SOFTWARE ENGINEERING

CHAPTER 1 - INTRODUCTION

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WEEK 1

TOPICS COVERED

Professional software development

- What is meant by software engineering.

Software engineering ethics

- A brief introduction to ethical issues that affect software engineering.

SOFTWARE ENGINEERING

using appropriate theories and methods to **solve** problems bearing in mind organizational and financial constraints.

Software engineering is an **engineering** discipline that is concerned with **all aspects** of software production

technical process of development, project management , the development of tools, methods etc.

WHAT IS SOFTWARE?

Computer programs and associated documentation.

Software products may be developed for

- a particular customer (Customized products)
- or a general market (Generic products)

Examples?

WHO IS IN CHARGE FOR THE SPECIFICATION?

Product specification at initial stage and the changes later

Generic products

- The software developer

Customized products

- The customer

Who else? What roles?

- Marketing department?
- Customer supporter?
- …

GOOD SOFTWARE?

Attributes of good software:

- ***deliver required functionality***
- performance
- maintainable
- dependable
- usable

SOFTWARE COSTS

Software costs ~ computer system costs

Costs to maintain > to develop

Software engineering is concerned with cost-effective software development.

SOME FAQS ABOUT SOFTWARE ENGINEERING

Question	Answer
What is the difference between software engineering and computer science?	Computer science focuses on theory and fundamentals; software engineering is concerned with the practicalities of developing and delivering useful software.
What is the difference between software engineering and system engineering?	System engineering is concerned with all aspects of computer-based systems development including hardware, software and process engineering. Software engineering is part of this more general process.

IMPORTANCE OF SOFTWARE ENGINEERING

We need:

- Reliability & trustworthy products
- Delivering on time
- Reusable
- Cost effective in changing/evolution

- More?

FUNDAMENTAL SOFTWARE ENGINEERING ACTIVITIES

Software specification

- Define the software specification and constraints

Software development

- Design and program the software

Software validation

- Check to ensure that the software is what the customer requires.

Software evolution

- Modify the software to reflect the change

GENERAL ISSUES THAT AFFECT MOST SOFTWARE

Heterogeneity

- Increasingly, systems are required to operate as distributed systems across networks that include different types of computer and mobile devices.

Business and social change

- Business and society are changing incredibly quickly as emerging economies develop and new technologies become available. They need to be able to change their existing software and to rapidly develop new software.

Security and trust

- As software is intertwined with all aspects of our lives, it is essential that we can trust that software.

SOFTWARE ENGINEERING DIVERSITY

Many different types of software system

- ➔ no universal set of software techniques applicable to all

Application types

- Stand-alone
- Transaction-based
- Embedded system
- Batch processing
- Entertainment
- Modeling and simulation
- Data collection
- System of systems

SOFTWARE ENGINEERING FUNDAMENTALS

Some fundamental principles apply to all types of software system:

- Use a managed and understood development process
- Consider dependability and performance
- Understand and manage the software specification and requirements
- Try reuse software

SOFTWARE ENGINEERING ETHICS

Ethics?

- (Oxford dictionary) Moral principles that govern a person's behaviour or the conducting of an activity.

Fundamental Software engineering ethics

- Software engineering involves **wider responsibilities** than simply the application of technical skills.
- Software engineers must behave in an honest and ethically responsible way if they are to be respected as professionals.
- Ethical behaviour is more than simply upholding the law but involves following a set of principles that are morally correct.

ACM/IEEE CODE OF ETHICS

The professional societies in the US have cooperated to produce a code of ethical practice.

Members of these organisations sign up to the code of practice when they join.

The Code contains some Principles related to the behaviour of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession.

IEEE CODE OF ETHICS

1. to accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;

IEEE CODE OF ETHICS (CONT.)

6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

ACM CODE OF ETHICS AND PROFESSIONAL CONDUCT

1.1 Contribute to society and human well-being.

1.2 Avoid harm to others.

1.3 Be honest and trustworthy.

1.4 Be fair and take action not to discriminate.

1.5 Honor property rights including copyrights and patent.

1.6 Give proper credit for intellectual property.

1.7 Respect the privacy of others.

1.8 Honor confidentiality.

ACM SE CODE OF ETHICS AND PROFESSIONAL PRACTICE (SHORT VERSION)

PUBLIC - Software engineers shall act consistently with the public interest.

CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.

PRODUCT - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.

JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgment.

MANAGEMENT - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.

PROFESSION - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.

COLLEAGUES - Software engineers shall be fair to and supportive of their colleagues.

SELF - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

SUMMARY

Software engineering is an engineering discipline that is concerned with all aspects of software production.

Essential software product attributes are maintainability, dependability and security, efficiency and acceptability.

The high-level activities of specification, development, validation and evolution are part of all software processes.

The fundamental notions of software engineering are universally applicable to all types of system development.

SUMMARY (CONT.)

There are many different types of system and each requires appropriate software engineering tools and techniques for their development.

The fundamental ideas of software engineering are applicable to all types of software system.

Software engineers have responsibilities to the engineering profession and society. They should not simply be concerned with technical issues.

Professional societies publish codes of conduct which set out the standards of behaviour expected of their members.

READING MORE

Self-study

DECIDE INITIAL TEAM ISSUES

Set the meeting agenda and time limits.

Choose the team leader (leadership strategy?).

Decide how the team will communicate.

Identify the customer.

- The party or parties who want this application.

Get an understanding of the project in general terms.

- Don't be embarrassed if project seems too vague to you.
- Probe until you are comfortable.

SET TEAM EXPECTATIONS

Get everyone's commitment to taking required time

- Define an expected average number of hours per week
- If not forthcoming:
  - Industrial: alert management
  - Academic: inform instructor; implement written mutual evaluations
- Gather dates of planned absences

Choose team emphasis: accomplishment / learning

- Accomplishment (capable product): get a good mix of leadership, technical, writing, customer relations
- Learning: sacrifice accomplishment by allowing members to experience new activities.
- Understand manager's / instructor's emphasis.

SPECIFY HOW THE TEAM WILL COMMUNICATE

General policy:

- if in doubt, communicate. Redundancy is OK!

Usual Meeting place and time

Alternative meeting

Standards:

- The MS WORD is used for documenting
- E-mail should be via any compatible Yahoo email (especially for attachments)

Preferred mode of electronic communication:

- Ex: Unless a communication is of very limited interest to the group, it should be posted to the group site, www.xxx.yyy with automatic notification to every member. The "subject" format should be Attn. <name(s)>: subject matter.

Alternative mode of electronic communication:

- For 1-1 communication of very limited group interest, members will use e-mail and/or telephone.

Acknowledgement:

- Team members should acknowledge all electronic communication specifically targeted to them, whether asked to acknowledge or not. Senders should follow up on all significant communication that is not acknowledged.