CSE 403: Software Engineering, Spring 2015

courses.cs.washington.edu/courses/cse403/15sp/

Introduction

Emina Torlak
emina@cs.washington.edu

outline

Staff, About, Format, Advice, Goals

Course staff: cse403-staff@cs.washington.edu

Emina Torlak

(emina)

Meg Campbell

(meganca)

Darioush Jalali

(darioush)

focus

This course is about *engineering* software.

What is software engineering?

What is software engineering?

software engineering ≠ programming

What is software engineering?

software engineering ≠ programming

Software engineering, broadly defined: creating and maintaining software applications by applying technologies and practices from computer science, project management, and other fields.

What is software engineering?

software engineering ≠ programming

Software engineering, broadly defined: creating and maintaining software applications by applying technologies and practices from computer science, project management, and other fields.

Software engineering is about people working in teams under constraints to create value for their customers.

What is software engineering?

"The first step toward the management of disease was replacement of demon theories and humours theories by the germ theory. That very step, the beginning of hope, in itself dashed all hopes of magical solutions. It told workers that progress would be made stepwise, at great effort, and that a persistent, unremitting care would have to be paid to a discipline of cleanliness. So it is with software engineering today."

Fred Brooks

Aspects of software engineering

1. Processes, methods, and techniques necessary to turn a concept into a robust deliverable that can evolve over time
2. Working with limited time and resources
3. Satisfying a customer
4. Managing risk
5. Teamwork and communication

Ties to many fields

- computer science (algorithms, data structures, languages, tools)

Ties to many fields

- computer science (algorithms, data structures, languages, tools)
- business/management (project mgmt, scheduling)
- economics/marketing (selling, niche markets, monopolies)
- communication (managing relations with stakeholders: customers, management, developers, testers, sales)
- law (patents, licenses, copyrights, reverse engineering)
- sociology (modern trends in societies, localization, ethics)
- political science (negotiations; topics at the intersection of law, economics, and global societal trends; public safety)
- psychology (personalities, styles, usability, what is fun)
- art (GUI design, what is appealing to users)

Ties to many fields

- computer science (algorithms, data structures, languages, tools)
- business/management (project mgmt, scheduling)
- economics/marketing (selling, niche markets, monopolies)
- communicatio mers, management, c
- law (patents, licenses, copyrights, reverse engineering)
- sociology (modern trends in societies, localization, ethics)
- political science (negotiations; topics at the intersection of law, economics, and global societal trends; public safety)
- psychology (personalities, styles, usability, what is fun)
- art (GUI design, what is appealing to users)

Necessarily "softer" than other parts of CS; fewer clearly right/wrong answers

Roles of people in software

- **customer / client**: wants software built
- **managers**: make plans, coordinate team
- **developers**: design and write code
- **testers**: perform quality assurance (QA)
- **users**: purchase and use software product

Roles of people in software

- **customer / client**: wants software built
    - often doesn't know what he/she wants
- **managers**: make plans, coordinate team
- **developers**: design and write code
- **testers**: perform quality assurance (QA)
- **users**: purchase and use software product

Roles of people in software

- **customer / client**: wants software built
    - often doesn't know what he/she wants
- **managers**: make plans, coordinate team
    - hard to foresee all problems in advance
- **developers**: design and write code
- **testers**: perform quality assurance (QA)
- **users**: purchase and use software product

Roles of people in software

- **customer / client**: wants software built
    - often doesn't know what he/she wants
- **managers**: make plans, coordinate team
    - hard to foresee all problems in advance
- **developers**: design and write code
    - hard to write complex code for large systems
- **testers**: perform quality assurance (QA)

- **users**: purchase and use software product

Roles of people in software

- **customer / client**: wants software built
    - often doesn't know what he/she wants
- **managers**: make plans, coordinate team
    - hard to foresee all problems in advance
- **developers**: design and write code
    - hard to write complex code for large systems
- **testers**: perform quality assurance (QA)
    - impossible to test every combination of actions
- **users**: purchase and use software product

Roles of people in software

- **customer / client**: wants software built
    - often doesn't know what he/she wants
- **managers**: make plans, coordinate team
    - hard to foresee all problems in advance
- **developers**: design and write code
    - hard to write complex code for large systems
- **testers**: perform quality assurance (QA)
    - impossible to test every combination of actions
- **users**: purchase and use software product
    - can be fickle and can misunderstand the product

format

Course format

A typical 403 week

A typical 403 week

- **Class sessions** to discuss best practices (MWF)

A typical 403 week

- **Class sessions** to discuss best practices (MWF)
- **Sections** to dig deeper, discuss pragmatics and tools (Th)

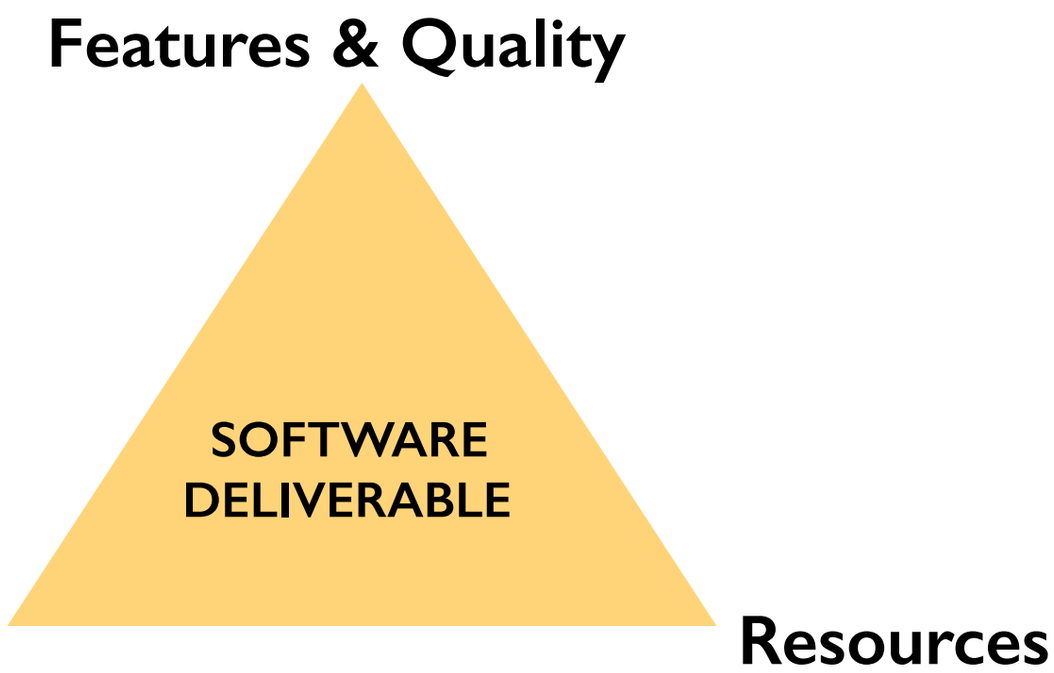
A typical 403 week

- **Class sessions** to discuss best practices (MWF)
- **Sections** to dig deeper, discuss pragmatics and tools (Th)
- **Reading assignments** to reinforce the concepts

A typical 403 week

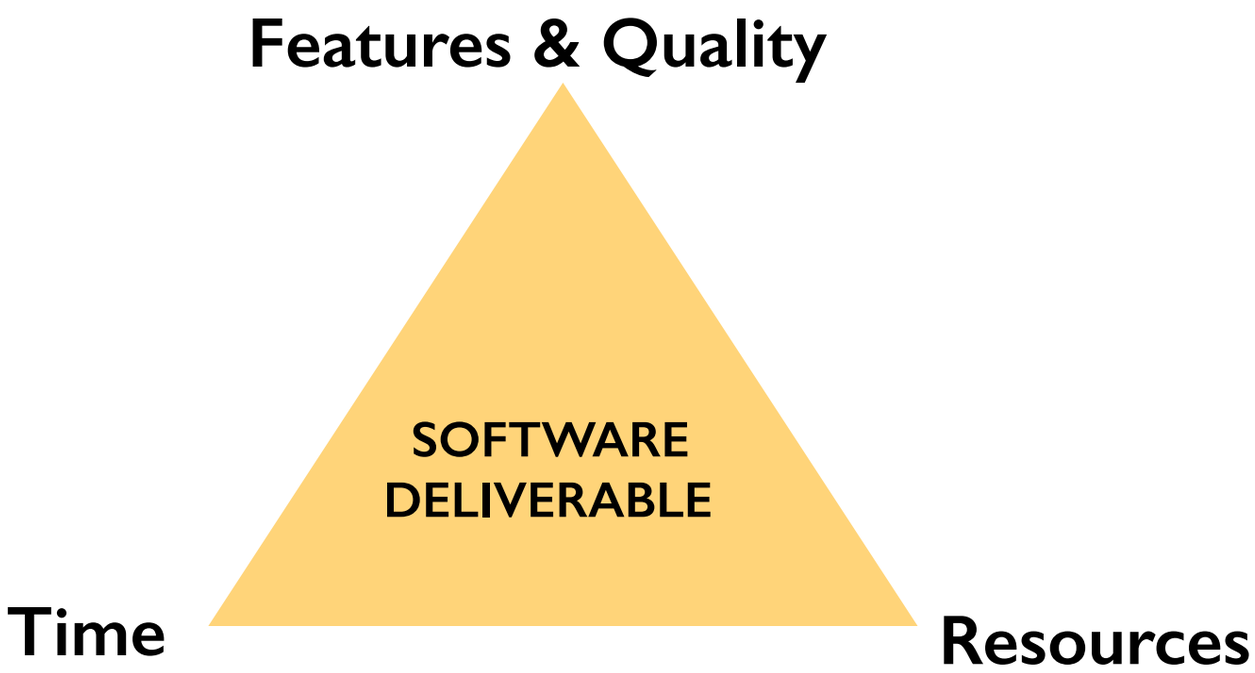
- **Class sessions** to discuss best practices (MWF)
- **Sections** to dig deeper, discuss pragmatics and tools (Th)
- **Reading assignments** to reinforce the concepts
- **Group project**: to give you hands-on experience with the material
    - **Technical** challenges given the larger project
    - **Social** challenges given the team effort
    - Frequent meetings (at **minimum**, each Tuesday)

What is a software project?



Projects are a balance of three dimensions, with the goal of producing a successful deliverable.

What is a software project?



Projects are a balance of three dimensions, with the goal of producing a successful deliverable.

"Good, fast, cheap … choose two"

The project

The project

- You make product proposals
    - And then vote on which products to "fund"

This Thursday and Friday!

The project

- You make product proposals
    - And then vote on which products to "fund"
- You're divided into project teams of 6-8 students
    - Larger teams, larger projects, like industry

This Thursday and Friday!

The project

- You make product proposals
    - And then vote on which products to "fund"
- You're divided into project teams of 6-8 students
    - Larger teams, larger projects, like industry
- You develop your deliverable in stages
    - Reflects modern methodologies for effective development

This Thursday and Friday!

The project

- You make product proposals
    - And then vote on which products to "fund"
- You're divided into project teams of 6-8 students
    - Larger teams, larger projects, like industry
- You develop your deliverable in stages
    - Reflects modern methodologies for effective development
- A TA will act as your customer
    - A project is successful only if it satisfies its customer

This Thursday and Friday!

Project development stages

- Proposal
- Requirements
- Design
- Implementation
- Testing, validation, verification
- Documentation
- Customer exposure
- Final deliverable

Choose your own tools and frameworks!

We'll hit the ground running …

- Your chance to turn a great idea into a product!
- Prepare a 3-slide, 3-minute product pitch in teams of 2
    - Vision and novelty
    - Architecture
    - Challenges and risks
- Turn in **Wed by 11pm** and present on Thu & Fri
- Vote next **Friday by 11pm**
    - Rank your choices
    - Self-select groups (or the staff will …)

Project culture

Project culture

- This is a real project
    - We expect you to work to build a real system
    - To be used by real people

Project culture

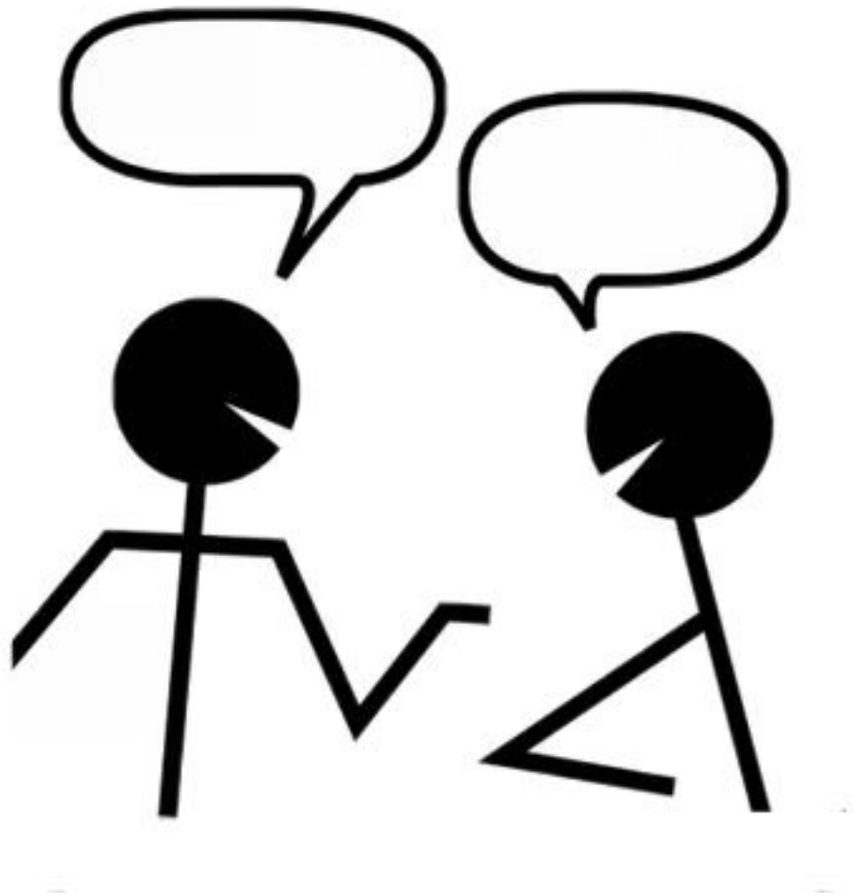
- This is a real project
    - We expect you to work to build a real system
    - To be used by real people
- This is real engineering
    - Take initiative
    - Find and solve problems yourselves
    - Coding is only part of the job
    - Good planning and design, hitting your market, and working well with your team, are all needed for success

Grading and academic integrity

- Grading
    - Project: 65%
    - Reading assignments: 15%
    - Final exam: 20%
- Academic integrity
    - Simple: *do not cheat*!
    - Do individual work by yourself.
    - Do group work with your teammates only.

Lessons from past students

Communication



Communication

- Foundation of the success of our team was communication

Communication

- Foundation of the success of our team was communication
- Team communication and cooperation are all-important

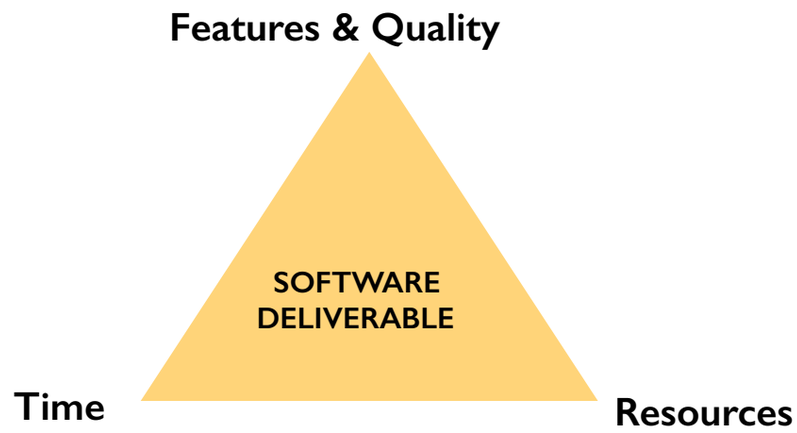
Communication

- Foundation of the success of our team was communication
- Team communication and cooperation are all-important
- Working together (physically) was good

Communication

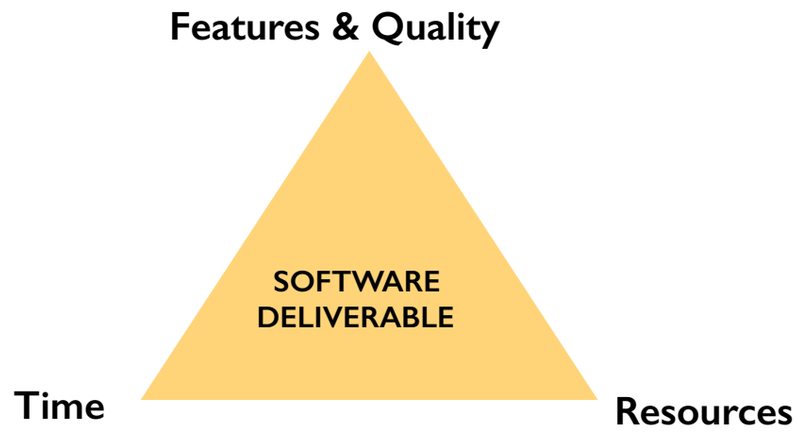
- Foundation of the success of our team was communication
- Team communication and cooperation are all-important
- Working together (physically) was good
- Well-run and consistently scheduled meetings help a project a lot

Scheduling



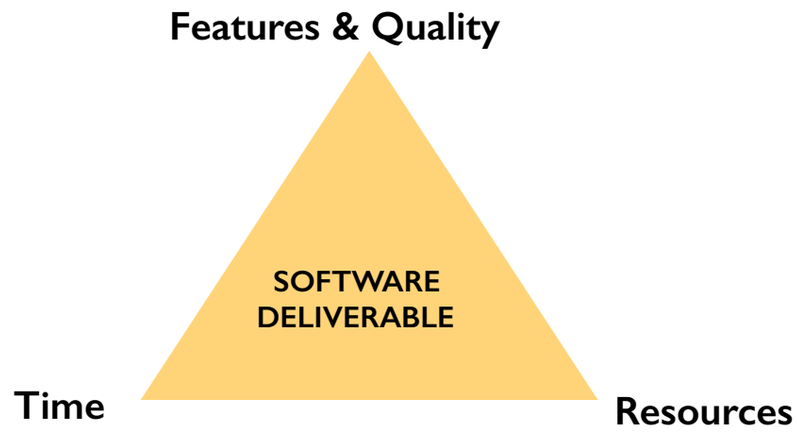
Scheduling

- We often underestimated tasks. If we had spent more time analyzing each task and breaking it down into more manageable chunks our estimated completion times would have been more accurate.



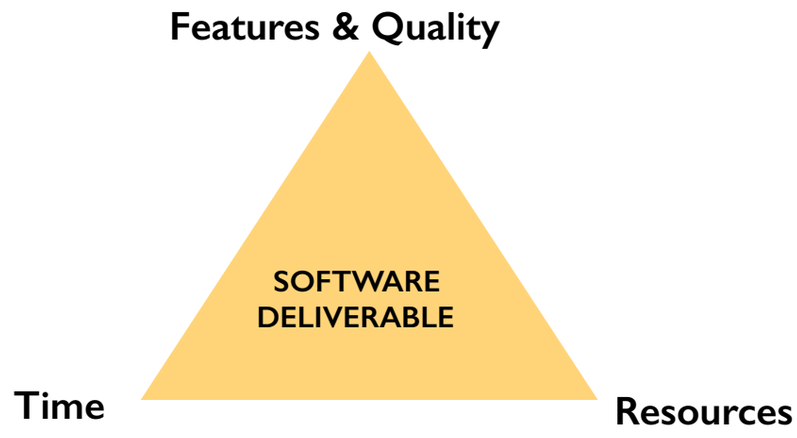
Scheduling

- We often underestimated tasks. If we had spent more time analyzing each task and breaking it down into more manageable chunks our estimated completion times would have been more accurate.
- Get things done early; don't cram at the end



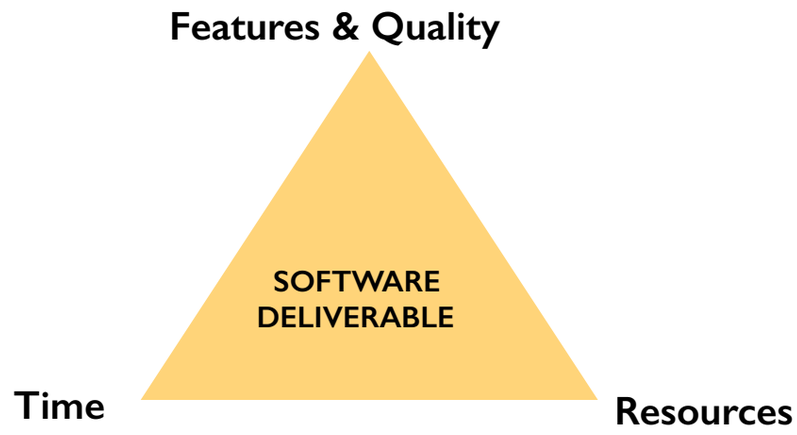
Scheduling

- We often underestimated tasks. If we had spent more time analyzing each task and breaking it down into more manageable chunks our estimated completion times would have been more accurate.
- Get things done early; don't cram at the end
- Remember you can cut features (triple constraint)



Scheduling

- We often underestimated tasks. If we had spent more time analyzing each task and breaking it down into more manageable chunks our estimated completion times would have been more accurate.
- Get things done early; don't cram at the end
- Remember you can cut features (triple constraint)
- Don't underestimate the difficulty of learning new programming languages, frameworks, and tools



Testing and coordination

Testing and coordination

- Thoroughly testing your code and ensuring that your code passes all current tests before submitting is very helpful

Testing and coordination

- Thoroughly testing your code and ensuring that your code passes all current tests before submitting is very helpful
- We needed a better upfront testing design

Testing and coordination

- Thoroughly testing your code and ensuring that your code passes all current tests before submitting is very helpful
- We needed a better upfront testing design
- We learned (through some pain) to ensure to do small, frequent updates and commits. Failing to do this results in merges that can be a nightmare.

goals

This sounds like a lot of work! Why take this course?

What’s in it for you?

What's in it for you?

- See how software is produced, from idea to ship to maintenance

What's in it for you?

- See how software is produced, from idea to ship to maintenance
- Get exposure to software development practices in use today

What's in it for you?

- See how software is produced, from idea to ship to maintenance
- Get exposure to software development practices in use today
- Get experience collaborating in a team toward a common goal

What's in it for you?

- See how software is produced, from idea to ship to maintenance
- Get exposure to software development practices in use today
- Get experience collaborating in a team toward a common goal
- Be able to articulate and understand technical ideas

Unique aspects of CSE 403

- Cross-disciplinary nature of the subject
- Larger teams
- Propose and work on your own ideas
- Course staff in the "coach" role
- Mistakes along the way are encouraged, not penalized
- Few clearly right/wrong answers
- Plans always change
- Content: software design, testing, project management, etc.

Isn't this just like an internship?

- It's not:
    - Focused on one role in the team (often dev. or test)
    - Requirements, arch, high-level design may be set
    - Less opportunity for reflection
    - Less generalization (such as from reading papers)
    - Mentor may be more focused on results than process and developing you as an engineer
- Internships are complementary to CSE 403
- People who have had internships learn different things in CSE 403, but no less

CSE403

courses.cs.washington.edu/courses/cse403/15sp/