CSE403 ● Software engineering ● sp12

Week 2				
Monday	Tuesday	Wednesday	Thursday	Friday
• ***Requirements*** • …	• Group meetings – let your group TA know where you meet	• Team work and structure	• SRS information	• Agile

There is no "I" in 'team'

(But there is a "me" in 'team')

Reprise: How big is 324 MLOC?

How long it would take you to type 324 MLOC
(assume 5 words/LOC @ 50 wpm)

~32,000,000 min ≈ 61 years
no thinking • no sleeping • no breaks

Teams of six people ≈ 10 years

Teams of 50 people ≈ 1¼ years

What's right and what's wrong with this reasoning?

Team pros and cons

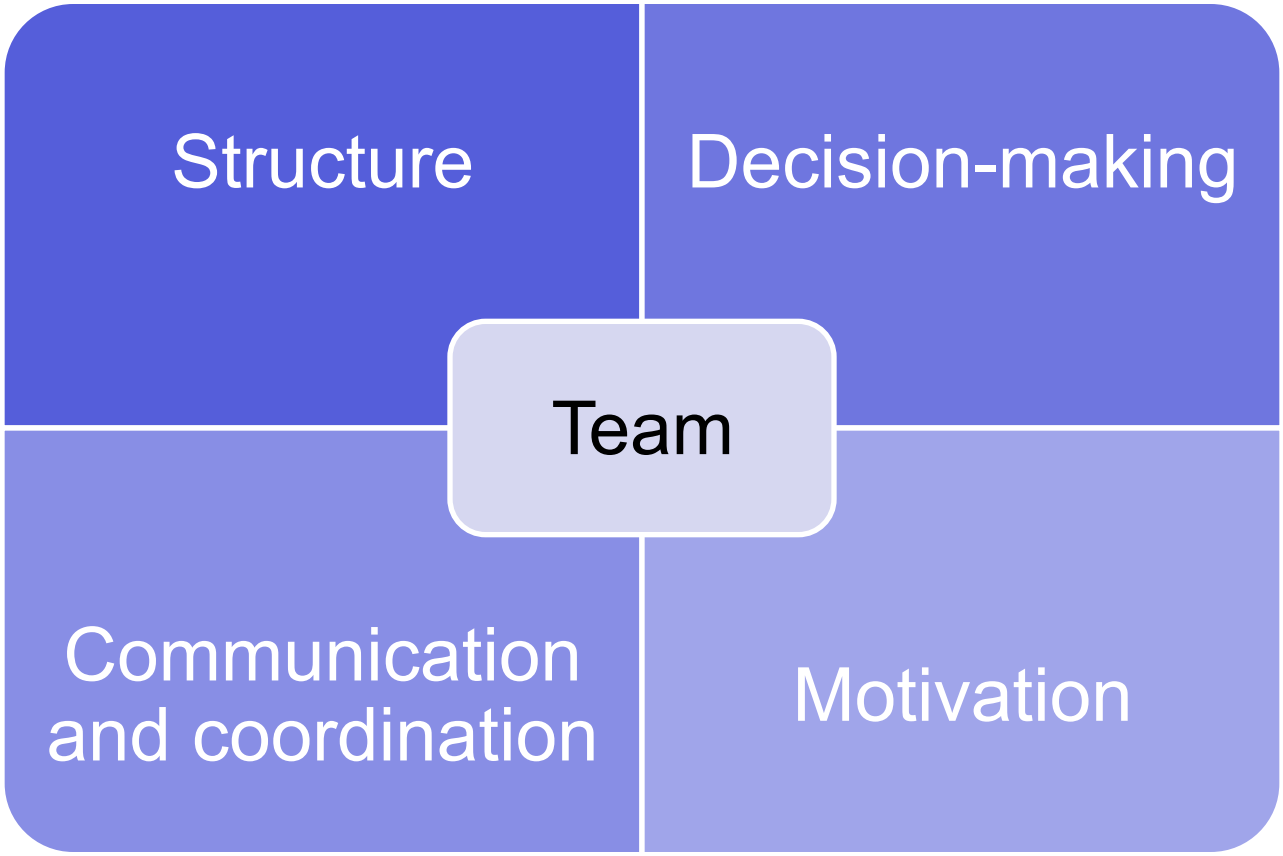
- Benefits
  - Attack bigger problems in a short period of time
  - Utilize everyone's collective experience and skills
- Risks
  - Communication and coordination issues
  - Groupthink: diffusion of responsibility, going along
  - Working by inertia, not planning ahead
  - Conflict or mistrust between team members

An apparent aside: diversity

From Diversity in Engineering by Wm. Wulf

Every time an engineering problem is approached with a pale, male design team, it may be difficult to find the best solution, understand the design options, or know how to evaluate the constraints.

…it is that the range of design options considered in a team lacking diversity will be smaller. … It is that the most elegant solution may never be pursued. …There is a real economic cost to that. Unfortunately, it is an opportunity cost … and those kinds of costs are very hard to measure.

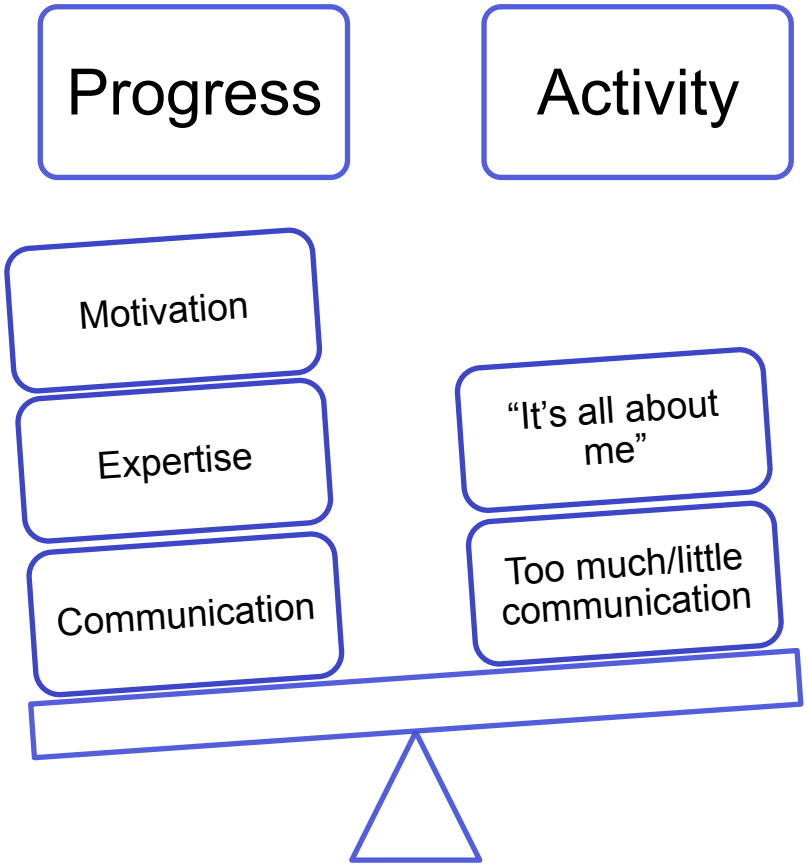


A team is a set of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable. – Katzenbach and Smith

Issues affecting team success

- Presence of a shared mission and goals
- Motivation and commitment of team members
- Experience level – and presence of experienced members
- Team size – and the need for bounded yet sufficient communication
- Team organization – and results-driven structure
- Reward structure within the team – incentives, enjoyment, empowerment (e.g., ownership, autonomy)

Team structures: tricky balance



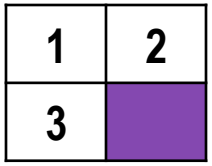
Artist's rendition only

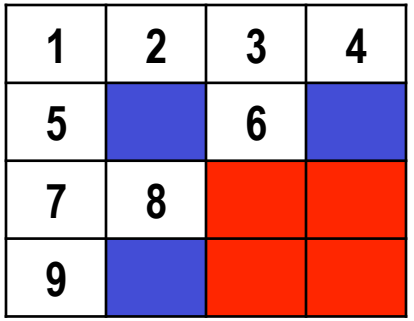
Communication: essence

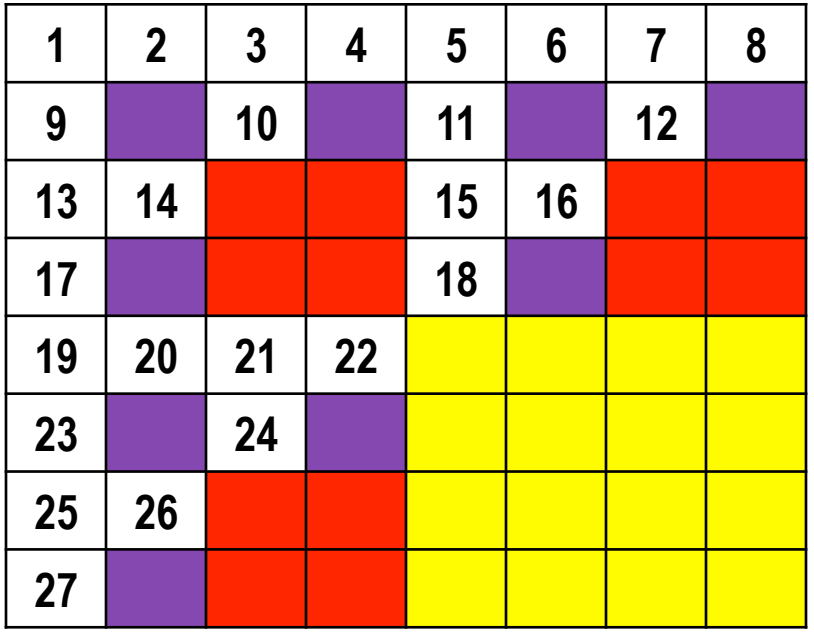
- Need a team to develop large projects
- Progress towards this goal requires concurrent *work* to achieve a team's multiplicative effect
- Concurrent work must be coordinated across the team – or activity may by itself be mistaken for progress towards the goal
- Communication is the foundation for team coordination – it there to allow progress towards the goal, but it isn't progress in and of itself

Communication: challenges

- Bigger teams ⇒ more communication
  - ⇒ a smaller multiplier effect
  - Everybody to everybody communication has quadratic cost (in team size)
  - Maybe ¼ of each increase in team size goes to communication cost
    [on right: 75% ● 56% ● 42%]
- Communication may introduce miscommunication
  - Electronic communication may be more susceptible to miscommunication







Common SWE team responsibilities

- Project management
- Functional management
- Designers/architects
- Developers: programmers, testers, integrators
- Lead developer (“tech lead”)

- These could be all different team members, or some members could span multiple roles
- Key: Identify and stress roles and responsibilities
  - *Responsibility should come with both authority and accountability*

Organizing by functionality

- Pragmatic Programmer tip: “Organize around [project] functionality, not job functions”
- Not testers and developers and maintainers *etc*., but UI and backend and network *etc*.

Benefits and costs of this approach?

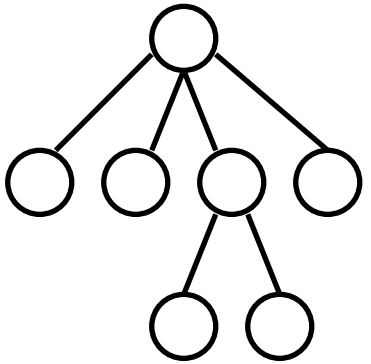
Extra credit

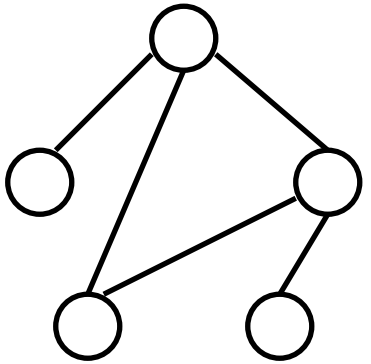
Who will do the ...

- Scheduling? Development? Testing? Documentation (spec, design, write-ups, presentations)? Build/release preparation? Team communication? Customer communication? …

Team structure models

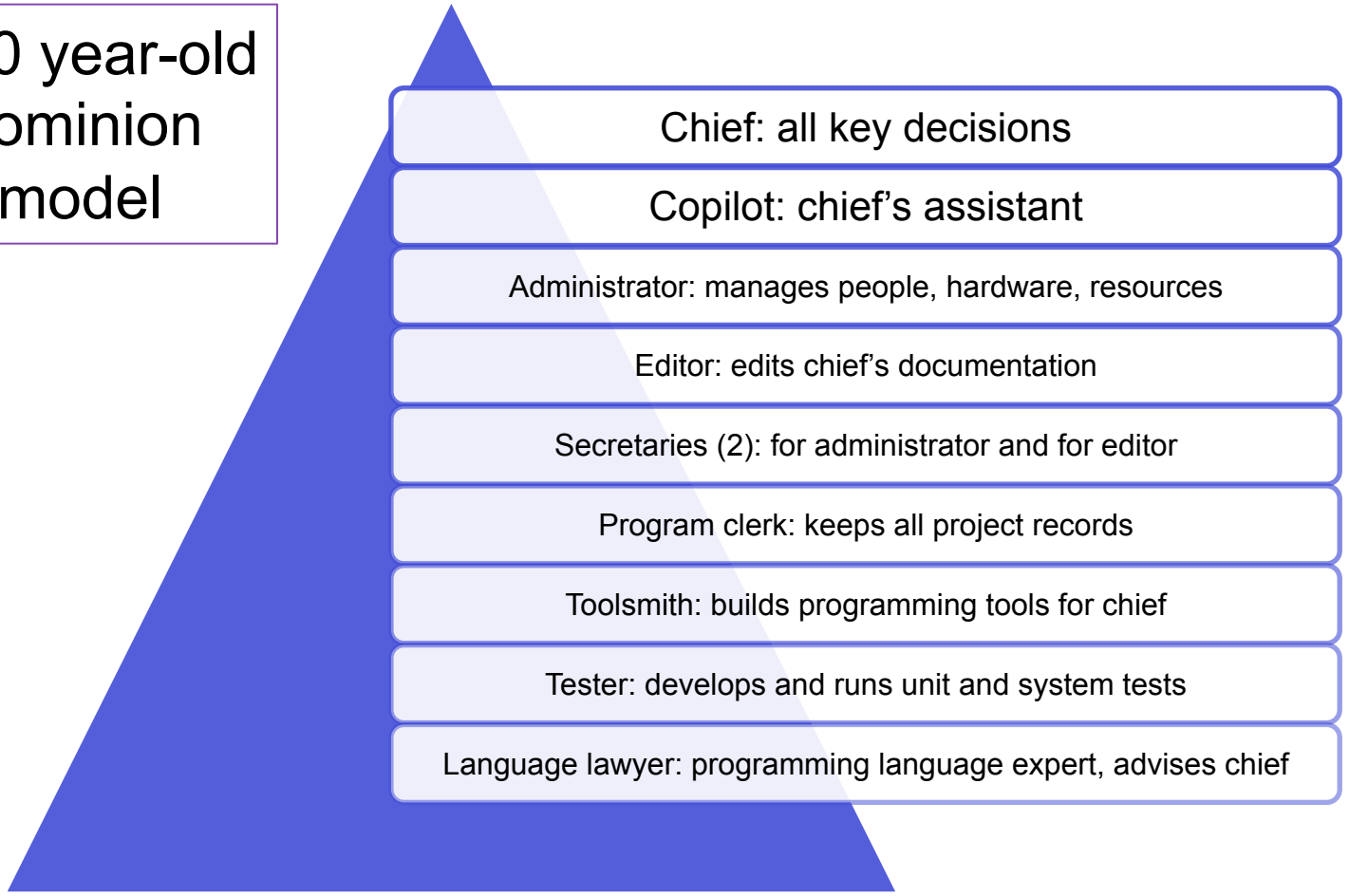
- Dominion model
  - ☑ clear chain of responsibility
  - ☑ people are used to it
  - ☒ single point of failure
  - ☒ less shared sense of ownership
- Communion model
  - ☑ a community of leaders, each in his/her own domain
  - ☑ inherent sense of ownership
  - ☒ people aren't used to it (and this scares them)





Surgical/Chief Programmer Team
[Baker, Mills, Brooks]

A 40 year-old dominion model



Toshiba Software Factory [Y. Matsumoto]

- Late 1970's structure for 2,300 software developers producing real-time industrial application software systems (such as traffic control, factory automation, etc.)
- Unit Workload Order Sheets (UWOS) precisely define a software component to be built
- Assigned by project management to developers based on scope/size/skills needed
- Completed UWOS fed back into management system
- Highly measured to allow for process improvement

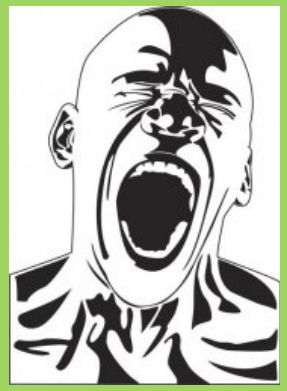
Microsoft's team structure [microsoft.com]

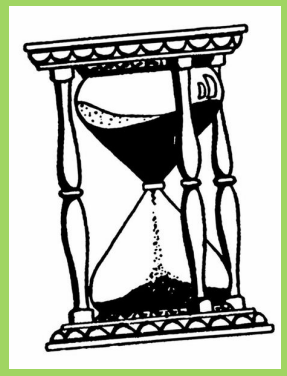
- **Program Manager**. Leads the technical side of a product development team, managing and defining the functional specifications and defining how the product will work.
- **Software Design Engineer**. Codes and designs new software, often collaborating as a member of a software development team to create and build products.
- **Software Test Engineer**. Tests and critiques software to assure quality and identify potential improvement opportunities and projects.

Other kinds/styles of teams

- **problem-resolution**: a focused attack on specific bugs, problems, issues
- **creative**: coming up with and exploring new ideas
- **tactical-execution**: carries out a defined plan
- Some other team models
  - **skunkworks**: turn the developers loose
  - **SWAT**: skilled with a particular advanced tool(s)
  - **Professional Athletic**: carefully selected people w/ very specialized roles
  - **Theater**: “director” assigns roles to others

Enough from me – what do you want to know about teams and teamwork?





Team leadership

- Who makes the important product-wide decisions in your team?
  - One person?
  - All, by unanimous consent?
  - Consensus?
  - Other options?...
- Is this an unspoken or an explicit agreement among team members?

Making decisions: some guidelines

- Delegate when possible – and make sure every member has a significant role
- Let everyone give their input – even if some of it appears to be off-track
- Write down pros/cons of alternatives, evaluate cost/ benefit/risks – how long will it take? is it needed? Plan B? …
- Have a clear procedure for resolving disagreement – strive for consensus, but if it cannot be achieved …
- Pareto analysis: find 20% of work that solves 80% of problem
- Compromise, compromise, compromise

Once decisions are made

- Write down decisions and responsibilities clearly
  - Document electronically; post to a shared wiki or web page that can be retrieved easily
- Determine how to accomplish the decision
  - Specific dates for progress – usually in terms of several smaller milestones
  - Agree to coordinate when milestones are met
- Prioritize and order goals and TODOs
  - List by urgency, by due date/milestone date
  - List team member responsibility

Results-driven structure

- Clear roles and responsibilities – each person knows and is accountable for their work
- Monitor individual performance, hold people accountable – who is doing what, are we getting the work done?
- Effective communication system – available, credible, tracking of issues and decisions
- Fact based decisions – focus on the facts, not the politics, personalities, …

Motivation

- How can you motivate all team members to do their share?
- What happens if they don't?
- What happens if they can't?

What motivates you? Others?

Incomplete and overlapping…

- Achievement
- Recognition
- Advancement
- Salary
- Possibility for growth
- Interpersonal relationships
  - Subordinate
  - Superior
  - Peer
- Status
- Technical supervision opportunities
- Company policies
- Work itself
- Work conditions
- Personal life
- Job security
- Responsibility
- Competition
- Time pressure
- Tangible goals
- Social responsibility
- Other?

What de-motivates you? Others?

Dementors are among the foulest creatures that walk this earth. They infest the darkest, filthiest places, they glory in decay and despair, they drain peace, hope, and happiness out of the air around them… Get too near a Dementor and every good feeling, every happy memory will be sucked out of you. If it can, the Dementor will feed on you long enough to reduce you to something like itself…soulless and evil. You will be left with nothing but the worst experiences of your life.

–Remus Lupin to Harry Potter

DE MENTORING AND DE MANAGEMENT OF DA STUDENTS

DAVID NOTKIN • UW COMPUTER SCIENCE & ENGINEERING

Incomplete and overlapping…

- Micro-management or no management
- Lack of ownership
- Lack of effective reward structure – including lack of simple appreciation for job well done
- Excessive pressure and resulting “burnout”
- Allowing “broken windows” to persist
- Lack of focus in the overall direction
- Productivity barriers – asking too much, not allowing sufficient learning time, using the wrong tools, …
- Too little challenge
- Work not aligned with personal interests and goals
- Poor communication inside the team

A productive team

- Specific, small, attainable goals that can be visualized
- Shared long-term vision
- Frequent communication and updates
- Meet in person to work as much as possible
- Minimize work done “solo” – use small teams
- Build good team camaraderie
- …

Road blocks?

- Technical confusion
  How do I start implementing that feature?
- Unclear responsibilities
  Oh, am I supposed to do that?
- Unclear due dates
  When was I supposed to have that done?
- Lack of milestones
  But it's not due until next Friday!
- Distraction
  Time to work on 403 ... Ooh look, Men of Sieg Hall calendar!

Slackers

- What do you do if a group member is slacking off?
  - Try to find out why
  - Check in more frequently
  - Team them up
  - Meet more in person

- If the problem persists…
  - PM can send a kind but firm email with concerns
  - In-person meeting with PM (and maybe a few members)
  - Talk to us to let us know about the issue and see if we can help

Group relations: handle with care

- Unnecessarily singling out individuals – by words or by actions, intentional or unintentional – is counterproductive
  - There are (at least) two sides to every story
- The goal is to maintain positive group relations and make progress on the project
  - Problems must be dealt with, but criticism does not necessitate being harsh, rude, mean
- Depersonalize when possible
  - “We are concerned about XYZ.”
  - "We are a little behind, so let's all meet in person in the lab today.”

Email

- Hey Dana, I was wondering if you finished the XYZ feature you were assigned yet? You were late on the ABC feature from the last phase so I thought I better email you. When you have time, please tell me when XYZ is done. –Hunter
- Hey Dana, how is your work on the XYZ going? It's due a week from Friday. Like we talked about at our last meeting, we are hoping to have the rough sketch of the first 2/3 of it by Sunday so we can go over it together. Please let me know by tomorrow night how much progress has been made. If you have any questions or need some help, let me know. We'll all meet Saturday in person and you can give us another update at that time. Thanks! –Hunter

Be quantitative and specific

- Use specific, incremental goals, not just for things to be “done”
- List particular dates that results are expected
- Give an expected date/time to reply to a communication
- Offer support, help, gratitude as appropriate – in contrast to being accusatory
- Remind about upcoming deadlines, meetings, key points

Effective meetings

- An agenda of topics to discuss (email ahead of time)
- Each member/subgroup reports its progress
- Get an update on every current work item
- Take notes on decisions made and post them to wiki or such
- Have whiteboard/paper handy for sketching out ideas
- Keep everyone's attention (ban laptops/cell phones?)
- Walk away with a clear plan of action, set of TODOs

Meeting gotchas

- Don't “meet just to meet” – if you have nothing to discuss, cancel it or make it a work meeting in the lab
- Use email, not meetings, for a one-way flow of information
- Start on time, end on time – a team member (often the PM) should track the agenda and time
  - Steer sidetracked discussion back to the agenda
  - If time runs out, push specific items to the next meeting and/or email
- Don't ignore a group member's input – even if you don't go forward with their idea, at least listen to it

Week 2				
Monday	Tuesday	Wednesday	Thursday	Friday
• ***Requirements*** • …	• Group meetings – let your group TA know where you meet	• Team work and structure	• SRS information	• Agile

- Weekly team summary: due Friday @ 11PM on DropBox by each PM
- SRS: due Tuesday April 10 @ 11PM on DropBox by each PM

Any questions?