CMPT 276 Class 01: Introduction To The Introduction To Software Engineering

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1. No, Really, What’s Software Engineering?

2. What Types of Software Are There And How Do We Develop Them?
Software Engineering Defined (Again)

• **Software Engineering**: The theories, methods, and tools for professional software development.

• It is a **discipline** concerned with all aspects of software production, from early specification to maintaining systems while in use.

• Good practices to solve problems within business and financial restraints.
Workplace Terminology

• **Programmer**: Anyone who writes code.

• **Engineer**: Technical professionals, often licensed.

• **Software Developer**: Applies engineering principles to the production of reliable, maintainable, and consistent software.
Why Is Software Engineering Important?

• Everything runs on software now.

• Imagine the pandemic without the ability to work from home.

(Note: some people DO have to live like that)

Image credits: https://en.wikipedia.org/wiki/Automated_teller_machine
https://en.wikipedia.org/wiki/Smartphone
Objectives Of Software Engineering

• Producing **reliable** systems **quickly** and **affordably**.

• The cost of engineering principles **scale** better than the individual craftsman approach.

• An ounce of prevention is worth a pound of cure: **fixing post-release** systems is expensive!
Software Process Activities

1. **Specification**
   Customer and developers define software features and constraints on its operation.

2. **Development**
   Design and program the software.

3. **Validation**
   Ensure software is what customer requires.

4. **Evolution**
   Modify software to reflect changing customer and market requirements.
Essential Attributes of Good Software

• Maintainability
  – Design software with evolution in mind.

• Dependability & Security
  – Must be reliable, secure, and safe. Must not cause physical or economic damage on failure.
  – Malicious users unable to access/damage system.

• Efficiency
  – Efficient use of resources: processing time, memory.

• Acceptability
  – Software must be acceptable its users: understandable, usable, and compatible with other systems.
Class Discussion: Comparing Software Development Challenges

**Animal Crossing**
- Maintainability
- Dependability
- Efficiency
- Acceptability

**A Self-Driving Car**
- Maintainability
- Dependability
- Efficiency
- Acceptability

1. **Stand-alone Applications**
   - Include all necessary functionality, does not need to be connected to a network.

2. **Embedded Applications**
   - Software control systems for hardware devices. There are more embedded systems than any other type of system

3. **Entertainment Applications**
   - Games!
More Types Of Applications

4. Batch Processing
   - Process data in large batches (Ex: payroll; monthly billing by a phone company)

5. Modelling and Simulation
   - For scientists and engineers to model complex physical process or simulations (Ex: car crashes, nuclear reactions, weather prediction)

6. Data Collection
   - Collect sensor data to send to other systems for processing.

7. Systems of Systems
   - Combine some other software systems. Ex: Car.
Even More Types Of Applications

8. Web Software
   - Reuses many system components
   - User interfaces limited by the web browser.

9. Software as a Service
   - Applications run remotely on the cloud. Users don't buy software, they pay according to use (Ex: Google docs, Amazon Web Services, etc)
   - Cloud ‘as-a-service’ types:
     a. Software as a Service (SaaS)
     b. Platform as a Service (PaaS)
     c. Infrastructure as a Service (IaaS)
General Software Issues

• Diverse Types of Systems
  – Distributed systems operate across networks, different types of computers, and many mobile devices.

• Changing Environment
  – Software has to keep up with rapidly changing business and society.
  – Must change existing software and rapidly develop new software.

• Security and Trust
  – Software is intertwined with all aspects of our lives, it’s essential we can trust it.
Diversity Of Needs

• **Common Needs**: All software projects should be professionally managed and developed.

• **Different Needs**: Different types of systems require different techniques
  – Games can be iterated on.
  – Life-critical systems need a complete specification first time!

• Select software engineering methods and tools by:
  – The **type** of application being developed.
  – The **requirements** of the customer.
  – The **background** of the development team.
Recap – Now You’re Introduced To Software Engineering!

• **Software Engineering Defined:** a discipline concerned with all aspects of software production.

• **Essential Software Attributes:** maintainability, dependability & security, efficiency, and acceptability.

• **Software Process Activities:** specification, development, validation and evolution.

• **Fundamentals of software engineering** are applicable to all types of system development.

• **Different types of systems** require different software engineering tools and techniques.
Next week – Version Control!