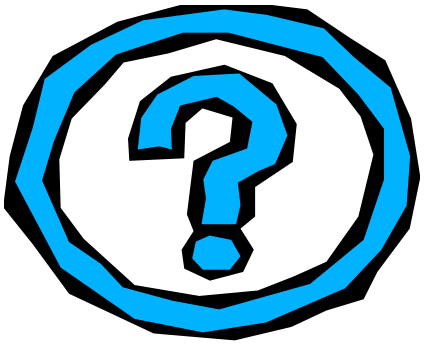
Chapter 5: software project team management

outline

- Introduction
  - The definition of team
  - Related areas
- Human resource plan
  - Roles
  - Organization structures
- Build a team
- Develop a team
- Case

What Is a Team?

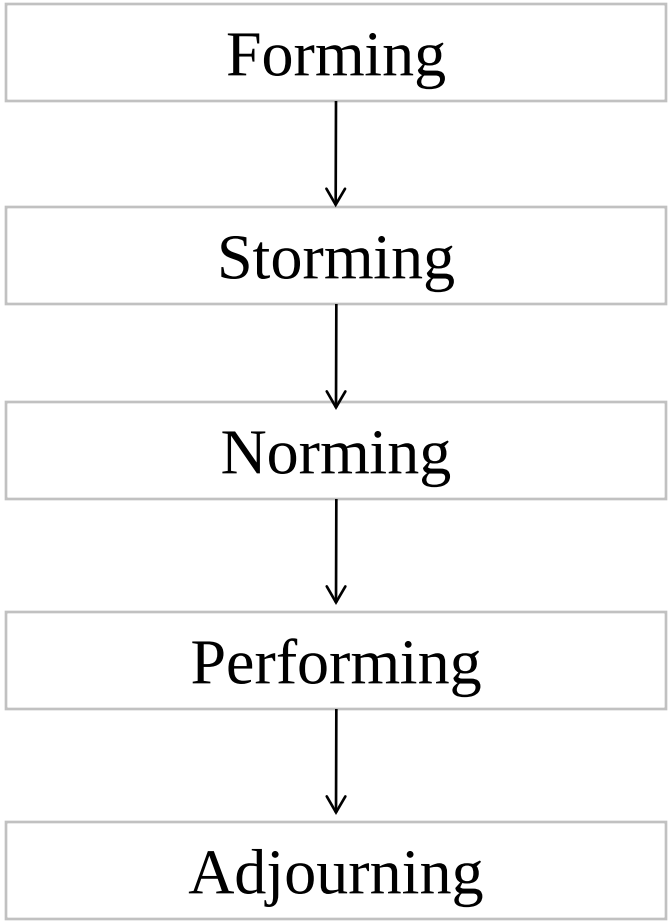
- **The passengers on a bus?**
- **countrymen ?**
- **Classmate?**
- **A football team?**



What Is a Team?

- A team is any group of people with a full set of complementary skills organized to work together interdependently and cooperatively to accomplish a goal.
- Team members (1) operate with a high degree of interdependence, (2) share authority and responsibility for self-management, (3) are accountable for the collective performance, and (4) work toward a common goal and shared rewards(s).
- The characters of a team:
  - People
  - Goal
  - Leader

Team Development Model



The stages 1

- **forming – project team initiation phase.**
  - behaviors----Members behave quite independently. Some members may display traits of uncertainty and anxiety. Individual roles and responsibilities are unclear. High dependence on leader for guidance and direction. Little agreement on team aims other than received from leader. Leader must be prepared to answer lots of questions about the team's purpose, objectives and external relationships. Processes are often ignored.
  - Tasks--Establish base expectations; Identify similarities; Agree on common goals; Begin to develop trust
  - Directing or “telling” style

The stages 2

- **storming – various ideas compete, often fiercely, for consideration.**
  - behaviors---Team members are showing their own personalities as they confront each other's ideas and perspectives. Team members vie for position as they attempt to establish themselves in relation to other team members and the leader, who might receive challenges from team members. Clarity of purpose increases but plenty of uncertainties persist. Frustration or disagreements about goals, expectations, roles and responsibilities is being expressed openly. Decisions don't come easily within group. Cliques and factions form and there may be power struggles.
  - tasks---The team needs to be focused on its goals to avoid becoming distracted by relationships and emotional issues. Compromises may be required to enable progress. Tolerance of each member and their differences needs to be emphasized.
  - Leader--Identify power & control issues; Gain communication skills; Begin to build unity; coaching style.

The stages 3

- **norming– Rules, values, behavior, methods, tools are being established.**
  - behaviors----Agreement and consensus is largely forms among team. Roles and responsibilities are clear and accepted. Big decisions are made by group agreement. Smaller decisions may be delegated to individuals or small teams within group. Commitment and unity is strong. The team may engage in fun and social activities. The team discusses and develops its processes and working style. There is general respect for the leader and some of leadership is more shared by the team.
  - Tasks--Mutual acceptance;Develop cohesion, commitment & unity; Team roles & processes clear & accepted
  - Leaders allows the team to become much more automomous. Paticipative style.

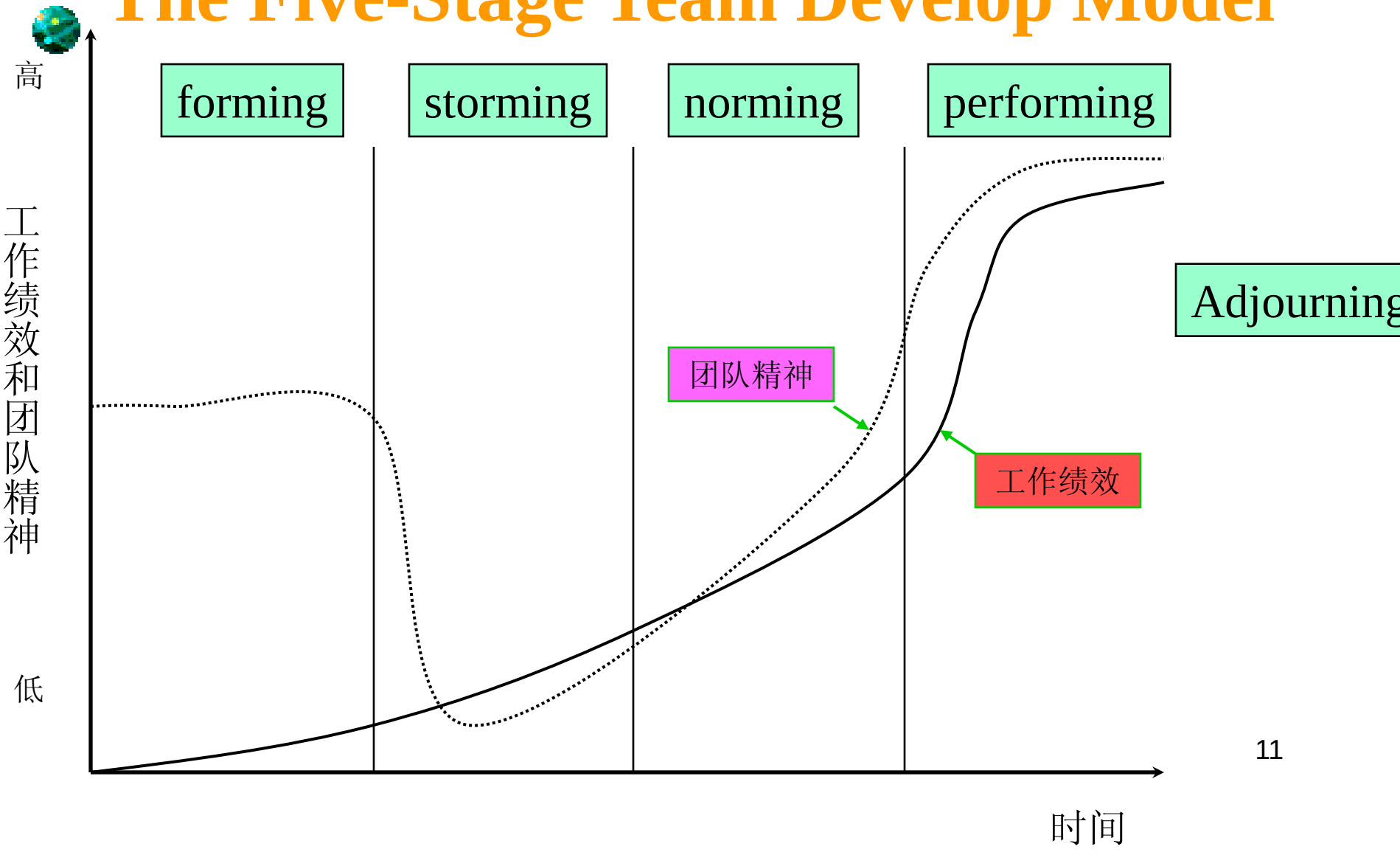
The stages 4

- **perfoming– roles become flexible and functional, and group energy is channeled into the task.**
  - behaviors----project team is now able to function as a unit. It gets the job done smoothly and effectively without inappropriate conflict or the need for external supervision. Members have a clear understanding of what is required of them at a task level. They are now competent, autonomous and able to handle the decision-making process without supervision. A “can do” attitude is visible. Offers to assist one another are made.
  - Tasks--Achieve challenging, effective & satisfying results; Find solutions to problems using appropriate controls; Establish autonomy & interdependency.
  - Leaders lets the team make most of the necessary decisions. Delegating style.

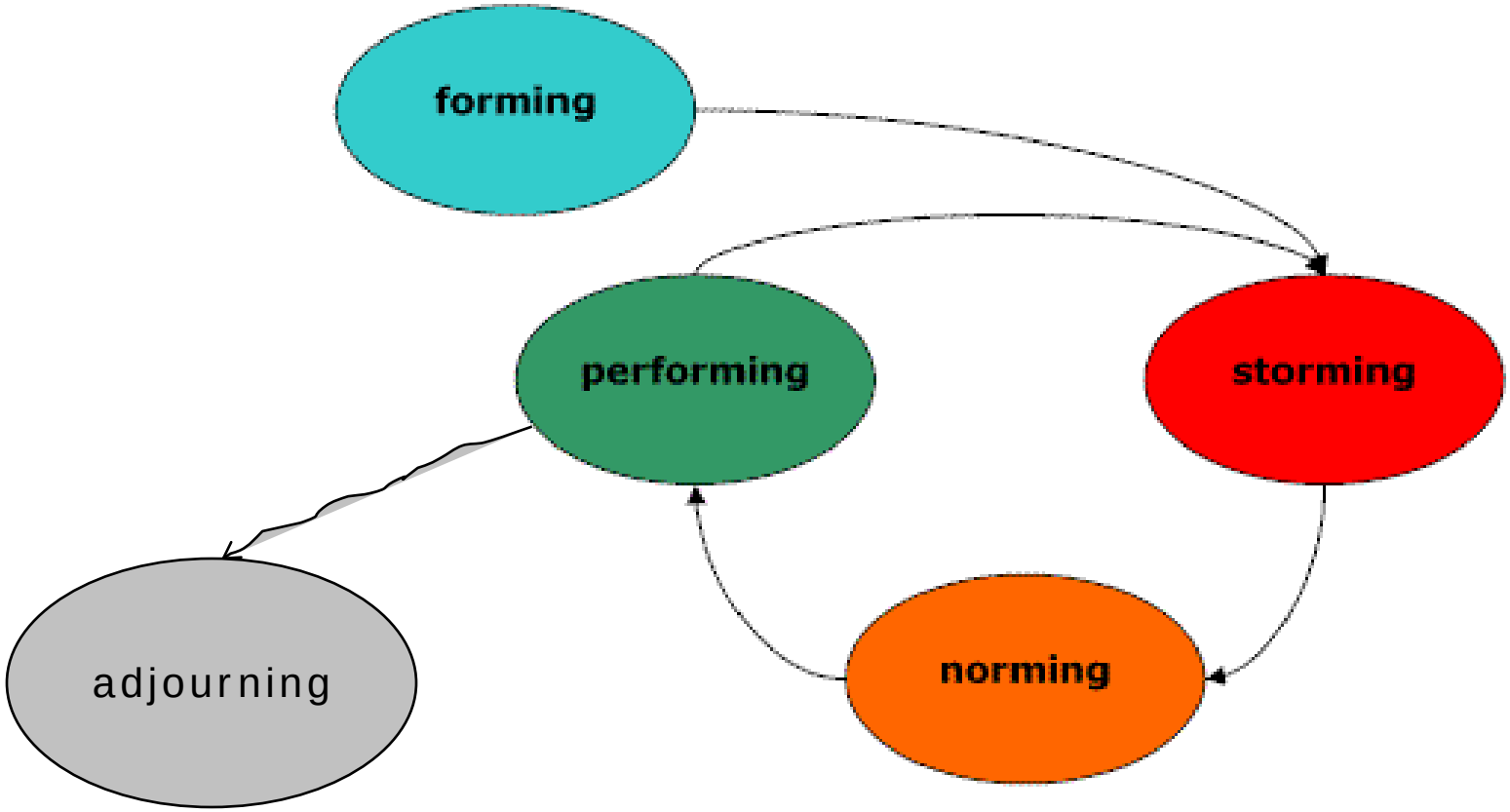
The stages 5

- **adjourning– the tasks are being completed and the team is disassembled.**
  - behaviors----some authors describe the stage as “deforming and Mourning”, recognizing the sense of loss felt by group members. Team members’ motivation levels can decline as uncertainty about the future begins to set in.
  - Leaders should give good point to introduce new projects in order to recommence the forming stage of team development.
  - Focus on how to finish the project
  - Detaching style.

The Five-Stage Team Develop Model



The Five-Stage Team Develop Model



The Model may be thought of as more cyclical than linear in nature

Human resource area

- **Develop Human Resource Plan—**The process of identifying and documenting project roles, responsibilities, and required skills, reporting relationships, and creating a staffing management plan.
- **Acquire Project Team—**The process of confirming human resource availability and obtaining the team necessary to complete project assignments.
- **Develop Project Team—**The process of improving the competencies, team interaction, and the overall team environment to enhance project performance.
- **Manage Project Team—**The process of tracking team member performance, providing feedback**,** resolving issues, and managing changes to optimize project performance.

Communication area

- **Identify Stakeholders**—The process of identifying all people or organizations impacted by the project, and documenting relevant information regarding their interests, involvement, and impact on project success.
- **Plan Communications** —The process of determining the project stakeholder information needs and defining a communication approach.
- **Distribute Information** —The process of making relevant information available to project stakeholders as planned.
- **Manage Stakeholder Expectations—**The process of communicating and working with stakeholders to meet their needs and addressing issues as they occur.
- **Report Performance** —The process of collecting and distributing performance information,including status reports, progress measurements, and forecasts.

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Staffing Management Plan

- Part of Software Development Plan
- Includes
  - What roles needed, how many, when, who
  - Resource assignments
  - Timing: Start/stop dates
  - Cost/salary targets (if hiring)
- Project Directory
  - Simply a list of those involved with contact info.

case

- Case 1 (from the sudents)

Is it reasonable about the roles?

Do you think which roles should be included in a software development team ?

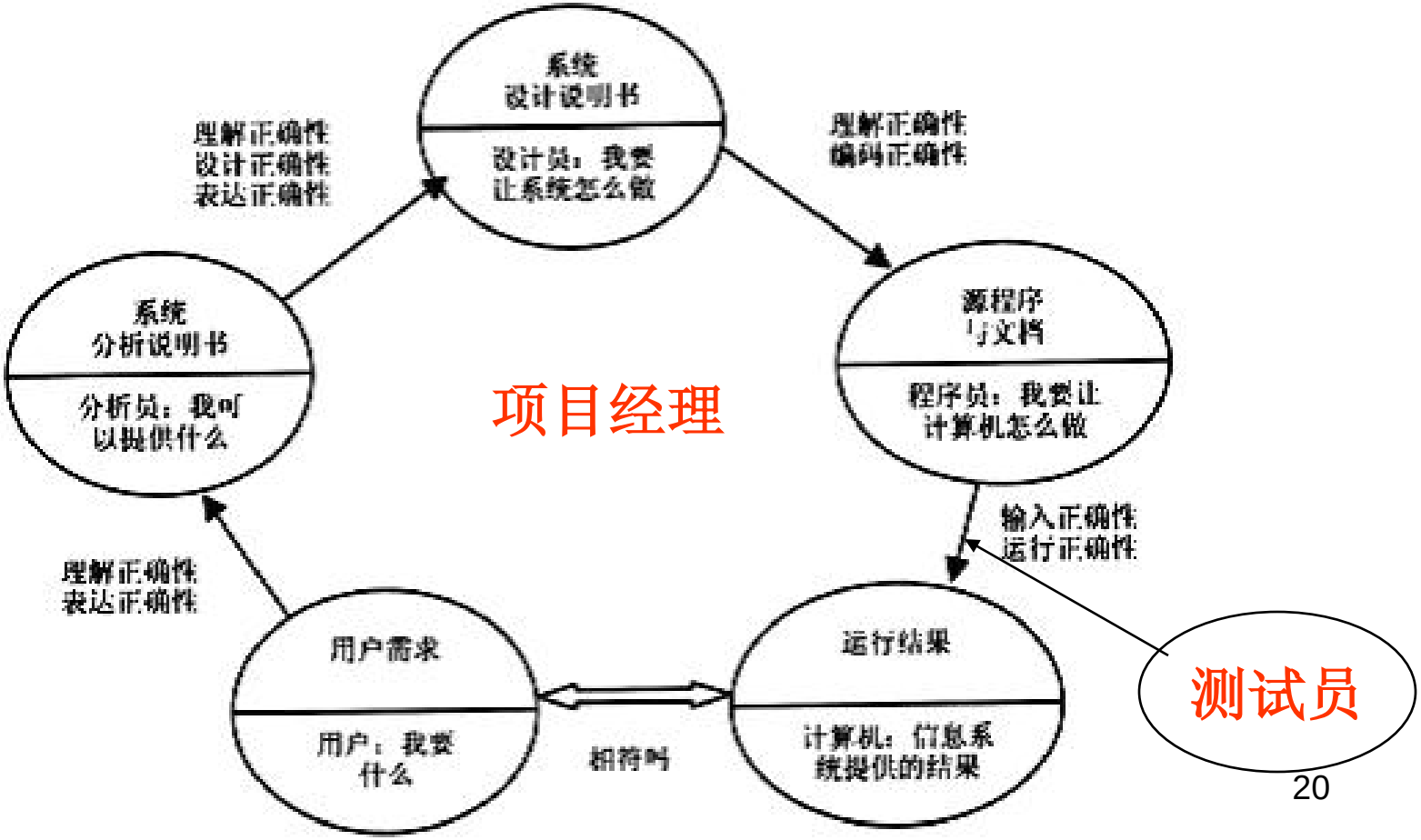
Software Project Roles

- Programmers (system engineers)
  - Technical lead, architect, programmer
- Quality Assurance (QA) engineers (testers)
  - QA Manager, QA staff
- DBAs
  - DB Administrator, DB Programmer, DB Modeler
- CM engineers
- Network engineers, System Administrators
- Analysts (business analysts)
- UI Designers
- Documentation writers (editors, documentation specialist)
- Project manager
- Other: Security specialist, consultants, trainer

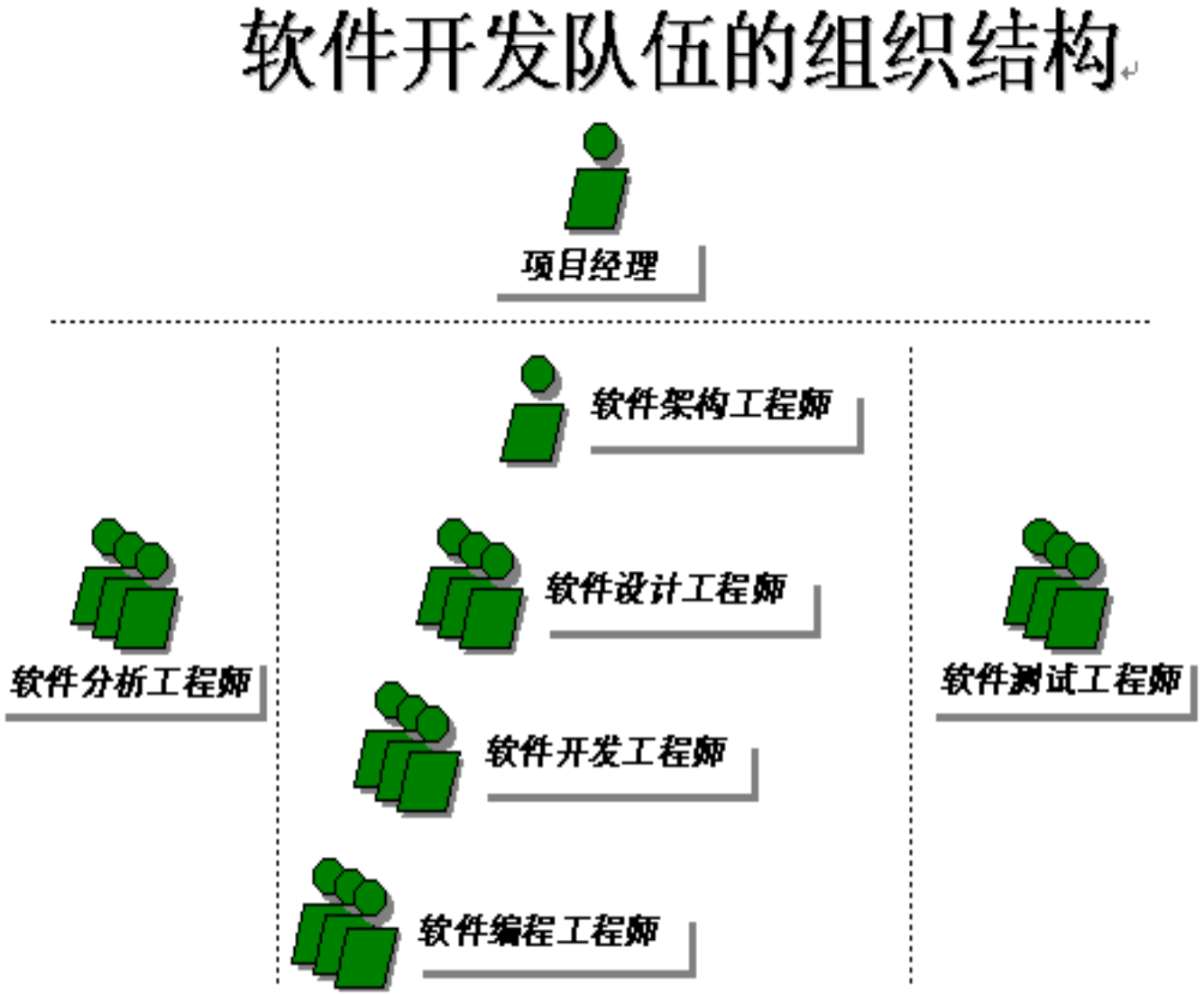
Project Roles

- You need to decide which of these are necessary for your project
- Depends on what you're building
  - How big is it?
  - Is it UI intensive? Data intensive?
  - Are you installing/managing hardware?
  - Is it in-house, contract, COTS, etc?
- Depends on your budget

大型IS基层项目团队构成



神州数码项目团队构成

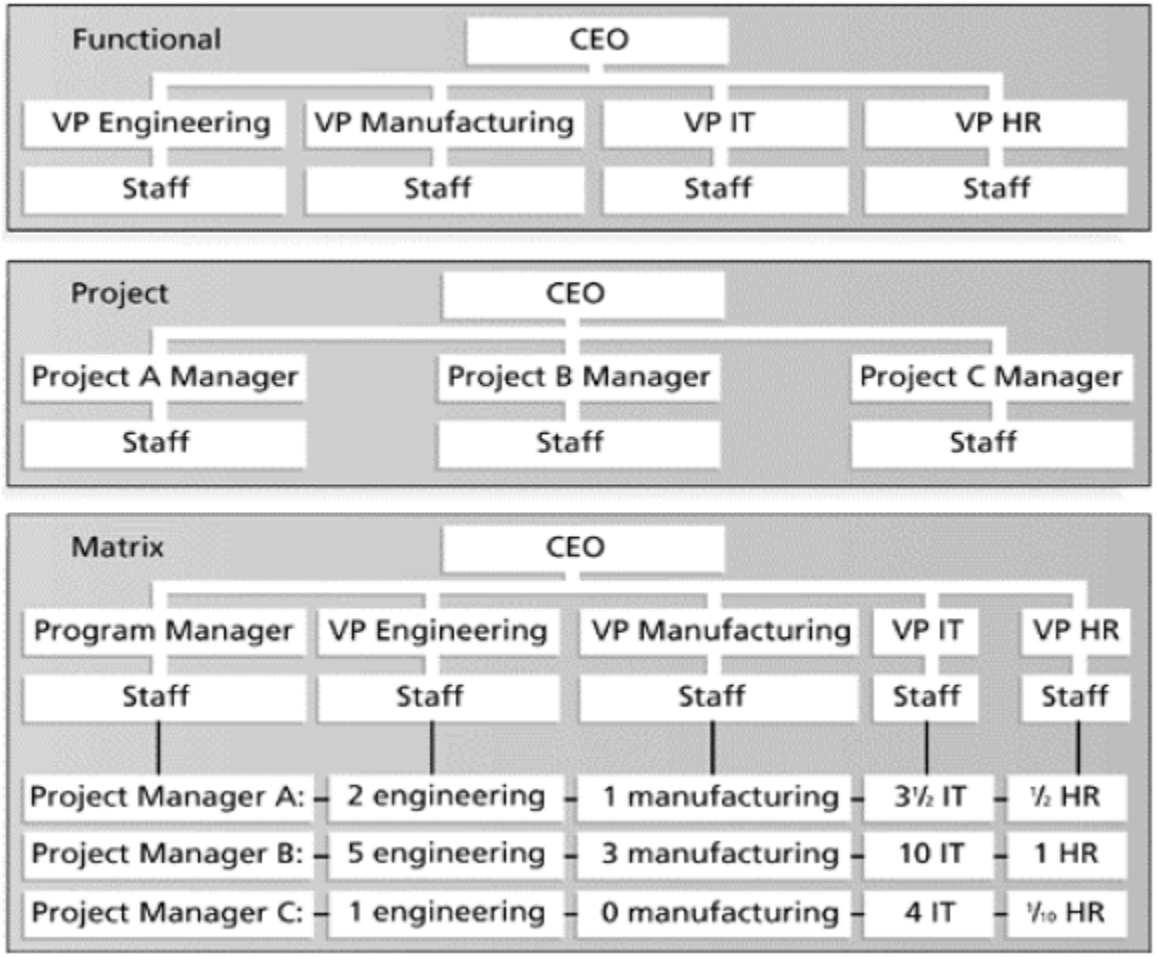

软件开发队伍的组织结构
项目经理
软件架构工程师
软件分析工程师
软件设计工程师
软件测试工程师
软件开发工程师
软件编程工程师

Staffing Profile

- Projects do not typically have a ‘static team size’
- Who and how many varies as needed, PM must have a plan as to how & when
- Roll-on
  - Hiring or ‘reserving’ resources
- Roll-off
  - Knowledge transfer
  - Documentation
  - Cleanup

General Organizational Structure

- Functional Organization
- Project Organization
- Matrix Organization



Functional Organization

- Standard pyramid with management at the top
- Strength – lumps similar recourses together
- Weakness –
  - there can be conflicts for time between projects for resources
  - Resources do not see big picture

Project/Vertical Organization

- Each Project its own organization
- Strengths
  - Ability to see the big picture and focus on projects
- Weaknesses
  - Organization is temporary and causes turmoil
  - Facilities are duplicated

Matrix Organization

- Combines the two structures so there is a functional boss and a project coordinator
- Strengths
  - Can see big picture and employees have security
- Weaknesses
  - Each employee has two bosses

When to Choose What

- Choose functional structure when there are many small short term projects
- Choose project structure for large long-term projects
- For a mix of projects of unknown length use the Matrix Structure

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Sub-outline

- Team Selection
- Team Structure

Importance of Member Selection

- Personnel Differences are HUGE!!!!
  - Account for the greatest swings in productivity
- Data gathered over 12 years
- Same training, tools, and methodology for all
- Productivity measured by bugs fixed in software
- Top 27% of programmers did 78% of the work
- The best-producing people can be 20 or more times better than the low-end group.

From “Not all Programmers are Created Equal” by G. Edward Bryan

Member Selection

- Eligible member——His resume showed that his working experience is good to the job.
- suitable member——People who can really do a good thing.
- It is necessary to avoid selecting Eligible but not suitable personnel

Eligible ≠ suitable

Factors of Member Selection

- Application Domain Knowledge
- Platform Experience
- Programming Language Experience
- Education
- Communication
- Adaptability
- Attitude
- Personality

From 《Software Engineering》 by Ian Somerville

Measuring Staff Characteristics

- Resources Available to Project Managers
  - Interviews
  - Resume
  - Recommendation
  - Programming aptitude tests
  - Psychological Tests

Importance

Criteria	When Important	Where indicated	How Easy to Tell
Application Domain Knowledge	Always	Resume	Easy
Platform Experience	General	Resume	Easy
Programming Language Experience	Small Project	Resume /Tests/ Interview	Easy
Education	Low Experience	Resume	Easy
Communication	Always Important	Interview/ Recommendations	Medium
Adaptability	Always Important	Interview/ Resume	Hard
Attitude	Always Important	Interview/ Recommendations	Hard
Personality	Always Important		Hard

Why Interviews Not Effective

- Interviewees will say what you want to hear
- Interviewees prepare for questions
- There are some biases in interviews

Interviews and bias

- Different interviewers = different results
- Good impression = interviewer talks more /better
- Previous Candidates affect outcome
- bad first impression = less credit
- First impressions are important – decided in first 4 minutes

Ways to improve Interview Objectivity

- Use multiple interviewers
- Ask each candidate the same questions
- Try to relax candidates
  - No desk between
  - Start with interviewees interests

Problems with Resumes

- Entries may be misleading
- Fail to capture intangibles

Must be used along with other methods

Problems With Recommendations

- People say things to be nice
- People may be politically motivated
- Checking recommendations takes a lot of time

- Only use recommendations for few candidates
- Take recommendations with a grain of salt

Problems with Testing

- Test questions often answered in a time limited manner
- Problem solving with large time segments does not map directly to this type of testing

Psychological Tests (Myers-Briggs Type Indicator)

MBTI Type Dimension	Characteristics
Introvert Extrovert (I,E)	***Source and direction of energy:*** I:from internal concentration E: from external contract
Sensing iNtuitive (S,N)	***Preferred method of information reception:*** S:prefers empirical, sensory data N:prefers meaningful patterns and abstractions
Thinking Feeling (T,F)	***Way of information processing:*** T:Makes decisions according to their impersonal logic F: Makes decisions according to their impersonal values
Judging Perceiving (J,P)	***Way of living out processed information:*** J:Organizes all life events and acts strictly according to their plans P:Inclined to improvisation and seeking different alternatives

Individual personality type

Guardians
analyst, PM

Idealists

ISTJ Inspector	ISFJ Protector	INFJ Counselor	INFP Tutor /Healer
ESTJ Supervisor	ESFJ Provider/Seller	ENFJ Teacher	ENFP Champion /Advocater
ISTP Crafter	ISFP Composer /Artist	INTJ Scientist	INTP Architect /Designer
ESTP Promoter	ESFP Performer /Demonstrator	ENTJ Mobilizer /Captain	ENTP Inventor

Artisans
art design

Rationals
developer, design

MBTI测试

The principle of Boehm

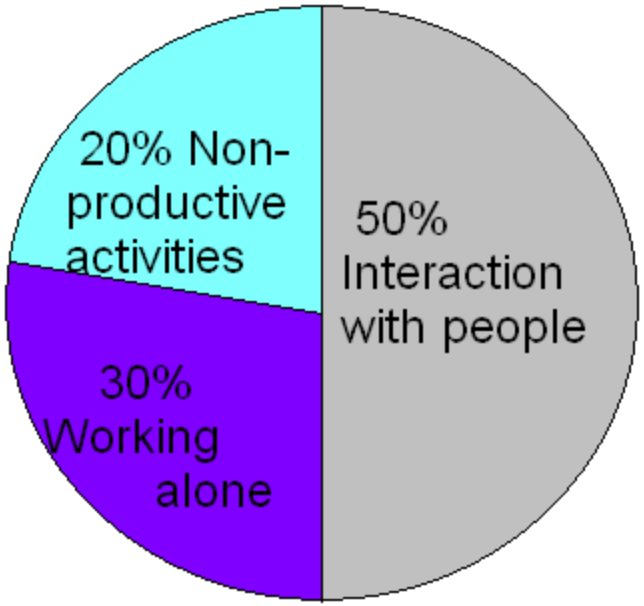
- Principle of top talent
  - Use better and fewer people
- Principle of job matching
  - Fit the tasks to the skills and motivation of the people available
- Principle of career progression
  - An organization does best in the long run by helping its people self-actualize
- Principle of team balance
  - Select people who will complement and harmonize with one another
- Principle of phaseout
  - Keeping a misfit on the team doesn't help anyone

——在评审如何为一个软件项目物色团队成员时，**Boehm**提出五大原则

balancing balance

- Team Balance and Job Matching are #1
- Top Talent and Phaseout are secondary
- Career Progression is the least important

Why Team Structure is Important



from Software Engineering 6th Edition by Ian Sommerville

Team Structure

- 1st: What's the team's objective?
  - Problem resolution
    - Complex, poorly-defined problem
    - Focuses on 1-3 specific issues
    - Sense of urgency
    - Feature: Trust
  - Creativity
    - New product development
    - Feature: Autonomy
  - Tactical execution
    - Carrying-out well-defined plan
    - Focused tasks and clear roles
    - Feature: Clarity

Team Structures

- Business Team
- Chief-Programmer Team
- Skunkworks Team
- Feature team
- Search and Rescue team
- SWAT Team
- Professional Athletic Team
- Theater Team
- Large Team

Business Team

- Business Team
  - Most common model
  - Technical lead + team (rest team at equal status)
  - Hierarchical with one principal contact
  - Adaptable and general
  - Variation: Democratic Team
    - All decisions made by whole team
    - See Weinberg's "egoless programming" model

Egoless Programming

- All programmers on one level
- Decisions are made by consensus
- Advantages
  - Free flow of information between all programmers
  - Generally better solutions to hard problems
- Disadvantages
  - Communication takes more time
  - Personality conflicts a major issue
  - Groupthink

Chief-Programmer Team

- The chief guides the project and makes all decisions but consults with specialists
- From IBM in 70's （See Brooks and Mythical Man-Month）
- a.k.a. 'surgical team'
- Puts a superstar at the top，Others then specialize around him/her
  - Backup Programmer
  - Administrator
  - Toolsmith
- Can be appropriate for creative projects or tactical execution
- Advantages
  - Fewer personality conflict
  - Faster decisions
- Disadvantages
  - Chief can get overloaded with information and make incorrect decisions
  - Difficult to achieve

Skunkworks（臭鼬） Team

- Put a bunch of talented, creative developers away from the mother ship
  - Off-site literally or figuratively
- Creates high ownership
- Little visibility into team progress
- Black box Organize itself
- Applicable: exploratory projects needing creativity
  - Not on well-defined or narrow problem

SWAT Team

- Highly skilled team
- Skills tightly match goal
- Members often work together
- Ex: security swat team, Oracle performance team
- Good for tactical execution

Feature Team

- Traditional hierarchy with focused teams
- Representative team members
- Accountable, empowered, balanced
- Good for problem resolution / creativity

Search and Rescue Team

- EMT team - specialized knowledge of tech and business problem
- Good for problem resolution

Professional Athletic Team

- *“Stars” with managers*
- *Specialized roles*
- *Good for tactical projects*

Theater Team

- “Director - with vision, roles and actors
- Strong direction with individual contributions and negotiation
- Producer - software manager
- Good for projects that must integrate many aspects

Large teams

- Communication increases multiplicatively
  - 50 programmers = 1200 possible paths
  - Communication must be formalized
- Always use a hierarchy
- Reduce units to optimal team sizes
  - Always less than 10
  - *Communication / coordination / control are issues*
  - *Create small teams within team with clear command*

Team Size

- Team size: often dictated by budget as often as any other factor
- What is the optimal team size?
  - 4-6 developers
  - Tech lead + developers
  - Increases cohesiveness
  - QA and pm on top of this

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Develop project team

- understand
  - The leader understand the members
  - the members understand each other
- Communication
  - timely
  - effective
- Motivation and lead

understand

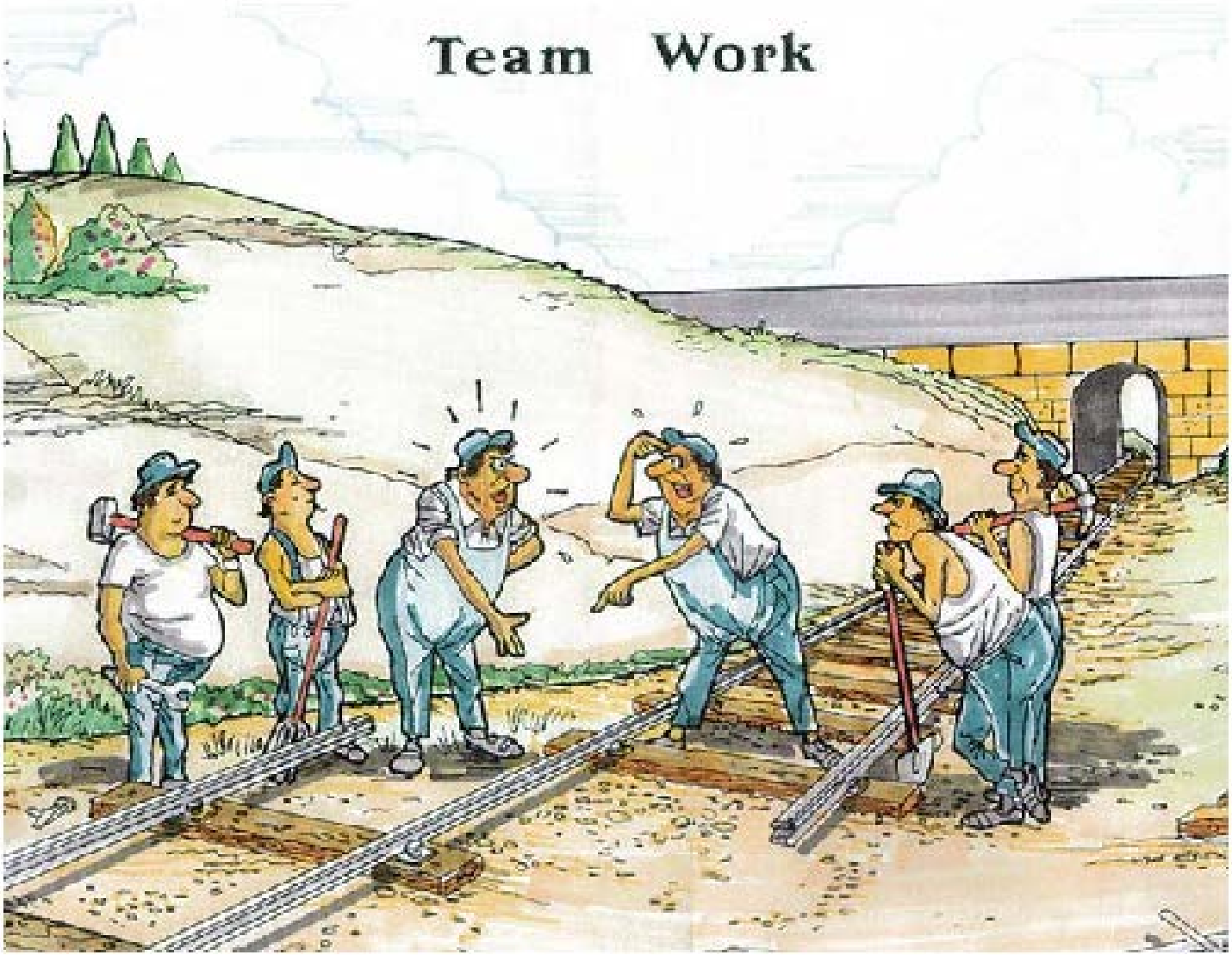
- 破冰训练
  - 串名字游戏——适用于成员不熟悉情况下
  - 猜猜我是谁——使初步认识的队员再次认识

案例二

学生软件项目管理团队之一

项目经理可能遇到性格和解决办法

- 相当领导的人：给他机会，如主持一些会议
- 护卫—老鼠型：帮助他们建立自信心
- 插科打诨人：分配足够的工作量
- 爱冒险的人：常常敲打


Team Work

Differences in Activities and Skills needed

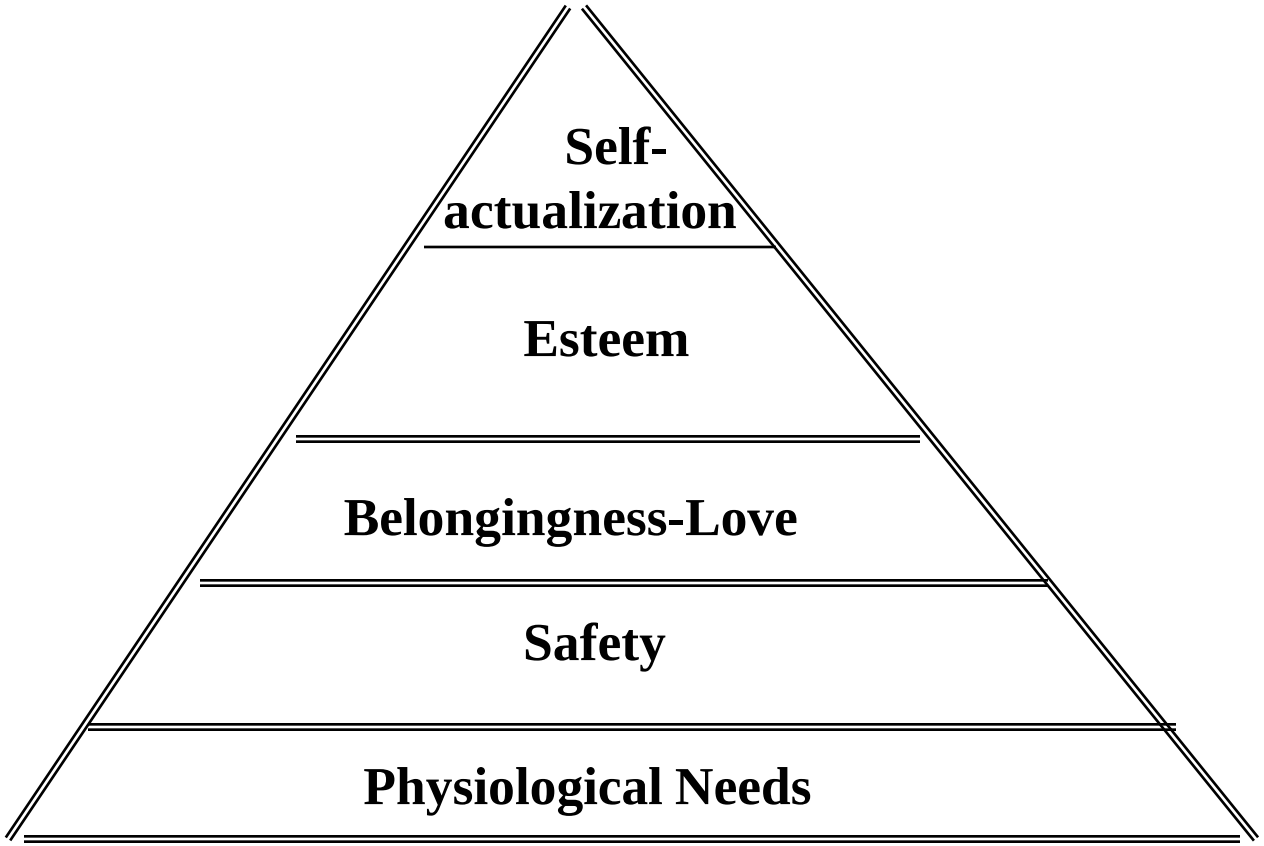
- **Technical Specialist**
- Technical expertise
- Hands-on problem solving
- Creativity
- Meet goals
- Meet budgets
- Follow guidelines
- Work with/for others
- Work with end product
- Accountable for own work
- Develop own skills

- **Project Managers**
- Understand relationships among tasks
- Lead and delegate to others
- Develop goals
- Develop budgets
- Gather and communicate information
- Relate to customer and team
- Accountable for work of others
- Develop skills of others

Things Project Managers Do as Leaders (probably not as technical professionals)

- Coordinate different functional groups and diverse personalities
- Evoke commitment from people who don't report to the manager
- Gain a sense of accomplishment from others' achievements rather than their own
- Take initiative in looking ahead of deadlines toward larger company goals
- Become accountable for others' performance or lack of performance
- Develop the skills of employees.

Maslow's Hierarchy of Needs



Once a lower level need is satisfied, it is no longer a motivator

Maslow's Hierarchy of Needs

- **Physiological Needs:** food, clothing, shelter
  - donuts & pizza
- **Safety:** fears about job, group acceptance, meeting deadlines, maintaining technical currency
  - emphasize the value of what the team is doing
  - assign constructive work as soon as an individual becomes available

Maslow's Hierarchy of Needs

Belongingness & Love/Social:

- Create organizational chart that identifies all players on the team and roles
- Schedule a team meeting and have everyone attend
- Schedule and hold required, management-oriented team meetings; limit them to 1 hour; non-technical
- Vary meeting leadership and assign a different person to run each session
- Have a distinctive name for the project team
- Provide some product that identify the team (coffee mugs, pens, notepads, etc.)
- Schedule some sort of function every month

Maslow's Hierarchy of Needs

- **Esteem:**
  - Recognize good performance and value to the team or organization
  - Don't tolerate poor performance
- **Self-Actualization:**
  - allow people direction in choosing their own work, and make the work interesting
  - Allow team members to set and achieve some of their own goals
  - Assign blocks of work to people and ask them to develop schedule for completing their work

Personal Recognition

- Appropriate and satisfying recognition differs from person to person.
  - learning new technology
  - public recognition
  - opportunity to teach others
  - chance to exercise some management skills

Three Types of Professionals

- Task-Oriented: Motivated by the intellectual challenge of the work
- Self-Oriented: Motivated by personnel success and recognition
- Interaction-Oriented: Motivated by coworkers

Motivational Factors (1)

- Achievement: getting work done; building something that works;
- Advancement: getting more responsibility
- Job security: a quaint 20th century notion;
- Personal life: the opportunity to spend time with family and friends and to pursue hobbies and interests unconnected with work;
- Possibility for growth: learn new skills; improve the use of current skills; become more knowledgeable; unique for each person;
- Recognition: identification by organization, customers, whatever of an individual’s contribution

Motivational Factors (2)

- Relations peers: how you get on with your day-to-day colleagues;
- Relations superior: access to the boss and decision makers;
- Relations with subordinates:
- Responsibility: ability to make / influence decisions.
- Salary:
- Status: how your peers value you
- Supervision technical: the ability to provide leadership and oversight in technical activities
- Work itself: do the job well;
- Working conditions: physical comfort, style and grace;

不同人员动机比较

	开发人员	项目管理人员	普通人
1	成就感	责任感	成就感
2	发展机遇	成就感	受认可程度
3	工作乐趣	工作乐趣	工作乐趣
4	个人生活	受认可程度	责任感
5	成为技术主管的机会	发展机遇	领先
6	领先	与下属关系	工资
7	同事间人际关系	同事间人际关系	发展机遇
8	受认可程度	领先	与下属关系
9	工资	工资	地位
10	责任感	操控能力	操控能力
11	操控能力	公司政策和经营	同事间人际关系
12	工作保障	工作保障	成为技术主管的机会
13	与下属关系	成为技术主管的机会	公司政策和经营
14	公司政策和经营	地位	工作条件
15	工作条件	个人生活	个人生活
16	地位	工作条件	工作保障
数据来源：《软件工程经济学》（Boehm）			

不同人员动机比较

如果一个管理者以对自己有效的方式来激励开发人员，则很可能会遭到挫折！

Material reward

- 现金方式的奖励必须谨慎处理，开发者一般都善于进行数学计算，他们会估算出和他们的付出相比奖励是否值得
- 在《提高软件生产率》一书中，Barry Boch提到：糟糕的奖励制度就是给了最佳表现者6%的奖励，同时，也给了表现平庸者5%的奖励

奖赏和鼓励

- 赞赏和欣赏的态度，有时比物质刺激更有效
  - 诚恳而直接地赞扬一项特别的成就
  - 小组的T恤衫，运动衫，手表，徽章，标语，奖杯等
  - 幽默或严肃的牌匾、证书、纪念品等
  - 重大成果的特别庆祝活动
  - 专门的培训方案
  - 为该小组颁布特殊政策，如为该小组添置一张乒乓球桌
  - 单独开的特别例会
  - 特殊津贴
- 激励的出发点是为了提高团队的绩效

Effective Delegation

- Don’t overload the best employees by always delegating to them
- Be sure that the employee you hand off to has the competence, skill, and ability to complete the task. If not, find a way to get this person trained
- Remind yourself that too much to do makes you do everything badly
- Check to see if the delegation is working: if not, shift the task to someone else who is more qualified or willing
- Remember that your employees work very hard. Respect and show gratitude for their acceptance of the tasks you delegate to them

Accountability, Authority, and Autonomy

- Accountability
  - responsibility for a project
- Authority
  - taking the lead and moving ahead with projects
- Autonomy
  - the desire, ability and authority to make decisions and act in the interest of the project without direct supervision.

高绩效团队的特点

- 共同的目标
- 团队成员的认同感
- 结果驱动的结构
- 胜任的团队成员
- 对团队的承诺
- 信任

高绩效团队的特点（续）

- 团队成员间相互依赖
- 有效沟通
- 自主意识
- 授权意识
- 小的团队规模
- 高层次的享受

outline

- Introduction
  - The definition of team
  - Related areas
- Human resource plan
  - Roles
  - Organization structures
- Build a team
- Develop a team
- Case

Case

- 西游记

项目团队如何拥有高的协调性

- 徐家龙最近被公司任命为项目经理，负责一个重要但不紧急的项目实施。公司项目管理部为其配备了7位项目成员。这些项目成员来自不同部门，大家都不太熟悉。徐家龙召集大家开启动会时，说了很多谦虚的话，也请大家一起为做好项目出主意，一起来承担责任。会议开的比较沉闷。项目开始以后，项目成员一有问题就去找项目经理，请徐家龙给出意见。徐家龙为了树立自己的权威，表现自己的能力，总是身体力行。其实有些问题项目成员之间就可以相互帮助，但是他们怕自己的弱点被别人发现，作为以后攻击的借口。所以他们一有问题就找经理，其实徐家龙的做法也不全对，成员发现了也不吭声，因为他们认为我是按你说的做的，有问题你经理负责。 团队成员之间一团和气，“找徐经理去”、“我们听你的”成为了该项目团队的口头禅。但随着时间的推移，这个貌似祥和和团结的团队在进度上很快出现了问题。该项目由“重要但不紧急的项目”变成了“重要而且紧急的项目”。项目管理部意识到问题的严重性，派高级项目经理张凤指导该项目的实施。
- 该项目问题出在哪里？ 徐家龙应该怎么做？