criticisms of Ethical Codes

faculty of Computing & Digital Technology

- Ladd (1995) argues that ethical codes rest on a series of confusions that are both "intellectual and moral."
- His argument has three main points.
  - First, ethics is basically an "open-ended, reflective, and critical intellectual activity."
  - Second, codes introduce confusions with respect to *micro-ethics* vs. *macro-ethics.*
  - Third, giving codes a disciplinary function makes them more like legal than ethical rules.

In Defense of Professional Codes

faculty of Computing & Digital Technology

- *Codes of ethics* as "aspirational," because they often serve as mission statements for the profession and thus can provide vision and objectives.
- *Codes of conduct* are oriented more toward the professional and the professional's attitude and behavior.
- *Codes of practice* relate to operational activities within a profession.

Some Strengths and Weaknesses of Professional Codes

faculty of Computing & Digital Technology

Strengths	Weaknesses
Codes inspire the members of a profession to behave ethically.	Directives included in many codes tend to be too general and too vague.
Codes guide the members of a profession in ethical choices.	Codes are not always helpful when two or more directives conflict.
Codes educate the members of a profession about their professional obligations.	A professional code's directives are never complete or exhaustive.
Codes discipline members when they violate one or more of the code's directives.	Codes are ineffective (have no "teeth") in disciplinary matters.
Codes "sensitize" members of a profession to ethical issues and alert them to ethical aspects they otherwise might overlook.	Codes do not help us distinguish between micro-ethics issues and macro-ethics issues.
Codes inform the public about the nature and roles of the profession.	Directives in codes are sometimes inconsistent with one another.
Codes enhance the profession in the eyes of the public.	Codes can be self-serving for the profession.

Computing Professional Societies

faculty of Computing & Digital Technology

- The Association for Computing Machinery (ACM) is the main professional organization for computing professionals.
- It is the world's largest computing society.
- ACM brings together computing educators, researchers, and professionals to inspire dialogue, share resources, and address the field's

Association for Computing Machinery

- The Institute of Electrical and Electronics Engineers (IEEE) an association dedicated to advancing innovation and technological excellence for the benefit of humanity.
- It is the world's largest technical professional society.
- It is designed to serve professionals involved in all aspects of the electrical, electronic, and computing fields and related areas of science and technology.

IEEE Advancing Technology for Humanity

Code of Ethics

- The ACM and IEEE Computer Society jointly released the Software Engineering Code of Ethics and Professional Practice, which outlines 8 principles of software engineering ethics:
  - the obligation of the software engineer to the general public,
  - the client and employer,
  - the product,
  - the profession,
  - colleagues,
  - the engineer himself or herself and
  - the ethical management of software engineering projects.

Case - Professional Ethics Violation

faculty of Computing & Digital Technology

- **Algorithmic bias** occurs when a computer system reflects the implicit values of its human designers in its behaviour.
- Bias can be due to many factors, including but not limited to the design of the algorithm itself, unintended or unanticipated use or decisions relating to the way data is coded, collected, selected or used to train the algorithm.
- The more labelled data an algorithm sees, the better it becomes at the task it performs. However, the trade-off to this approach is that deep learning algorithms will develop blind spots based on what is missing or is too abundant in the data they're trained on.
- For instance, in 2015, Google's photos app mistakenly tagged a photo of two black people as gorillas because its algorithm hadn't been trained with enough images of dark-skinned persons.
- In another case, the AI judge of a beauty contest mostly choose white participants as winners because its training was done on images of white people.

Case - Professional Ethics Violation (continue)

faculty of Computing & Digital Technology

- Another example is a joint project by researchers at Microsoft and Boston University, in which they found sexist biases in word embedding algorithms, which are used in search engines, translation and other software that depend on natural language processing.
- Among their findings about the behaviour of word embedding algorithms was a tendency to associate words such as “programming” and “engineering” to men and “homemaker” to women.
- In this case, the bias was ingrained in the thousands of articles the algorithms had automatically scavenged and analysed form online sources such as Google News and Wikipedia. For instance, the tech industry is mostly dominated by men.
- This means that you’re more likely to see male names and pronouns appear next to engineering and executive tech jobs.
- As humans, we acknowledge this as a social problem that we need to address.
- But a mindless algorithm analysing the data would conclude that tech jobs should belong to men and wouldn’t see it as a lack of diversity in the industry.

More Cases

- In 2015, independent tests revealed that Volkswagen engineers programmed cars to cheat emissions standards.
- The 2016 U.S. presidential election, Facebook - grappling with an epidemic of fake news.
- Recent - Cambridge Analytica's weaponization of personal user information.
- These are just a few examples of how software can be used for nefarious purposes; there's no way to know definitively every possible outcome of the development and use of every piece of technology, every line of code.
- So, it's up to those who design and build the products, software packages, the apps and solutions that we use daily to do the right thing.

Overview of Whistle-Blowing

- Whistle-blower
  - Tries to report harmful situation through authorized channels
  - Rebuffed by organization
  - Makes disclosure through unauthorized channels
- Whistle-blowers punished for their actions
  - Lose job or all chances of advancement
  - Financial and emotional hardship
- False Claims Act
- Whistleblower Protection Act

Motives of Whistle-blowers

- People become whistle-blowers for different reasons
- Morality of action may depend on motives
- Good motive
  - Desire to help the public
- Questionable motives
  - Retaliation
  - Avoiding punishment

Whistle-blowing

faculty of Computing & Digital Technology

- Bowie (1982) defines whistle-blowing as "the act of an employee informing the public on the immoral or illegal behavior of an employee or supervisor."

- Bok (1997) defines whistle blowing as an act in which one "makes revelations meant to call attention to negligence, abuses, or dangers that threaten the public interest."

Criteria for Blowing the Whistle in an Engineering Context

- De George (1981) offers some specific conditions for when an engineer is:

  (a) *permitted* to blow the whistle;

  (b) *obligated* to do so.

When an Engineer is *Permitted* to Blow the Whistle

1) The harm that will be done by the product to the public is serious and considerable.

2) The engineers (or employees) have made their concerns known to their superiors.

3) The engineers (or employees) have received no satisfaction from their immediate supervisors and they have exhausted the channels available within the corporation, including going to the board of directors.

McFarland's Argument

- McFarland's model encourages engineers to shift their thinking about responsibility issues from:
  - the level of individual responsibility (at the micro-ethical level),
  - to responsibility at the broader level of the profession itself (i.e., the macro-ethical level).

Responsibility

faculty of Computing & Digital Technology

- A person could be held responsible even if he or she did not intend the outcome.
- Robert Morris, who launched the "Internet worm" in 1988, claimed that he did not intend for the Internet to be brought to a standstill.
- Morris was held responsible for the outcome *caused* by his act of unleashing the computer worm.

Liability vs. Responsibility

- *Liability* is a legal concept.
- It is sometimes used in the narrow sense of "strict liability." (responsible by law)
- To be strictly liable for harm is to be liable to compensate for it even though one did not necessarily bring it about through faulty action (e.g., when a someone is injured on a person's property).

The Importance of Taking Personal Responsibility

The ability to cause harm to members of the public is a powerful reason why those in computer-related careers must act according to ethical principles. Without universal certification and licensing and other components of a well-developed profession to rely upon, those in computer-related careers must take more personal responsibility for developing their ethical decision-making skills.

Accountability (vs. Liability and Responsibility)

- Accountability means that someone, or some group of individuals, or perhaps even an entire organization is *answerable*.
  - ...there will be someone, or several people *to answer* not only for malfunctions in life-critical systems that cause or risk grave injuries and cause infrastructure and large monetary losses, but even for the malfunctions that cause individual losses of time, convenience, and contentment.

The Problem of “Many Hands” in a computing Context

faculty of Computing & Digital Technology

- Computer systems are the products of engineering teams or of corporations, as opposed to the products of a single programmer working in isolation.
- So "many hands" are involved in their development.
- It is difficult to determine who exactly is accountable whenever one of these safety-critical systems results in personal injury or harm to individuals.

Assessing Risk

faculty of Computing & Digital Technology

- Gotterbarn (2001) argues that "ethical risks" associated with the entire "software development life cycle" must also be taken into consideration.

- The life cycle of software includes the maintenance phase, as well as the design and development stages.

Risk Assessment

- Gotterbarn worries that the concept of risk has typically been understood in terms of three conditions, where software is either:

  (i) behind schedule;

  (ii) over budget;

  (iii) fails to meet a system's specified requirements.

- Software can satisfy all three conditions and still fail to meet an acceptable standard of risk assessment

Summary

- System administration, computer programming not yet formal, full-fledged professions like medicine or law
  - No certification and licensing required
- However, computer professionals have responsible positions because their actions can harm public
- Software Engineering Code of Ethics and Professional Practice an important tool, but good judgment still required
- Organizations should have policies and procedures in place so good principles can be upheld and issues can be resolved without whistle-blowing

Reference

- Ethics and Technology: Ethical Issues in an Age of Information and Communication Technology by Tavani H. T.
- Ethics for the Information Age, 8th Edition by Michael J. Quinn (Pearson)
- Institute of Electrical and Electronics Engineers (IEEE)

  https://www.ieee.org/
- Association for Computing Machinery (ACM)

  https://www.acm.org/

This work is protected by United States copyright laws and is provided solely for the use of instructors in teaching their courses and assessing student learning. Dissemination or sale of any part of this work (including on the World Wide Web) will destroy the integrity of the work and is not permitted. The work and materials from it should never be made available to students except by instructors using the accompanying text in their classes. All recipients of this work are expected to abide by these restrictions and to honor the intended pedagogical purposes and the needs of other instructors who rely on these materials.