CSc648/848 Software Engineering Fall 2022

SW Engineering Teamwork (including global/distributed environment)

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Important

Teamwork - General

- **Teamwork vs. group work**
  - *Group work*: Working together to deliver M0 is group work – you help each other but each of you has to do his/her same M0 deliverable
  - *Teamwork*: Working on final class project is teamwork – you all work together on pieces to complete ONE deliverable

- **Teamwork vs. group work**
  - **https://3back.com/well-formed-teams/teamwork-vs-group-work/**
  - https://smallbusiness.chron.com/differences-between-group-work-team-work-11004.html

Essence of Teamwork

- From
  - https://3back.com/well-formed-teams/teamwork-vs-group-work/

- Sublimation of individual ego and need for recognition to the needs of the Team
- Sharing and balancing workload dynamically at daily or finer granularity
- Offering and requesting help in an environment of trust
- Willingness to make personal sacrifices in support of the Team
- Recognition that the Team's goal outweighs (but does not exclude) individual goals

Processes/phases in teamwork (general) – http://en.wikipedia.org/wiki/Teamwork

- *Transition process* (between periods of action)
  - Mission analysis
  - Goal specification
  - Strategy formulation
- *Action process* (when the team attempts to accomplish its goals and objectives)
  - Monitoring progress toward goals
  - Systems monitoring
  - Team monitoring and backup behavior
  - Coordination
- *Interpersonal process* (present in both action periods and transition periods)
  - Conflict management
  - Motivation and confidence building
  - Affect management

Important

Important

Professionals in terms of the motivation (Bass, Dunteman 1963)

- *Task oriented:* motivated by the work they do. Often like to work alone
- *Self-oriented:* primarily interested by personal success. Often like to work alone
- *Interaction-oriented:* motivated by interacting with co-workers and users (important for UI). Usually better communicators, like to work in a team

- What are you?
- **As a manager, know this for your people and assign them to roles consistent with their motivation**

Important

Current research on team success

- Team success correlates with team cohesion and NOT with the sum of team members IQs or expertise

Teamwork in SE

CRITICAL AND KEY FACTOR

IMPORTANT

SW Management and teamwork

Important

- Process (learned in this course)
- Technology (you studied it)

BUT also

- **People (surprise, this might be the key!)**

Two great reads

- Most SW project failures related to poor SW teamwork, management, process, not to technical issues
  - Charette, R. N: "Why Software Fails." *IEEE Spectrum*, September 2005, pp. 42.
- What Google leaned from its quest to build the perfect team – Google (NY Times 02/28/16)
  - http://www.nytimes.com/2016/02/28/magazine/what-google-learned-from-its-quest-to-build-the-perfect-team.html?_r=0

What is SW management

- Project management
  - Organizing, planning and scheduling SW projects
- **People management**
  - Hiring, motivating, organizing, rewarding, assigning tasks
- Cost Management
  - Planning and estimating costs, productivity, monitoring costs etc.
- Quality Management
  - Quality assurance, standards, planning, control, SW measurements and metrics
- Process management and improvement
  - Process measurement and assessment, analysis and modeling, SEI Capability Maturity Model (CMM)

Important

People Management

Important

People "stuff" in SE

- People "stuff" is critical for success of SW projects
- People are the key and biggest asset in SW companies ➔ proper management and motivation of the **people** is the key
- Upper management, client management and users are **people**, and they have to be "managed" also
- People management involves some policies and rules, but above all it is about proper communication, motivation, listening and respect
- Balancing individualism v.s. team work
- SW Engineers productivity varies widely ➔ need to hire and motivate the best you can get

One of SFSU CS department's learning objectives

Objective 3

- Students will be able to solve problems working **in group settings**. This translates to the following outcomes; students will demonstrate:
  - 3.1 Knowledge of basic SW engineering methods and practices, and their appropriate application
  - 3.2 Knowledge and application of collaborative tools for SW development
  - 3.3 Successful implementation of teamwork behavior and policies in a large class project

What is teamwork in SE (definition by Petkovic, Thompson, Todtenhoefer, Huang, Sosnick)

Important

- Knowledge and proper application of SE processes
- Knowledge of team organization and dynamics in SW development (theory, best practices)
- Proper personal team behavior: ethics, courtesy, attendance, being reachable and responsive
- Knowledge and proper application of SW development tools
- Knowledge and application of team collaborative tools

Important

SW development as a teamwork

- SW teams can range from 2 to several hundred
- Work together (same room) to different countries, language, time zone
- Best group size up to 8 members, responsible for a product or well defined subsystem
- Smaller groups are much better in terms of organization and communication ➔ critical factor
- Most innovation comes from 1-3 people, then gets implemented by larger teams

SW development as a teamwork (2)

Important

- Making groups work *effectively* is critical task of team leads and project managers
  - Development and communication of shared project vision and goals
  - Hiring
  - Getting team organized and trained
  - Motivating and sustaining motivation
  - Tracking progress
  - Providing adequate resources
  - Resolving conflicts (technical, personal, resource, schedule, priorities, comm. between SW team and stakeholders…)
  - Managing different phases differently (design, innovation, execution…)

Important

SW teams

- *Composition:* balance of skills, experience and personalities
- *Cohesiveness:* is this a team or collection of individuals
- *Communication:* do group members communicate effectively with each other
- *Organization:* is the organization such that everybody is effective and the whole team is productive? Can the best idea win? Can the team execute and deliver?

SW team organization

Important

- *Informal, with implicit technical leader.* No formal authority exists. Decisions made democratically. Works best for small groups
- *Extreme programming* concept is the variant of the above where programmers work in a team of two, and all decisions are made in a group setting. Requires highly competent and motivated people
- *Chief programmer team:* very skilled person responsible for all key decisions and implementation, the rest are supporting him/her. May work, but may cause resentment, and requires really good chief programmer
- *Project manager, team lead, team members*: most common today

SW team organization (2)

Important

Project manager, team lead, team members

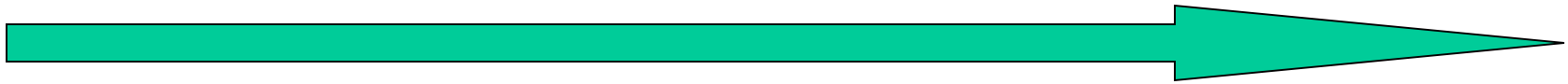
- Eng. management (often less technical, mostly business)
  - Project manager
    - Tech lead or chief architect or Lead programmer (can be several)
      - SW team members (coming from same or different organizations)
- Optional: external vendors, subcontractors
- Can have personnel manager in case of matrix management (manages people salary, vacations, promotions etc.)
- In case of global teams: some roles can be repeated locally (e.g. team lead)

Lead programmer or Team lead or Project Manager

Important

- Usually: *lead programmer* denotes primarily technical role, while *team lead* also includes some managerial tasks, and *project manager* is focused mostly on resource management and scheduling

- Lead programmer Team lead Project Manager



More technical Less technical

- Definition for lead programmer from Wikipedia
  - http://en.wikipedia.org/wiki/Lead_programmer

Team lead roles

- From: http://www.npd-solutions.com/leader.html (Great summary)
  - **Provide team leadership and coaching**
  - **Focus the team on the tasks at hand or the internal and external customer requirements**
  - **Coordinate team logistics**
  - **Communicate team status, task accomplishment, and direction**

Important

- Example job advertisements
  - https://teksavvy.com/Media/Default/Job%20Descriptions/jd-Software%20Development%20Team%20Lead-en-03.12.13.pdf

Additional on Team lead role (Dragutin)

- Develop common vision and goals (with management, stakeholders…) AND communicate it to all
- Hire the best and continuously motivate people
- Make sure the best ideas win, be open to “out of the box” thinking
- Know when to encourage discussion, and when to force the decision
- Balance managerial and team lead role with individual work, focus on team lead role
- Communicate well in 360 degrees (people, peers, upper management)
- Use humor…life is stressful enough…

Important

Team CTO/tech lead role

- Also called: lead programmer, lead/SW architect

  Definitions, roles, responsibilities:

  – Establishes a technical vision with the development team
  – Leads SW Architecture
  – Works with the team on development
  – Resolves technical issues and trade-offs
  – Gives technical advice to team lead

- Resources
  – https://www.thekua.com/atwork/2014/11/the-definition-of-a-tech-lead/
  – https://en.wikipedia.org/wiki/Lead_programmer
  – https://en.wikipedia.org/wiki/Software_architect

Tech Leads – can be several in a team

- Larger SW teams can have several tech leads, each specializing in some sub-area
  - E.g. Lead Architect
- Our class:
  - Back end lead
    - Data organization, database, APIs for front end, overall system architecture…also leads its team
  - Front end lead
    - UI design (including “customers”), business and application logic…also leads its team
  - Back end and front end lead have to cooperate and establish good SW interface

Team github master

Important

- “Owns” github organization
- Manages branches
- Ensures integrity of master branch
- Reviews githib postings (for comments etc.)
- Good best practices for github teams
  - https://stackify.com/managing-teams-github/
  - https://code.tutsplus.com/articles/team-collaboration-with-github--net-29876
  - Check gitflow slides on iLearn from Anthony
  - Ho to write good commit messages (important and will be part of grading)
    - https://github.com/erlang/otp/wiki/writing-good-commit-messages

Globalization, outsourcing and teamwork

Motivation Important

- Get talent you need in a very short time
- Access to local market with specific requirements
- Reduce cost (do not forget cost of maintenance, problem handling) – becoming less of as factor lately
- Simplify adherence to specific county legal, import and business requirements

Teamwork related positives:

- Meet wonderful new people from different cultures
- Make new personal, professional and business connections
- Travel to distant lands

Globalization, outsourcing and teamwork

Important

Significant Challenges:

- Complicated management (people, business, project, multiple management chains)
- Teams may have different objectives
- Loss of coordination
- Harder to resolve conflicts
- Cultural differences, diverse team members
- Impediments due to *time zone differences and lack of personal contact*

Globalization, outsourcing and teamwork

Important

- If you are part of global team:
  - Be very aware of the challenges specific to globalization
  - Work on establishing personal connection **early** – use phone, Skype, video, images for introduction, travel if possible
  - Create common goals
  - Be sensitive to cultural and diversity issues – “CQ”
  - Create process for conflict resolution

Cultural Intelligence: critical for your success in global environment (latest research)

- Good brief overview
  - https://getpocket.com/explore/item/the-hidden-talent-that-determines-success?utm_source=pocket-newtab
- "CQ Drive" – the desire to learn about other cultures.
- "CQ Knowledge", understanding of some of the cultural differences
- "CQ Strategy", how you make sense of those difficult confrontations and learn from them
- "CQ Action", involves your behavioural flexibility to adapt your conduct like a cultural chameleon.

Managing conflict - some rules

Always present, the key is how you manage it:

1. First try to resolve within the group among involved parties
2. If that does not work, involve team lead or trusted outside person
3. If that does not work involve management

Important

For *global* environment:

1. First try to resolve issue within local groups
2. If that does not work involve team leads from all groups
3. If that does not work, escalate to management from all groups
4. Ultimately, one single person resolves the conflict

Behavior and attitude are critical in conflict management

- Separate technical from personal issues
- Be courteous
- *Focus on problems, not personalities*
- *Fight for your ideas, but must ultimately think of what is best for the project, the team, the company*
- Do not send problematic e-mail, use meetings or phone
- For managers and team leads: encourage “out of box thinking” and balance it with the need to come to common plan and execute on time and budget and per specs

Important

Teamwork issues: personal behavior and teamwork ethics are critical

Important

- Phone manners
  - http://ezinearticles.com/?20--Business-Telephone-Etiquette-Tips&id=246471
- E-mail manners
  - http://careerplanning.about.com/od/communication/a/email_etiquette.htm
- **Also be ware of what you post on social networks!!!!**
- In person meeting manners
  - https://www.businessinsider.com/10-etiquette-rules-for-meetings-that-every-professional-needs-to-know-2013-11
- Attend meetings on time or let people know if you can not
- Respect different personalities and cultures
- Dealing with conflict
- Assertiveness vs. aggressiveness (it is not gender neutral!)
  - http://bookboon.com/blog/2012/12/whats-the-difference-between-an-assertive-and-aggressive-leader/
- Understand company culture and "Implicit behaviors and rules"
- *Global issues*: note: different countries have different culture and rules - **CQ**

Important

Also: meeting manners for virtual meetings e.g. ZOOM

From https://blog.gotomeeting.com/7-rules-virtual-meeting-etiquette-every-professional-know/

- Leave the keyboard alone
- Dress appropriately
- Be aware of your surrounding
- Mute your microphone when you're not talking
- Speak up
- No food allowed
- Stay seated and stay present

Some Resources

- **https://miro.com/blog/remote-team-meeting-etiquette/**
- **https://www.owllabs.com/blog/remote-meetings**

How to teach teamwork – CSC 648-848 Important

SE Teamwork is the core of CSC 648-848 – based on teaching "best practices" and experiential learning

- Teach best practices as needed for team project
- Immerse students in teamwork project in realistic environment
- Coach, help, encourage, monitor
- Set up grading to encourage teamwork and not just favor coding (**recall our grading rubrics AND all team members get same grade**)

Important

Rubrics for grading the final project

Measured Team Outcomes for SE *process*	**Measured Team Outcomes for SE *product***
1. Fraction of the team participating at the meetings with the instructor 2. Quality and timing of follow-up on outstanding issues 3. Ability to deal with feedback constructively 4. Producing the non-SW and SW deliverables on time 5. Quality and completeness of non-SW deliverables (requirements, use cases, UI mockups, design documents, test plans etc.) 6. Number of teamwork issues that instructor had to deal with (whether resolved or not) 7. Ability to apply best SE process and teamwork practices 8. NEW: Adherence to continuous and collaborative development practices 9. Ability to effectively use the SE tools (e.g. collaborative tools, version control, issue trackers)	1. Correctness and reliability of operation 2. Functionality of the product vs. desired requirements and use cases 3. Ease of use, user interface 4. Architecture of the developed system 5. Database design 6. Performance 7. Code quality (coding principles, style, documentation) 8. NEW Proper usage of collaborative tools e.g. repository 9. Presentation style and effectiveness of final product demonstration (content, delivery, adherence to time, dealing with Q/A)
25 %	**25 %**

Practical guidelines for teamwork and project management

Important

- Establish communication channels for quick communications
- Have at least once a week (preferably twice) in-person team meeting and e-mail checkpoints on status of each team members in between. Subteams can meet separately
- Have all design documents permanently posted (github/google docs) so everybody can access them and use for their SW design and development
- After each meeting team lead creates brief meeting summary (about one page) and posts it on shareable resource (github, googledoc) with
  - Main conclusions and decisions
  - List of tasks, owners, and schedules
- At subsequent meetings start with summary of previous meetings and follow up on tasks and status (like SCRUM management practice https://en.wikipedia.org/wiki/Scrum_(software_development))
- If there is more than a week between two meetings, have e-mail checkpoint on status in between these meetings, for all team members
- Use tools for project management like Trello
- PLUS follow good ZOOM practices

Case studies, discussion on teamwork

People stuff is complex but critical – let us look at it based on real case stories

- Case will be presented to you.
- Think how would you resolve it as:
  - Manager
  - Manager's manager
  - Team member
- You can not fire or replace him/her
- Did you have this case in your career or experience?

Case 1 – technically weak project manager

- He simply does not understand SW concepts.
- Friend of CEO
- He is not able to check if the estimate or technical decisions he gets from people are valid
- His communication skills are OK
- Project is late, with plenty of technical risks
- What would you do as:
  - His manager
  - Team member

Case 2 – technically strong project manager

- She is brilliant
- She likes to control all the technical decisions
- She micromanages
- She still likes to program
- Due to above she does not have time to do all the management work (salary, resources, awards, customer contacts, internal politics…)
- Consequences?
- What would you do as:
  - Her manager
  - Team member

Case 3 – technically strong project manager, poor communicator

- He is good, made good decisions so far
- Does not involve people in decision process
- Does not like to meet 1-1
- Can not motivate people well
- Can not deal with people having problems or needing some help
- Very demanding
- Not very accessible
- Project is facing a crisis. It is late and people are burning out
- Consequences?
- What would you do as:
  - Her manager
  - Team member

Case 4 – brilliant programmer, individualistic, strong opinions

- She is brilliant
- So far created amazing things in SW
- Very strong opinions, usually right
- Hard to convince her to change her way of doing things
- Other members are grumbling
- Project has poor usability, customers are complaining OR her SW can not integrate well with the rest of the system (the rest of the system is required by customer)
- What would you do:
  - As her manager
  - As team member

Case 4 A – brilliant programmer, individualistic, strong opinions

- BUT, her decision may be a correct one?

- How do you prevent/manage this: a) keep the team happy?; OR b) make the team win although some might be grumbling?; OR c) ??? – can you make it win-win?

Case 5 – Average programmer, but always late

- He is average
- Nice and smooth in communication, everybody loves him
- Always late, with buggy SW
- Project is late, everybody is overworked
- What would you do:
  - As his manager
  - As team member

Case 6 – from our class

- Team lead often tries to “hide” poor performance of tam members – natural instinct among students
- Issues comes back mid late in the project
- Not a good practice – why?
  - (Hint: think as you being super performer while somebody is not performing, and is paid about the same…)
  - Good lead MUST deal with poor performance early