Software Engineering

3-1
Project Management
(HR, Risk, Team)

School of Computer Science
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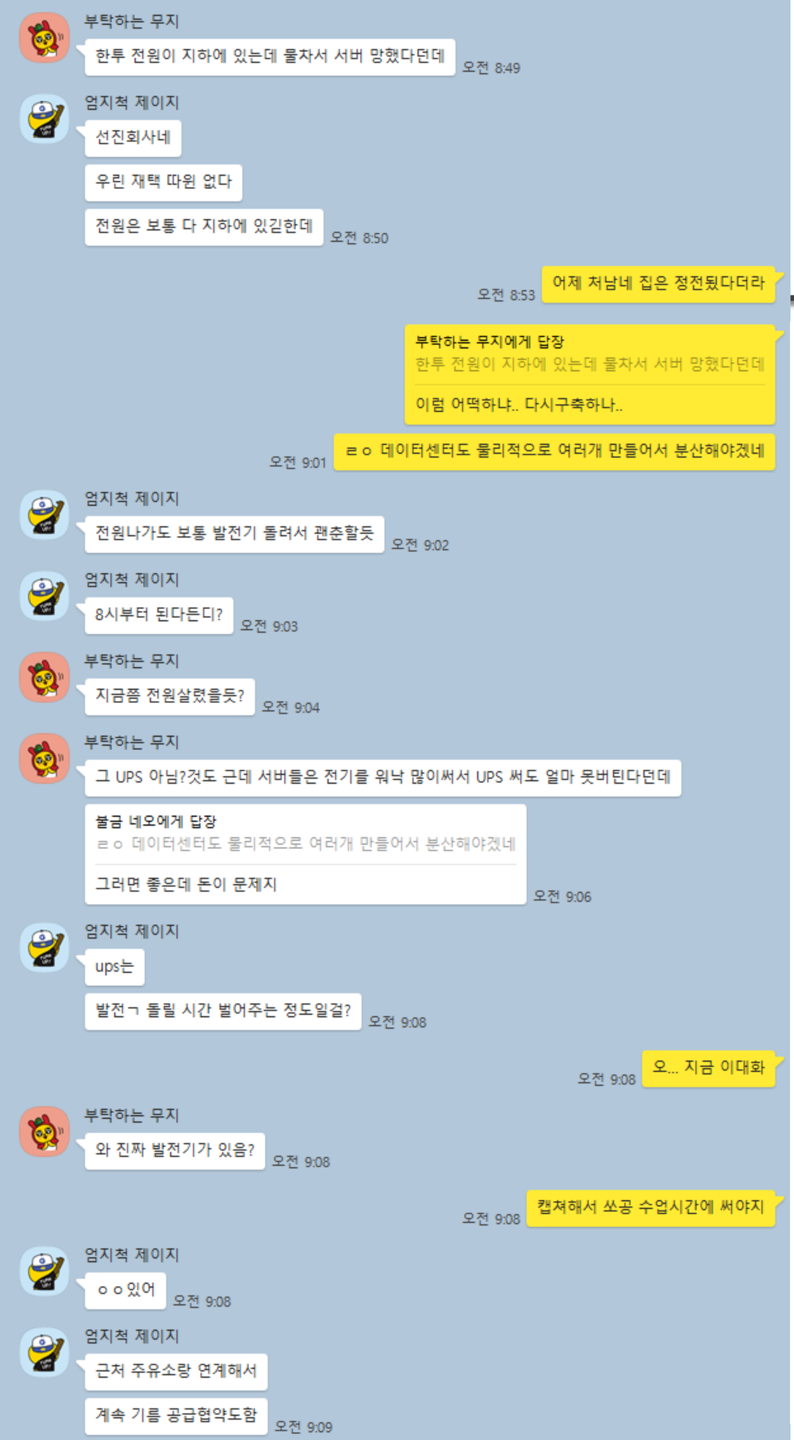

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엄지척 제이지
선진회사네
우린 재택 따윈 없다
전원은 보통 다 지하에 있긴한데 오전 8:50

오전 8:53 어제 처남네 집은 정전됐다더라

부탁하는 무지에게 답장
한투 전원이 지하에 있는데 물차서 서버 망했다던데
이럼 어떡하냐.. 다시구축하나..

오전 9:01 ㄹㅇ 데이터센터도 물리적으로 여러개 만들어서 분산해야겠네

엄지척 제이지
전원나가도 보통 발전기 돌려서 괜춘할듯 오전 9:02

엄지척 제이지
8시부터 된다든디? 오전 9:03

부탁하는 무지
지금쯤 전원살렸을듯? 오전 9:04

부탁하는 무지
그 UPS 아님?것도 근데 서버들은 전기를 워낙 많이써서 UPS 써도 얼마 못버틴다던데

불금 네오에게 답장
ㄹㅇ 데이터센터도 물리적으로 여러개 만들어서 분산해야겠네
그러면 좋은데 돈이 문제지 오전 9:06

엄지척 제이지
ups는
발전ㄱ 돌릴 시간 벌어주는 정도일걸? 오전 9:08

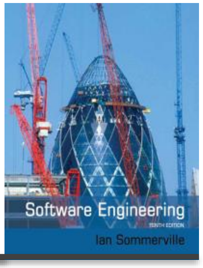
오전 9:08 오... 지금 이대화

부탁하는 무지
와 진짜 발전기가 있음? 오전 9:08

오전 9:08 캡쳐해서 쏘공 수업시간에 써야지

엄지척 제이지
ㅇㅇ있어 오전 9:08

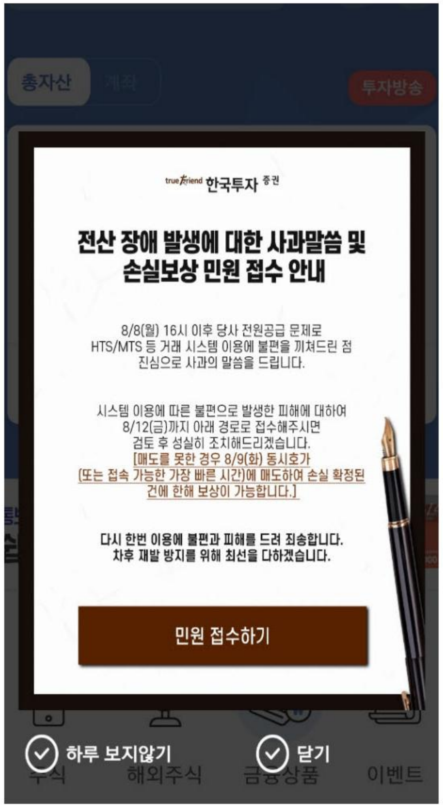
엄지척 제이지
근처 주유소랑 연계해서
계속 기름 공급협약도함 오전 9:09



한국투자증권, 서버 15시간 '셧다운'...IT관리 능력 '낙제점'

발행일 : 2022-08-09 13:52 지면 : 2022-08-10 5면

> MTS·HTS·홈페이지 접속 장애
> 시간외·해외거래 고객 피해 입어
> 한투 "전산실 전원 불안정 원인…
> '침수 사고 문건' 본사 공지 아냐"



true friend 한국투자 증권

전산 장애 발생에 대한 사과말씀 및 손실보상 민원 접수 안내

8/8(월) 16시 이후 당사 전원공급 문제로
HTS/MTS 등 거래 시스템 이용에 불편을 끼쳐드린 점
진심으로 사과의 말씀을 드립니다.

시스템 이용에 따른 불편으로 발생한 피해에 대하여
8/12(금)까지 아래 경로로 접수해주시면
검토 후 성실히 조치해드리겠습니다.
[매도를 못한 경우 8/9(화) 동시호가
(또는 접속 가능한 가장 빠른 시간)에 매도하여 손실 확정된
건에 한해 보상이 가능합니다.]

**다시 한번 이용에 불편과 피해를 드려 죄송합니다.
차후 재발 방지를 위해 최선을 다하겠습니다.**

민원 접수하기

한국투자증권, 폭우에 본사 사옥 일부 침수...외부 정원서 누수(종합)

2022-08-09 10:23

> "합선으로 HTS·MTS 접속 불량...누수와 상관관계 규명 안 돼"

Chapter3-1. Project Management

Topics covered

01 ▌ SW Project Management

02 ▌ Risk Management

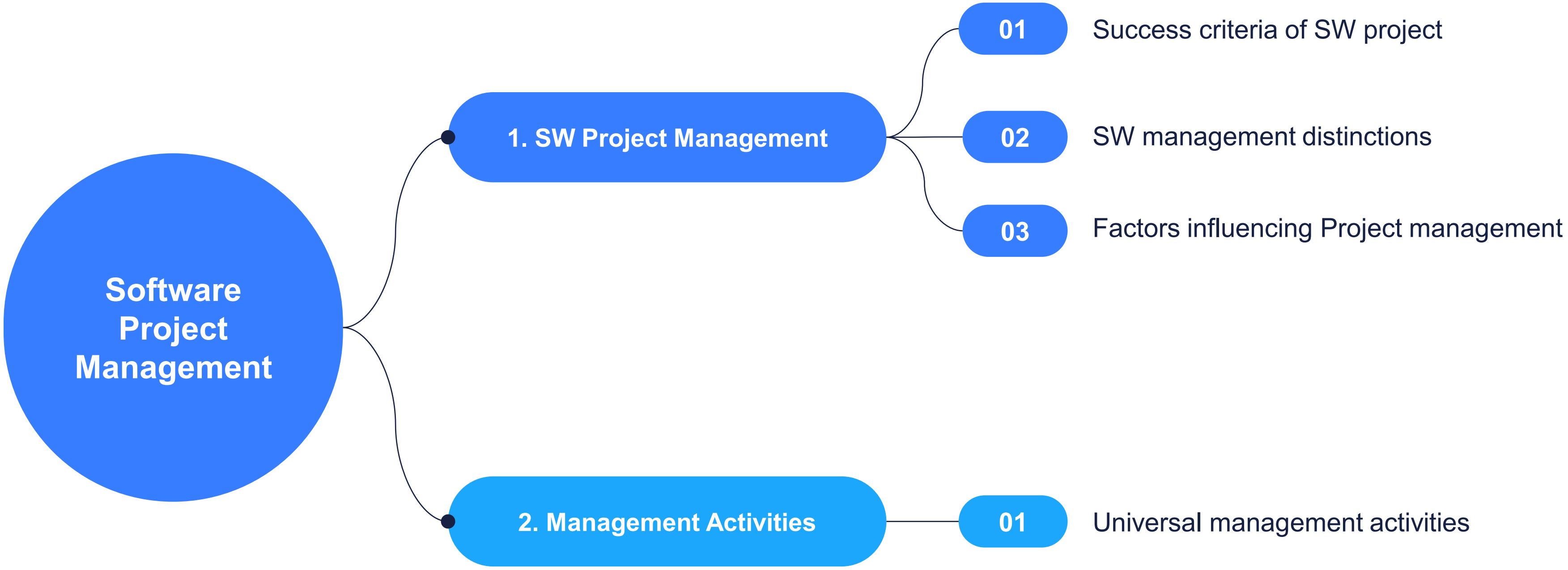
03 ▌ Managing People

04 ▌ Teamwork

05 ▌ Organization of Project Teamwork

Chapter3-1. Project Management

3-1: Software Project Management


Software Project Management

1. SW Project Management

01 Success criteria of SW project

02 SW management distinctions

03 Factors influencing Project management

2. Management Activities

01 Universal management activities

SW project management

Software Project Management

[Software project management]

- **Concerned with activities involved in ensuring**
  - software is delivered **on time and on schedule**
  - accordance with the **requirements** of the organizations developing and procuring the software.

- Project management is needed because software development is always subject to **budget and schedule constraints** that are set by the organisation developing the software.

SW project management

Software Project Management

[Success criteria of software project]

- **Deliver** the software to the customer at the **agreed time**.
- Keep overall **costs** within budget.
- Deliver software that meets the **customer's expectations**.
- Maintain a **coherent and well-functioning** development team.

Software Project Management

[Software management distinctions]

- **The product is intangible.**
  - Software cannot be seen or touched.
  - Software project managers cannot see progress by simply looking at the artefact that is being constructed.
- **Many software projects are 'one-off (일회성)' projects.**
  - Large software projects are usually different in some ways from previous projects.
  - Even managers who have lots of previous experience may find it difficult to anticipate problems.
- **Software processes are variable and organization specific.**
  - We still cannot reliably predict when a particular software process is likely to lead to development problems.

Software Project Management

[Factors influencing project management]

- Company Size
- SW Customers
- SW Size
- SW Types
- Organizational culture
- SW development process

[These factors mean that project managers in different organizations may work in quite different ways.]

SW project management

Management Activities

[Universal management activities]

- **Project planning** *(Details are covered in next week.)*
  - Project managers are responsible for planning.
  - Estimating and scheduling project development and assigning people to tasks.
- **Risk management**
  - Project managers assess the risks that may affect a project, monitor these risks and take action when problems arise.
- **People management**
  - Project managers have to choose people for their team and establish ways of working that leads to effective team performance.

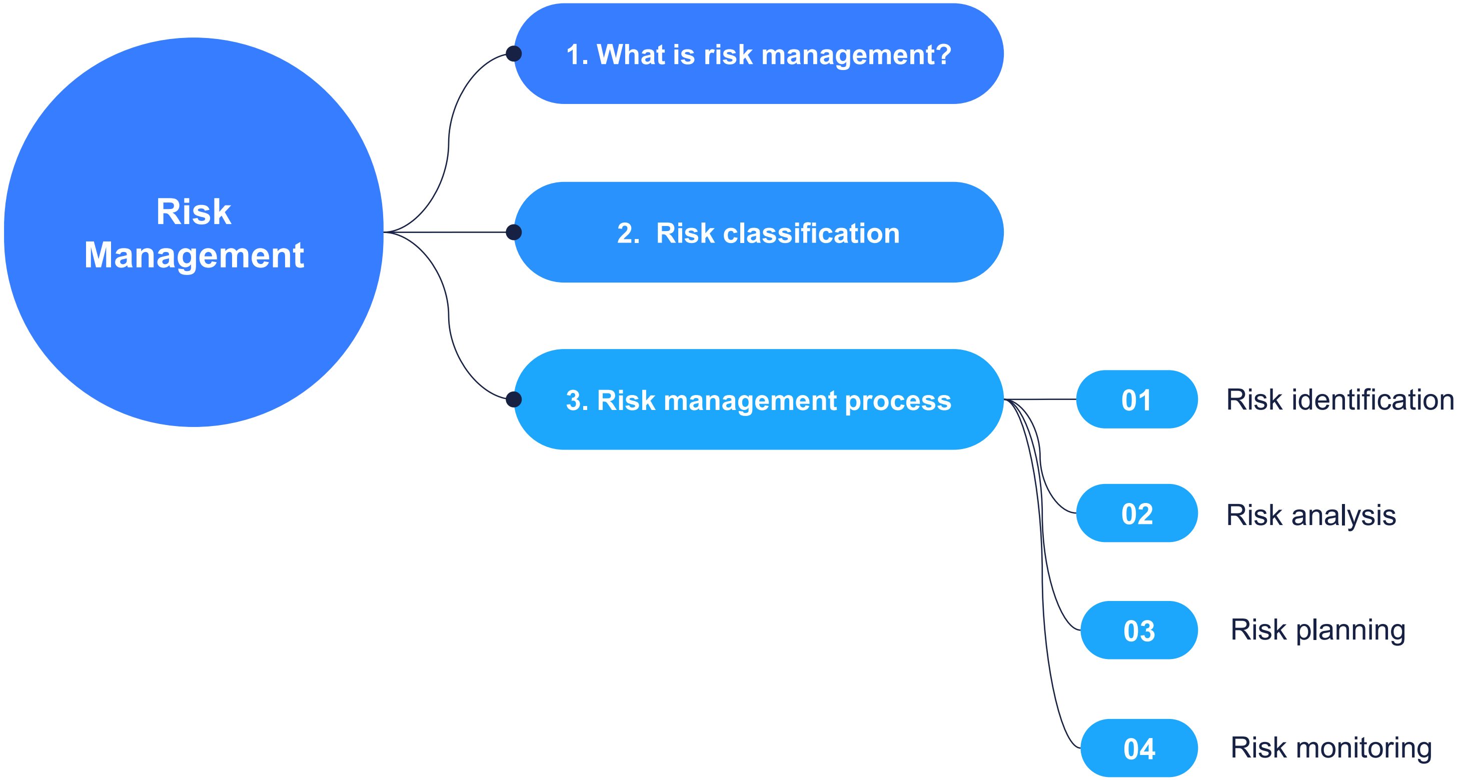
Management Activities

[Universal management activities]

- **Reporting**
  - Project managers are usually responsible for reporting on the progress of a project to customers and to the managers of the company developing the software.
- **Proposal writing**
  - The first stage in a software project may involve writing a proposal to win a contract to carry out an item of work.
  - The proposal describes the objectives of the project and how it will be carried out.

Chapter3-1. Project Management

3-2: Risk Management



Risk Management

1. What is risk management?

2. Risk classification

3. Risk management process

01 Risk identification

02 Risk analysis

03 Risk planning

04 Risk monitoring

Risk Management

What is Risk Management?

- Risk management is concerned **with identifying risks** and drawing up plans to **minimise** their effect on a project.

- Software risk management is important because of the inherent **uncertainties in software development**.
  - These uncertainties stem from
    - Loosely defined requirements
    - Requirements changes due to changes in customer needs
    - Difficulties in estimating the time and resources required for Software development
    - Differences in individual skills

- To anticipate risks
  - Understand the impact of these risks on the project, the product and the business
  - Take steps to avoid these risks.

Risk Management

Risk Classification

- There are two dimensions of risk classification
  - The **type** of risk (technical, organizational, ..)
  - **What** is affected by the risk:

- ***Project risks*** affect schedule or resources;
- ***Product risks*** affect the quality or performance of the software being developed;
- ***Business risks*** affect the organisation developing or procuring the software.

Risk Management

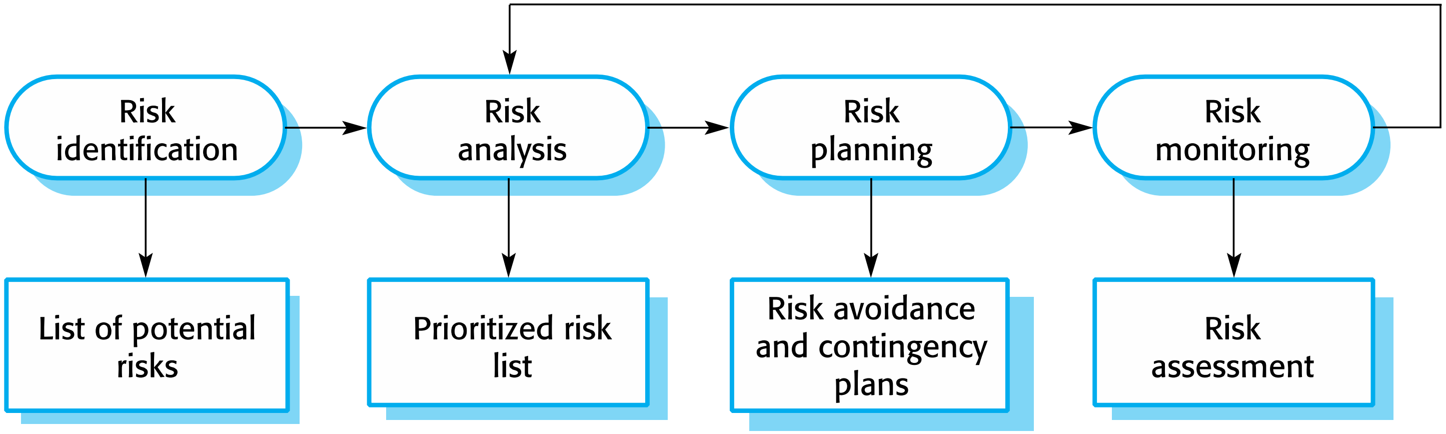
Examples of project, product, and business risks

Risk	Affects	Description
Staff turnover	Project	Experienced staff will leave the project before it is finished.
Management change	Project	There will be a change of organizational management with different priorities.
Hardware unavailability	Project	Hardware that is essential for the project will not be delivered on schedule.
Requirements change	Project and product	There will be a larger number of changes to the requirements than anticipated.
Specification delays	Project and product	Specifications of essential interfaces are not available on schedule.
Size underestimate	Project and product	The size of the system has been underestimated.
CASE tool underperformance	Product	CASE tools, which support the project, do not perform as anticipated.
Technology change	Business	The underlying technology on which the system is built is superseded by new technology.
Product competition	Business	A competitive product is marketed before the system is completed.

Risk Management

Risk management process

① **Risk identification**	Identify project, product and business risks
② **Risk analysis**	Assess the likelihood and consequences of these risks
③ **Risk planning**	Draw up plans to avoid or minimise the effects of the risk
④ **Risk monitoring**	Monitor the risks throughout the project



Risk Management

Risk management process (1)

① Risk identification

- May be a team activities or based on the individual project manager’s experience.

- **A checklist of common risks** may be used to identify risks in a project
  - Technology risks.
  - Organizational risks.
  - People risks.
  - Requirements risks.
  - Estimation risks.

Risk Management

Risk management process (1)

✧ Examples of different risk types

Risk type	Possible risks
Estimation	The time required to develop the software is underestimated. (12) The rate of defect repair is underestimated. (13) The size of the software is underestimated. (14)
Organizational	The organization is restructured so that different management are responsible for the project. (6) Organizational financial problems force reductions in the project budget. (7)
People	It is impossible to recruit staff with the skills required. (3) Key staff are ill and unavailable at critical times. (4) Required training for staff is not available. (5)

Risk management process (1)

✧ Examples of different risk types (cont.)

Risk type	Possible risks
Requirements	Changes to requirements that require major design rework are proposed. (10) Customers fail to understand the impact of requirements changes. (11)
Technology	The database used in the system cannot process as many transactions per second as expected. (1) Reusable software components contain defects that mean they cannot be reused as planned. (2)
Tools	The code generated by software code generation tools is inefficient. (8) Software tools cannot work together in an integrated way. (9)

Risk management process (2)

② Risk Analysis

- Assess probability and seriousness of each risk.
- Probability may be very low, low, moderate, high or very high.
- Risk consequences might be catastrophic, serious, tolerable or insignificant.

Risk Management

Risk management process (2)

✧ Risk types and examples

Risk	Probability	Effects
Organizational financial problems force reductions in the project budget (7).	Low	Catastrophic
It is impossible to recruit staff with the skills required for the project (3).	High	Catastrophic
Key staff are ill at critical times in the project (4).	Moderate	Serious
Faults in reusable software components have to be repaired before these components are reused. (2).	Moderate	Serious
Changes to requirements that require major design rework are proposed (10).	Moderate	Serious
The organization is restructured so that different management are responsible for the project (6).	High	Serious
The database used in the system cannot process as many transactions per second as expected (1).	Moderate	Serious

Risk management process (2)

✧ Risk types and examples (cont.)

Risk	Probability	Effects
The time required to develop the software is underestimated (12).	High	Serious
Software tools cannot be integrated (9).	High	Tolerable
Customers fail to understand the impact of requirements changes (11).	Moderate	Tolerable
Required training for staff is not available (5).	Moderate	Tolerable
The rate of defect repair is underestimated (13).	Moderate	Tolerable
The size of the software is underestimated (14).	High	Tolerable
Code generated by code generation tools is inefficient (8).	Moderate	Insignificant

Risk Management

Risk management process (3)

③ Risk planning

- **Consider each risk and develop a strategy to manage that risk.**
  - **Avoidance strategies**
    - The probability that the risk will arise is reduced;
  - **Minimization strategies**
    - The impact of the risk on the project or product will be reduced;
  - **Contingency plans**
    - If the risk arises, contingency plans are plans to deal with that risk;

Risk Management

Risk management process (3)

③ Risk planning : What-if questions

- What if several engineers are ill at the same time?
- What if an economic downturn leads to budget cuts of 20% for the project?
- What if the performance of open-source software is inadequate and the only expert on that open source software leaves?
- What if the company that supplies and maintains software components goes out of business?
- What if the customer fails to deliver the revised requirements as predicted?

Risk Management

Risk management process (3)

Strategies to help manage risk

Risk	Strategy
Organizational financial problems	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business and presenting reasons why cuts to the project budget would not be cost-effective.
Recruitment problems	Alert customer to potential difficulties and the possibility of delays; investigate buying-in components.
Staff illness	Reorganize team so that there is more overlap of work and people therefore understand each other’s jobs.
Defective components	Replace potentially defective components with bought-in components of known reliability.

Risk management process (3)

✧ Strategies to help manage risk (cont.)

Risk	Strategy
Organizational restructuring	Prepare a briefing document for senior management showing how the project is making a very important contribution to the goals of the business.
Database performance	Investigate the possibility of buying a higher-performance database.
Underestimated development time	Investigate buying-in components; investigate use of a program generator.
Requirements changes	Derive traceability information to assess requirements change impact; maximize information hiding in the design.

Risk management process (4)

④ Risk monitoring

- Assess each identified risks regularly to decide whether or not it is becoming less or more probable.
- Also assess whether the effects of the risk have changed.
- Each key risk should be discussed at management progress meetings.

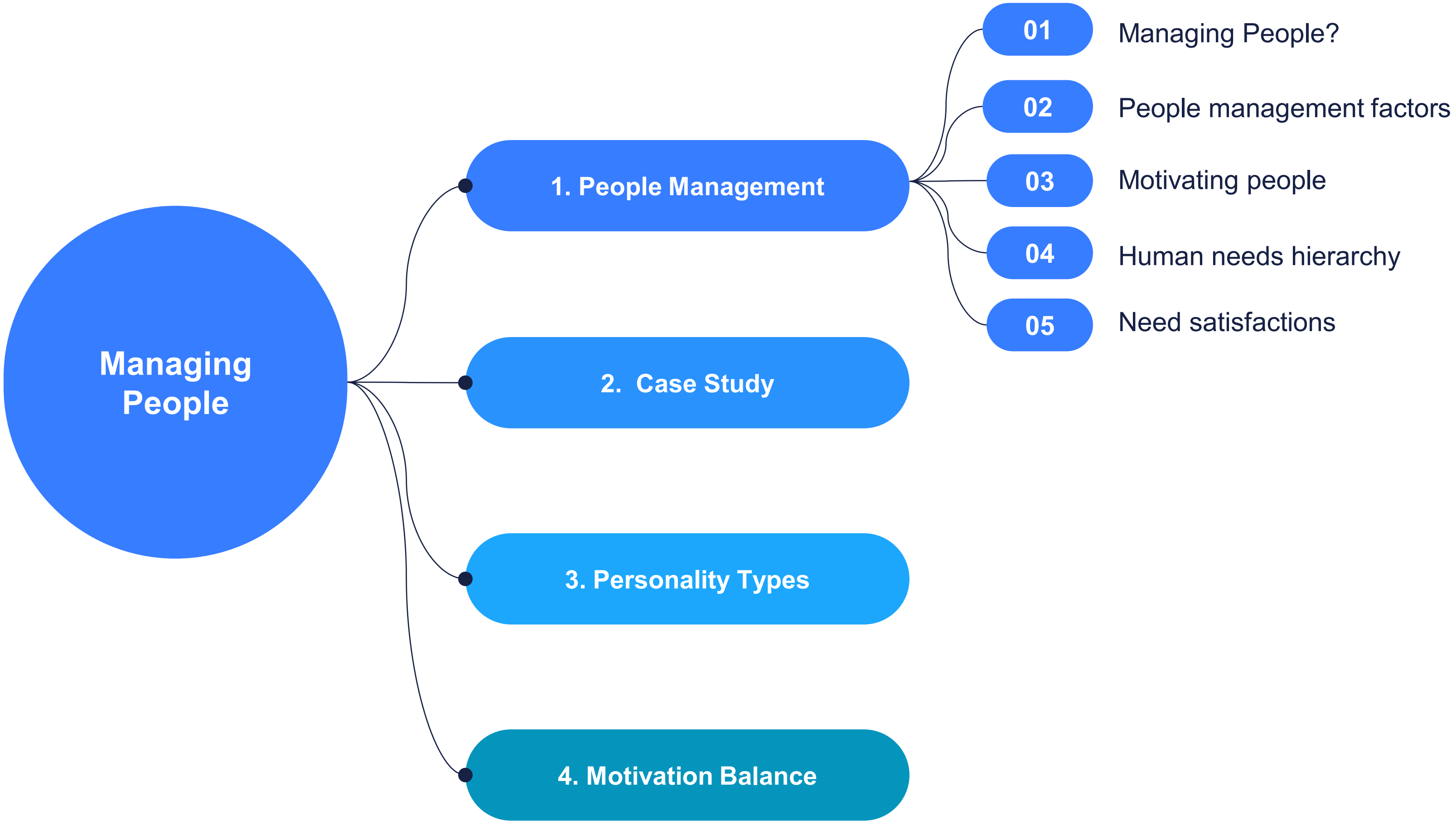
Risk management process (4)

✧ Risk indicators

Risk type	Potential indicators
Estimation	Failure to meet agreed schedule; failure to clear reported defects.
Organizational	Organizational gossip; lack of action by senior management.
People	Poor staff morale; poor relationships amongst team members; high staff turnover.
Requirements	Many requirements change requests; customer complaints.
Technology	Late delivery of hardware or support software; many reported technology problems.
Tools	Reluctance by team members to use tools; complaints about CASE tools; demands for higher-powered workstations.

Chapter3-1. Project Management

3-3: Managing People



Managing People

People Management

[Managing people?]

- People are an organisation’s most important assets.

- The tasks of a manager are essentially people-oriented.
  - Unless there is some understanding of people, management will be unsuccessful.

- Poor people management is an important contributor to project failure.

Managing People

People Management

[People management factors]

Consistency Team members should all be treated in a comparable way without favourites or discrimination.

Respect Different team members have different skills and these differences should be respected.

Inclusion Involve all team members and make sure that people’s views are considered.

Honesty You should always be honest about what is going well and what is going badly in a project.

Managing People

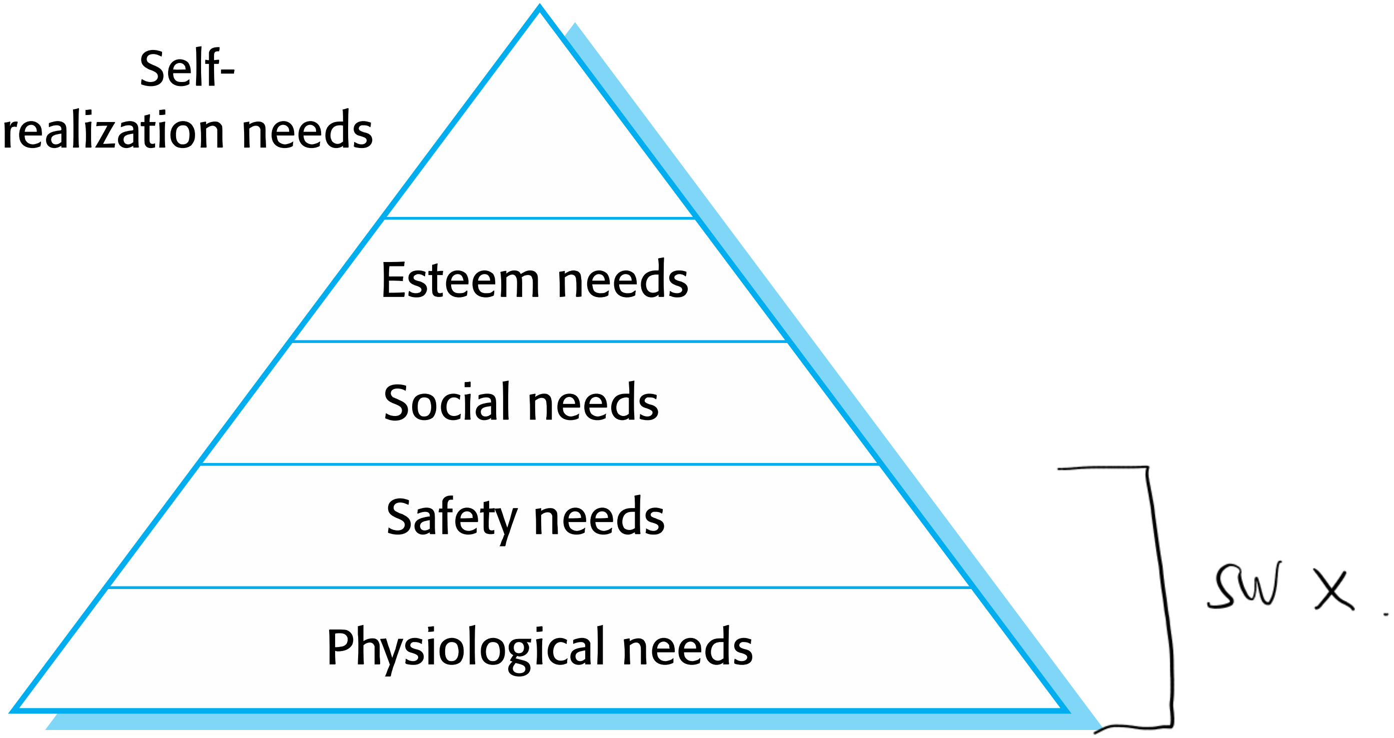
People Management

[Motivating people]

- An important role of a manager is to **motivate the people working on a project**.
- Motivation means organizing the work and the working environment **to encourage people to work effectively**.
  - If people are not motivated, they will not be interested in the work they are doing.
  - They will work slowly, be more likely to make mistakes and will not contribute to the broader goals of the team or the organization.
- Motivation is a complex issue but it appears that their are **different types of motivation** based on:
  - Basic needs (e.g. food, sleep, etc.);
  - Personal needs (e.g. respect, self-esteem);
  - Social needs (e.g. to be accepted as part of a group).

People Management

[Human needs hierarchy]



Managing People

People Management

[Need satisfaction]

- In software development groups, basic **physiological** and **safety** needs are not an issue.

Social

Provide communal facilities;
Allow informal **communications** e.g. via social networking

Esteem

Recognition of **achievements**;
Appropriate **rewards**.

Self-realization

Training - people want to **learn more**;
Responsibility.

Managing People

Case Study : Individual motivation

Alice is a software project manager working in a company that develops alarm systems. This company wishes to enter the growing market of assistive technology to help elderly and disabled people live independently. Alice has been asked to lead a team of 6 developers than can **develop new products based around the company's alarm technology.**

Alice's assistive technology project starts well. **Good working relationships** develop within the team and creative new ideas are developed. The team decides to develop a peer-to-peer messaging system using digital televisions linked to the alarm network for communications. However, some months into the project, Alice notices that **Dorothy**, a **hardware design expert**, starts coming into work **late**, the quality of her **work deteriorates** and, increasingly, that she does **not appear to be communicating** with other members of the team.

Alice talks about the problem informally with other team members to try to find out if **Dorothy's personal circumstances have changed**, and if this might be **affecting her work**. They don't know of anything, so Alice decides to talk with Dorothy to try to understand the problem.

Managing People

Case Study : Individual motivation

After some initial denials that there is a problem, Dorothy admits that she has lost interest in the job. **She expected** that she would be **able to develop and use her hardware interfacing skills**. However, because of the product direction that has been chosen, she has **little opportunity** for this. Basically, she is working as a C programmer with other team members.

Although she admits that the work is challenging, **she is concerned that she is not developing her interfacing skills.** She is worried **that finding a job that involves hardware interfacing will be difficult after this project**. Because she does not want to upset the team by revealing that she is thinking about the next project, she has decided that it is best to minimize conversation with them.

Managing People

Case Study

[Comments on case study]

- If you **don’t sort out the problem** of unacceptable work, the other **group members** will become **dissatisfied** and feel that they are doing an **unfair** share of the work.

- Personal **difficulties affect motivation** because people **can’t concentrate** on their work.
  - They need time and support to resolve these issues, although you have to make clear that they still have a responsibility to their employer.

- Alice gives Dorothy more **design autonomy** and **organizes training courses in software engineering** that will give her more opportunities after her current project has finished.

Managing People

Personality types

[Personality types]

- The needs hierarchy is almost certainly an over-simplification of motivation in practice.
- Motivation should also take into account **different personality types**:
  - **Task-oriented people,** who are motivated by the **work** they do. In software engineering.
  - **Interaction-oriented people,** who are motivated by the **presence** and **actions** of co-workers.
  - **Self-oriented people,** who are principally motivated by **personal success** and **recognition**.

Managing People

Personality types

Task-oriented

- The motivation for doing the **work is the work itself**;

Self-oriented

- The work is a means to an end which is the **achievement of individual goals**
- e.g. to get rich, to play tennis, to travel etc.;

Interaction-oriented

- The principal motivation is the presence and actions of **co-workers**.
- People go to work because they like to go to work.

Managing People

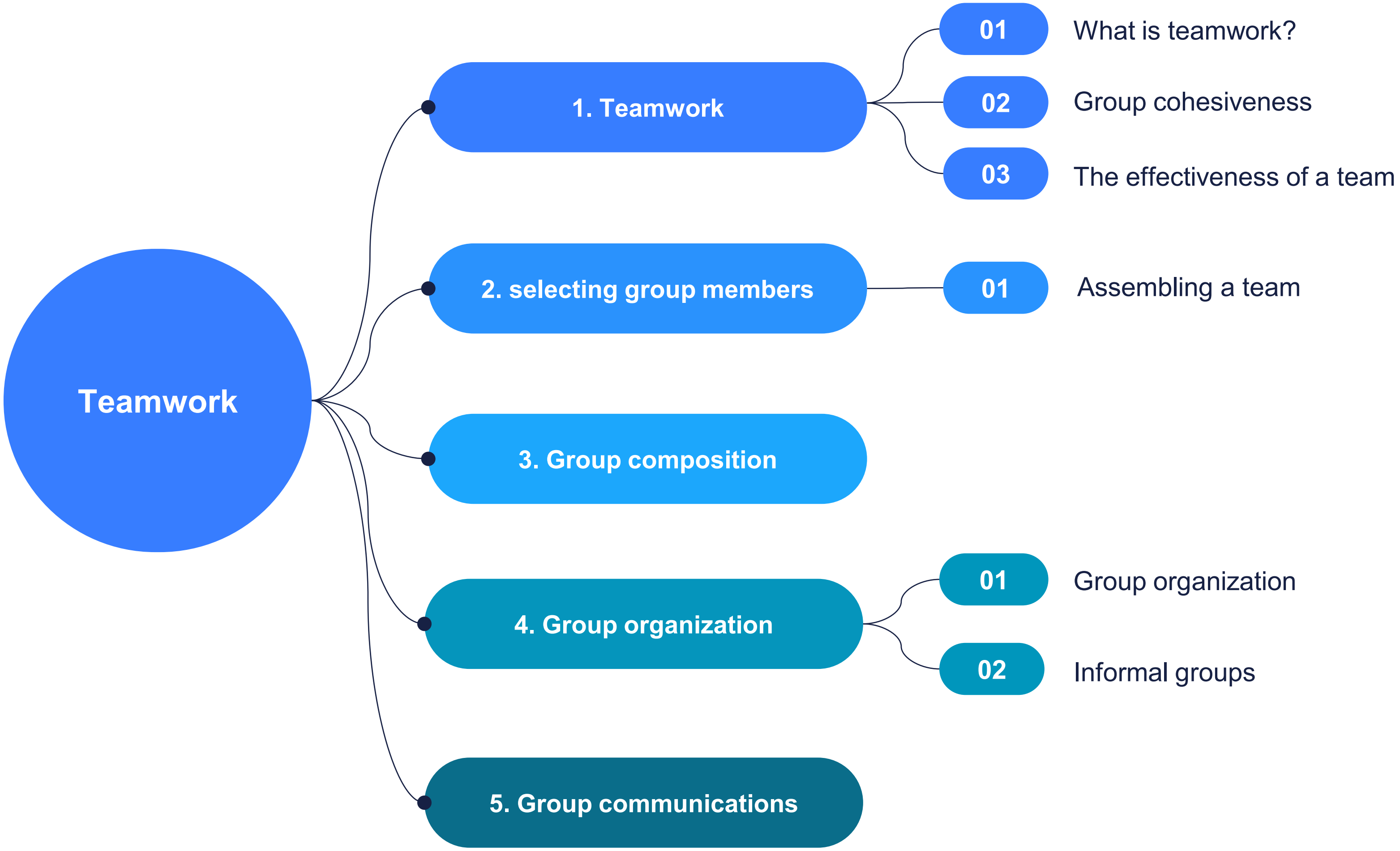
Motivation Balance

[Motivation balance]

- Individual motivations are made up of elements of each class.
- The balance can change depending on personal circumstances and external events.
- However, **people are not just motivated by personal factors** but also by being **part of a group and culture**.
- People go to work because **they are motivated by the people that they work with**.

Chapter3-1. Project Management

3-4: Teamwork



Teamwork

[What is teamwork?]

- Most software engineering is a **group activity**
  - The development schedule for most non-trivial software projects is such that they cannot be completed by one person working alone.
- A good group is **cohesive** and has a **team spirit**.
  - The people involved are motivated by the success of the group as well as by their own personal goals.
- **Group interaction** is a key determinant of group performance.
- Flexibility in group composition is limited
  - Managers must do the best they can with available people.

Teamwork

[Group cohesiveness (그룹의 단결력)]

- In a cohesive group, members consider **the group to be more important than any individual** in it.
- The advantages of a cohesive group are:
  - Group **quality standards can be developed** by the group members.
  - Team members **learn from each other** and get to know each other’s work; Inhibitions caused by ignorance are reduced.
  - **Knowledge is shared.**
    - Continuity can be maintained if a group member leaves.
  - **Refactoring and continual improvement** is encouraged.
    - Group members work collectively to deliver high quality results and fix problems, irrespective of the individuals who originally created the design or program.

Teamwork

[Case study: team spirit (공동체 정신)]

Alice, an experienced project manager, understands the importance of creating a cohesive group. As they are developing a new product, **she takes the opportunity of involving all group members in the product specification and design** by getting them to discuss possible technology with elderly members of their families. She also **encourages them to bring these family members** to meet other members of the development group.

Alice also arranges **monthly lunches** for everyone in the group. These lunches are an opportunity for all team members to meet informally, talk around issues of concern, and get to know each other. At the lunch**, Alice tells the group what she knows about organizational news, policies, strategies, and so forth.** Each team member then briefly summarizes **what they have been doing and the group discusses a general topic**, such as new product ideas from elderly relatives.

Every few months, Alice organizes an 'away day' for the group where the team spends two days on 'technology updating'. Each team member prepares an update on a relevant technology and presents it to the group. This is an off-site meeting in a good hotel and plenty of time is scheduled for discussion and social interaction.

Teamwork

[The effectiveness of a team]

- The **people** in the group
  - You need a **mix of people** in a project group as software development involves diverse activities such as negotiating with clients, programming, testing and documentation.
- The group **organization**
  - A group should be organized so that **individuals can contribute** to the best of their abilities and tasks can be completed as expected.
- Technical and managerial **communications**
  - **Good communications** between group members, and between the software engineering team and other project stakeholders, is essential.

Teamwork

Selecting group members

[Selecting group members]

- A manager or team leader’s job is to **create a cohesive group** and **organize their group** so that they can work together effectively.
- This involves **creating a group** with the **right balance** of technical **skills** and **personalities**, and organizing that group so that the members **work together** effectively.

Teamwork

Selecting group members

[Assembling a team]

- May not be possible to appoint the ideal people to work on a project
  - Project **budget** may not allow for the use of highly-paid staff;
  - Staff with the **appropriate experience** may not be available;
  - An **organization** may wish to develop employee skills on a software project.

- Managers have to work within these constraints especially when there are shortages of trained staff.

Teamwork

Group composition

[Group composition]

- Group composed of members who share the same motivation can be problematic
  - Task-oriented - everyone wants to do their own thing;
  - Self-oriented - everyone wants to be the boss;
  - Interaction-oriented - too much chatting, not enough work.
- An effective group has a **balance of all types.**
- This can be difficult to achieve software engineers are often task-oriented.
- Interaction-oriented people are very important as they can detect and defuse tensions that arise.

Teamwork

Group composition

✧ Case study: group composition

In creating a group for assistive technology development, **Alice is aware of the importance of selecting members with complementary personalities**. When interviewing potential group members, she tried to assess whether they were task-oriented, self-oriented, or interaction-oriented. She felt that she was primarily a self-oriented type because she considered the project to be a way of getting noticed by senior management and possibly promoted. She therefore looked for one or perhaps two interaction-oriented personalities, with task-oriented individuals to complete the team. **The final assessment that she arrived at was**:

Alice—**self-oriented**
Brian—**task-oriented**
Bob—**task-oriented**
Carol—**interaction-oriented**
Dorothy—**self-oriented**
Ed—**interaction-oriented**
Fred—**task-oriented**

Teamwork

Group Organization

- **The way that a group is organized affects the decisions that are made by**
  - that group
  - the ways that information is exchanged
  - the interactions between the development group and external project stakeholders.

- **Key questions include:**
  - Should the project manager be the technical leader of the group?
  - Who will be involved in making critical technical decisions, and how will these be made?
  - How will interactions with external stakeholders and senior company management be handled?
  - How can groups integrate people who are not co-located?
  - How can knowledge be shared across the group?

Teamwork

Group Organization

- **Small software** engineering groups are usually organised informally without a rigid structure.

- **For large projects**, there may be a hierarchical structure where different groups are responsible for different sub-projects.

- **Agile development** is always based around an informal group on the principle that formal structure inhibits information exchange

Teamwork

Group Organization

[Informal groups]

- The group **acts as a whole** and comes to a consensus on decisions affecting the system.
- The **group leader** serves as the **external interface** of the group but does not allocate specific work items.
- Rather, **work** is **discussed by the group** as a whole and tasks are allocated according to ability and experience.
- This approach is successful for groups where **all members** are **experienced and competent**.

Group Communications

[Group communications]

- Good communications are essential for **effective group working**.
- **Information** must be **exchanged** on the status of work, design decisions and changes to previous decisions.
- **Good communications** also strengthens group cohesion as it promotes understanding.

Teamwork

Group Communications

[Group communications (cont.)]

Group Size The larger the group, the harder it is for people to communicate with other group members.

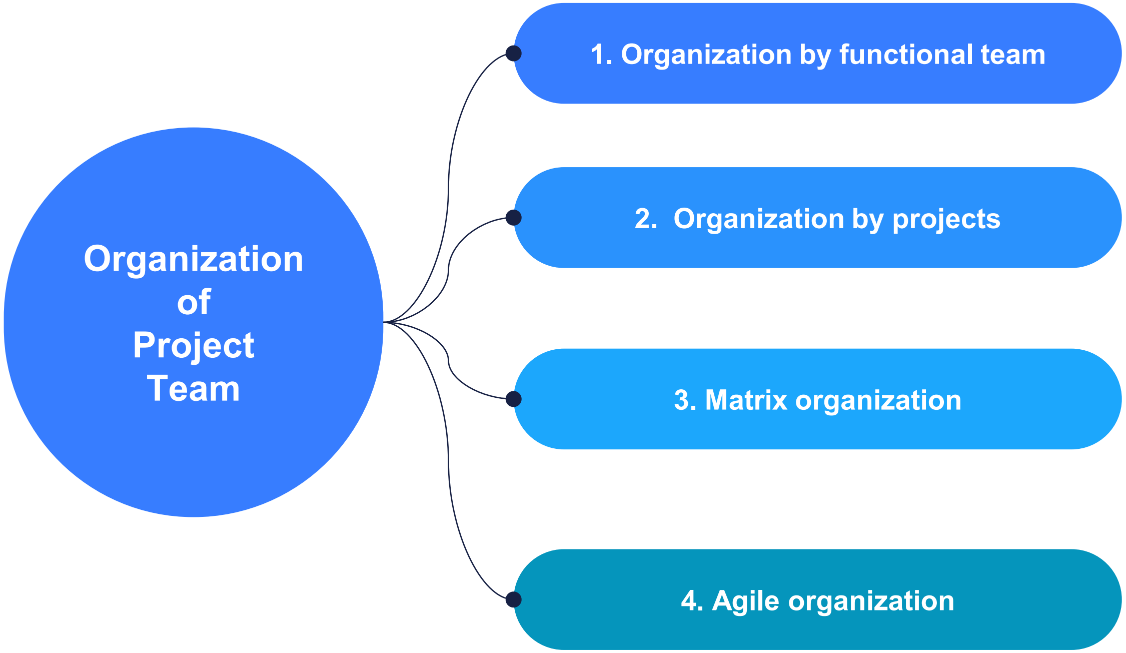
Group Structure Communication is better in informally structured groups than in hierarchically structured groups.

Group Composition Communication is better when there are different personality types in a group and when groups are mixed rather than single sex.

The Physical work environment Good workplace organisation can help encourage communications.

Chapter3-1. Project Management

3-5: Organization of Project Team

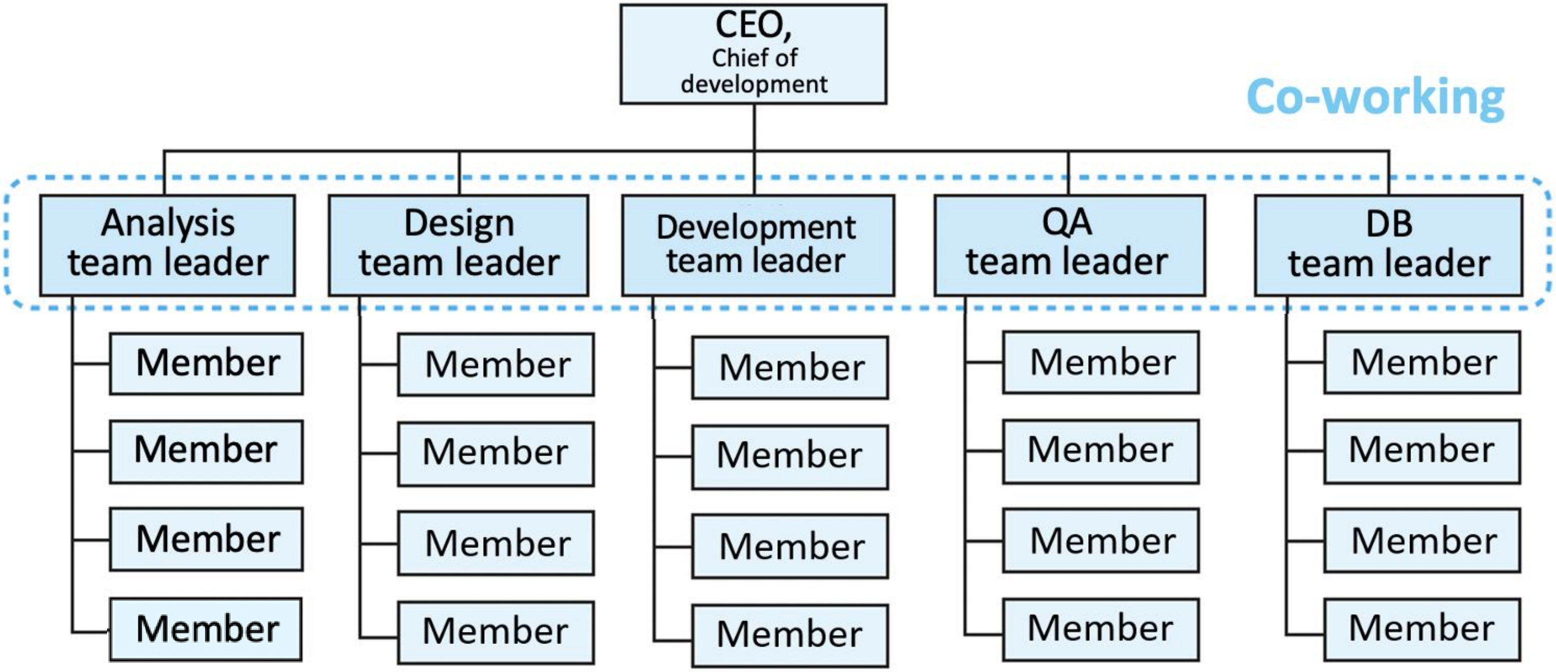


Organization of Project Teamwork

Organization by Functional team (직능별 조직)

- Different departments perform different roles in the same project.
- A team member is included in a department
- Co-work is performed among departments

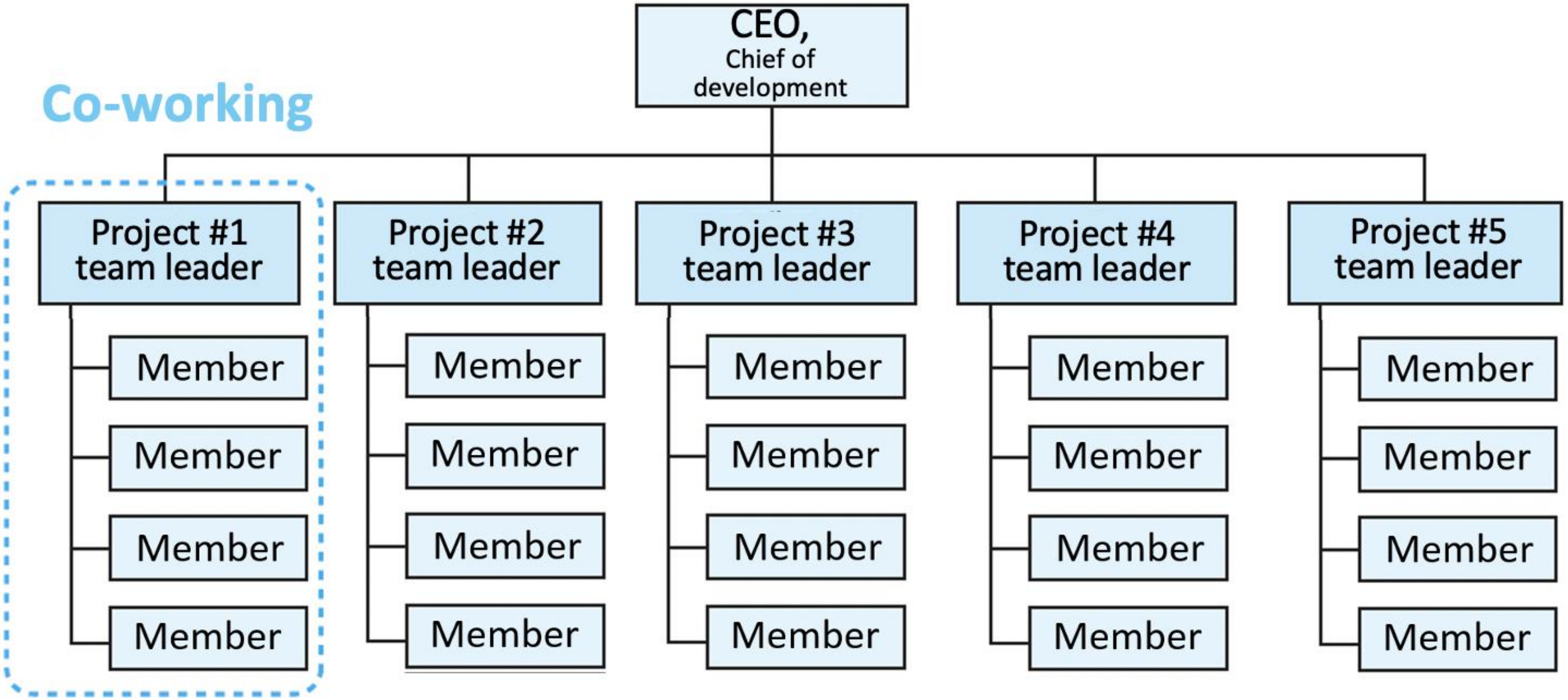
Source: <All about software engineering>. 생능출판사. 최은만



Organization by Projects (프로젝트별 조직)

- Functional member (developer) is located in different project
- Communication paths are short, thus human resource and progress management is efficient.

Source: <All about software engineering>. 생능출판사. 최은만

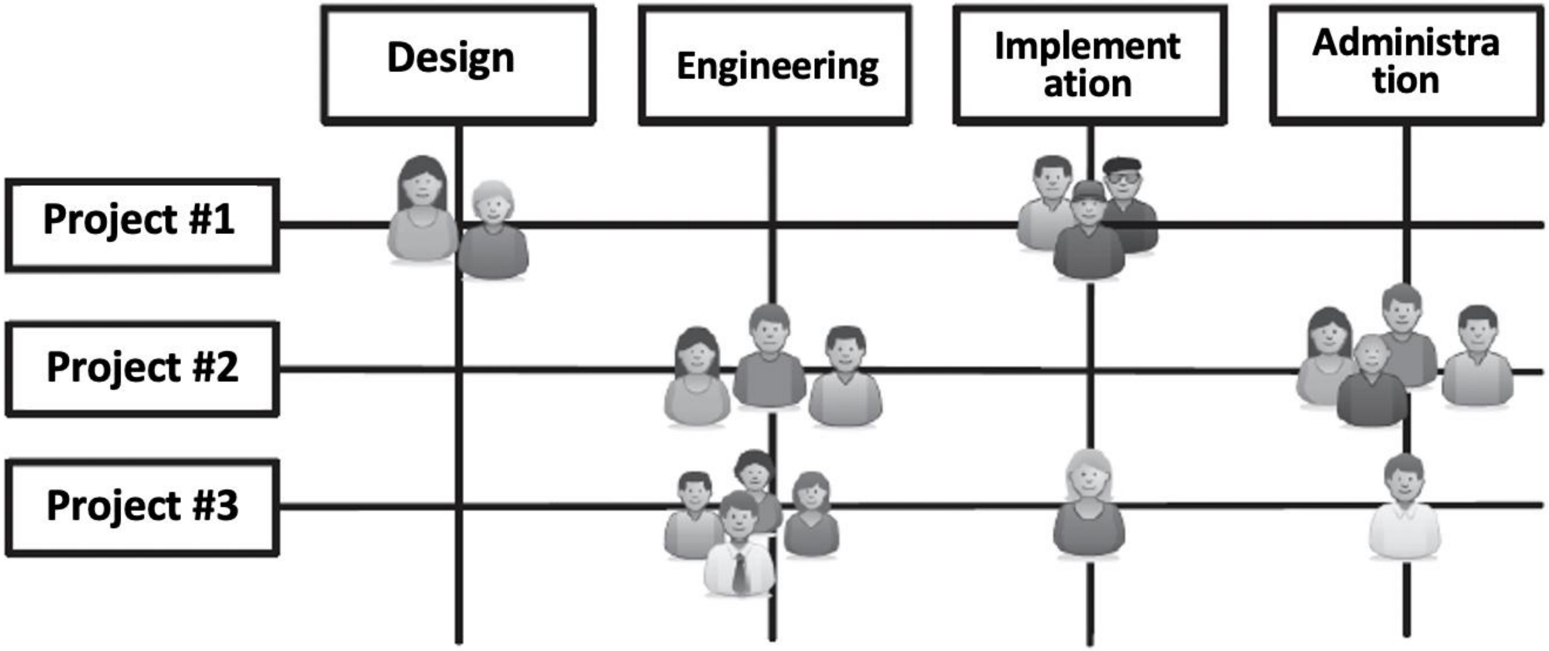


Organization of Project Teamwork

Matrix Organization (메트릭스 조직)

- Manager of functional group has responsibility
- Developers are included in functional teams
- Member can be duplicated in different project teams

Source: <All about software engineering>. 생능출판사. 최은만

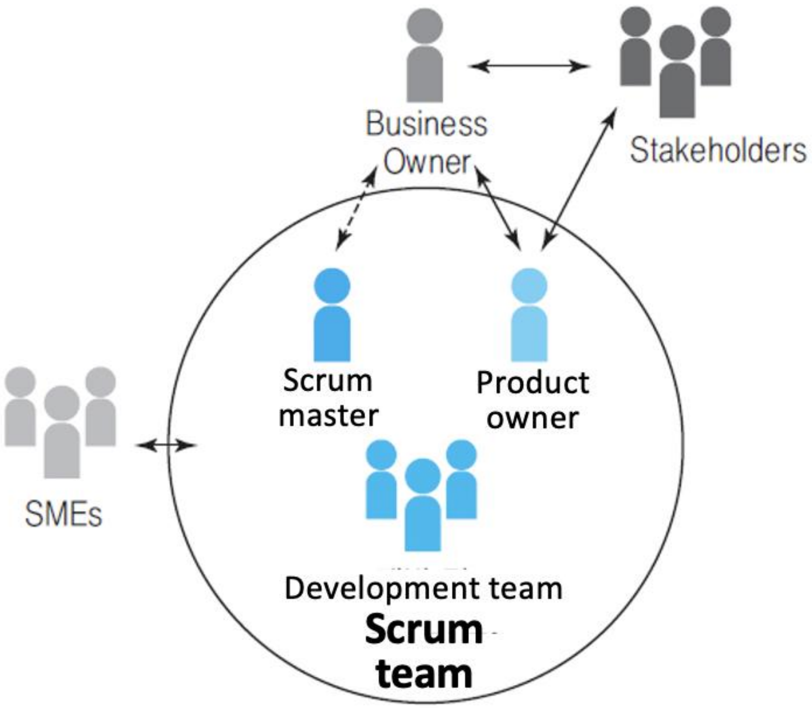


Organization of Project Teamwork

Agile Organization (에자일 조직)

- Teams of 5-9 people working closely with each other
- Share ownership of results and issues

Source: <All about software engineering>. 생능출판사. 최은만



Chapter3-1. Project Management

Key Points (1)

- ✧ Good project management is essential if software engineering projects are to be developed on schedule and within budget.

- ✧ Software management is distinct from other engineering management. Software is intangible. Projects may be novel or innovative with no body of experience to guide their management. Software processes are not as mature as traditional engineering processes.

- ✧ Risk management involves identifying and assessing project risks to establish the probability that they will occur and the consequences for the project if that risk does arise. You should make plans to avoid, manage or deal with likely risks if or when they arise.

Chapter3-1. Project Management

Key Points (2)

- ✧ People management involves choosing the right people to work on a project and organizing the team and its working environment.
- ✧ People are motivated by interaction with other people, the recognition of management and their peers, and by being given opportunities for personal development.
- ✧ Software development groups should be fairly small and cohesive. The key factors that influence the effectiveness of a group are the people in that group, the way that it is organized and the communication between group members.
- ✧ Communications within a group are influenced by factors such as the status of group members, the size of the group, the gender composition of the group, personalities and available communication channels.