Introduction to Project Management

- **What is project?**
- **What is project management?**
  - **Time management of a project**
  - **Quality management of a project**
  - **Cost management of a project**
  - **Risk management of a project**
- **Project management is the key to success in the competition for global markets today and in the future.**

Definition of Project

- ***Project***
  - — A temporary endeavor undertaken to create a unique product, service, or result.
- ***Temporary***
  - — Definite beginning and definite end
  - — Not an ongoing products or services
  - — Opportunity of market (timely manner)
  - — Project team (usually with a finite term)
- ***Unique product, service, or result***
  - — Not been done before
  - — Fundamental uniqueness, may have repetitive elements
- ***Progressive elaboration***
  - — continuously and constantly modified, detailed, and improved plan, as a result of a series of iterations

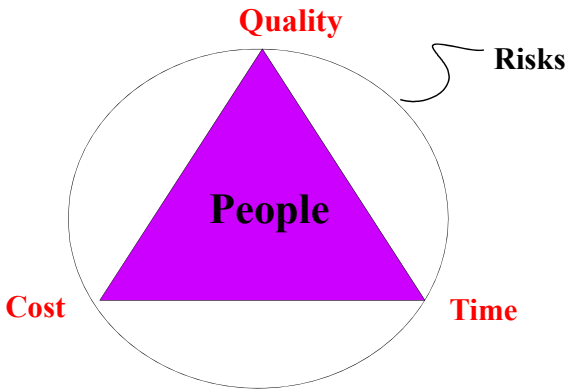
Basic Properties of Project

- Unrepeatable nature of the process
- Uniqueness of the operation
- Determinability of targets
- Temporality nature and open structure of the organization

What is Project Management ?

- Project management is applying a set of principles, practices, and techniques to leading project teams and controlling project schedule, quality, cost, and performance risks to result in delighted customers or exceed stakeholder expectations.
- Project management is about applying all kinds of resources available to the project to fulfill its targets.

Essentials of Project Management



Criteria of Successful Projects

- Satisfactions from stakeholders (sponsors, owners, or consumers);
- Targets of project: quality, time, and costs - meeting the requirements;
- Benefits (social, environmental and economical benefits) for participants.

Contributors to Successful Projects: 10 Essential Elements (100%)

Elements	Weight ratio	Elements	Weight ratio
Support from the management	18%	Normal infrastructure	8%
Customer/client participation	16%	Steady basic requirements	6%
Clear targets	14%	Correct methodology	6%
Experienced project leader/manager	12%	Reliable estimation	5%
Minimum scopes	10%	Others	5%

Status of Project Management in US (1)

- **Status of previous IT projects**

  8400 IT projects (investment of $25 billion US$) were investigated by Standish Group, and the results showed:

  - **Projects reaching targets** **16%**
  - **Projects requiring remedy** **50%**
  - **Totally failed** **34%**

Status of Project Management in US (2)

- Average budget of projects exceeded: 90% (1.9 times), and their schedules exceeded: 120% (2.2 times);
- 33% projects exceeded budget and was behind the schedule;
- Only 16.2% projects were finished within the budget and schedule;
- In big companies, only 9% projects were finished within the budget and schedule.

Status of Project Management in US (3)

- Investigations according to three project goals (cost, target, schedule)
  - Investigator: Dr. Frame (a member of American Project Management Institute)
  - Time: 1997
  - Investigation scopes: 438 project workers

Status of Project Management in US (4)

- Cost status of surveyed projects:
  - Extremely overspent 17%
  - Overspent at some degree 38%
  - Within the budget 27%
  - Surplus at some extent 12%
  - Surplus a lot 6%

Status of Project Management in US (5)

- Meeting the preset requirements? (recently surveyed projects):
  - Far below the anticipation 29%
  - Reaching the requirements 51%
  - Exceeding the requirements 20%

Status of Project Management in US (6)

- Meeting schedules? (recently surveyed projects):
  - Seriously delayed 35%
  - Delayed a little 34%
  - Finished on time 22%
  - A little ahead of schedule 8%
  - Far ahead of schedule 1%

Why so few successful projects

Reasons for Project Failure (I)

- ***Related to organizations***
  - Incompetent project manager
  - Un-adaptable project organization
  - Invalid usage of personnel
  - No or invalid prompting system
  - Bad handling of benefits

- ***Related to requirements***
  - —Poor requirement analysis
  - —No enough recognition of harm caused by requirement changes
  - —Lack of standardizations for changing processes
  - —Lack of control for requirement changes

Why so few successful projects

Reasons for Project Failure (II)

- ***Related to implementation***
  - Unscientific plans
  - Lack of communications
  - Lack of dynamic tracking tools and mechanism, cannot handle the changes
  - Underestimating the influence of risks, and no preparation for them.

- ***Related to estimation***
  - —Complexity of the project
  - —Insufficient experience
  - —Insufficient efficient estimation tools
  - —Man-made estimation errors

Project Manager (1)

— Role and knowledge

- **Role**

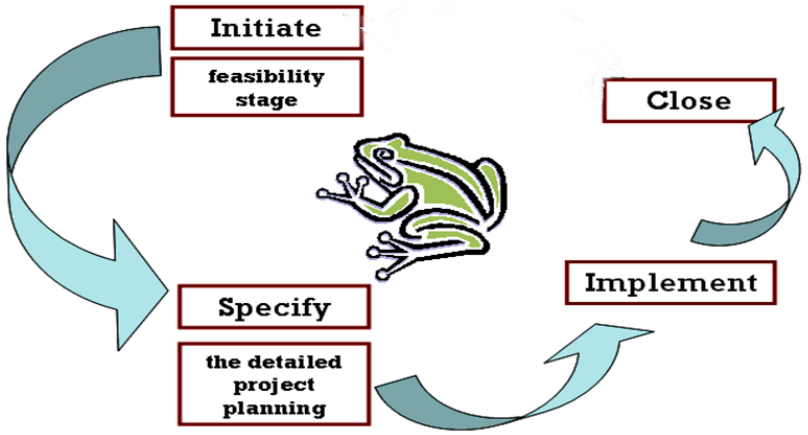
—In general, the project manager is responsible for the overall success of the project. In some companies, this person might be called a project coordinator, or a team leader; however, the key aspect is that the person is responsible for ensuring the success of the project.

Project Manager (2)

— Role and knowledge

- **Knowledge**
  - — Principles and practices of contemporary project management
  - — Competitive tendering and contracting processes
  - — Policies and strategic directions of the current government
  - — Strategic and operational issues of the project or business unit

Time management



Definition of project life cycle

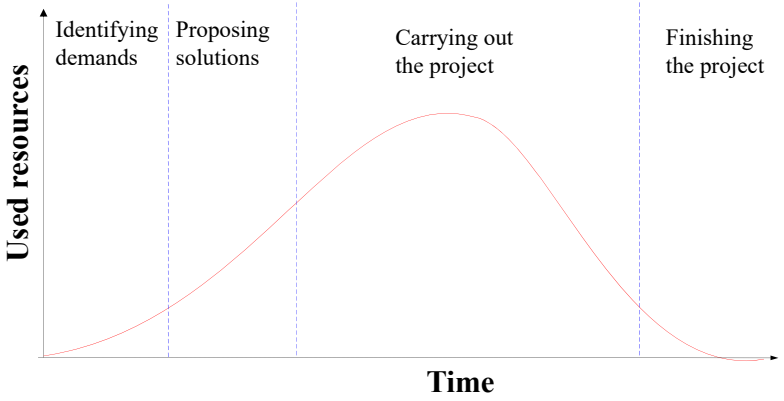
The life cycle divides a project into phases - logical units of work that fit together, and whose results make a sense when reviewed as a unit.

- Technical work required at every stage
- Personnel related to every stage

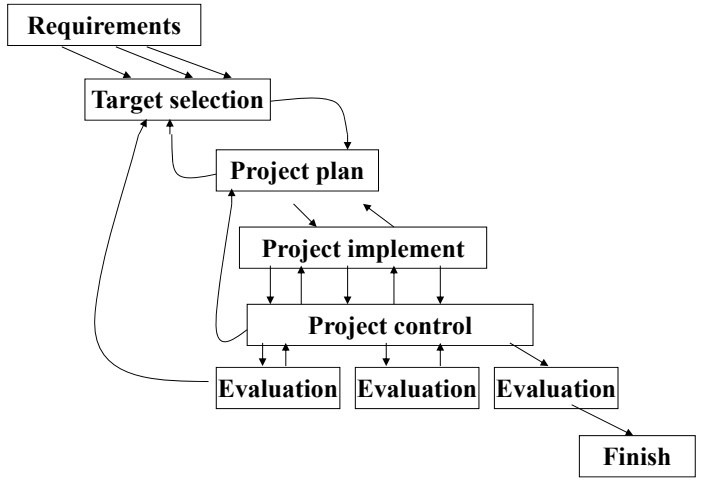
Characteristics of project stages

- Every project stage is symbolized by finishing one or several deliverable achievements. Deliverable achievements are a kind of realizable accomplishment which can be validated, such as project feasibility study report, detailed design, and a work prototype.
- The end of every project stage is identified by inspecting the deliverable achievements and the situation of the project.
- "Goals-Milestones-Methodologies-Indicators"

Curve of project life cycle

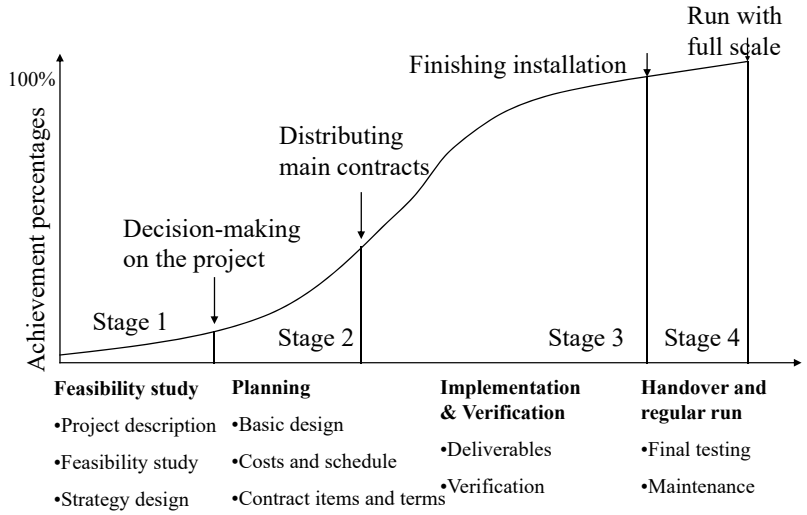


Characteristics of project life cycle



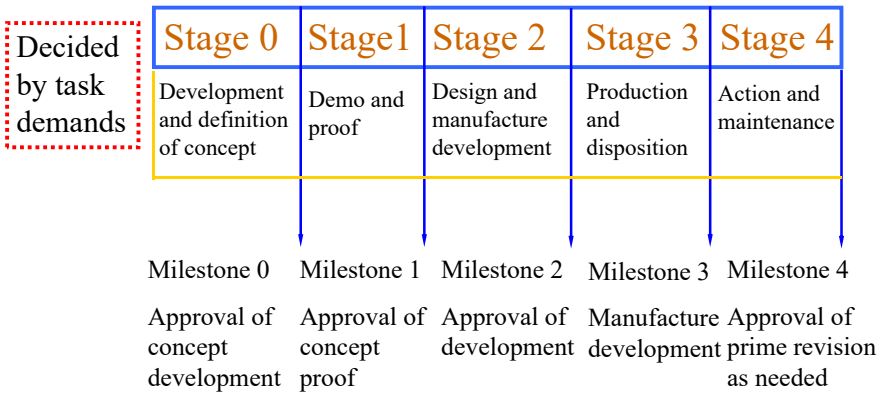
Typical project life cycle (1)

—life cycle of a typical engineering project

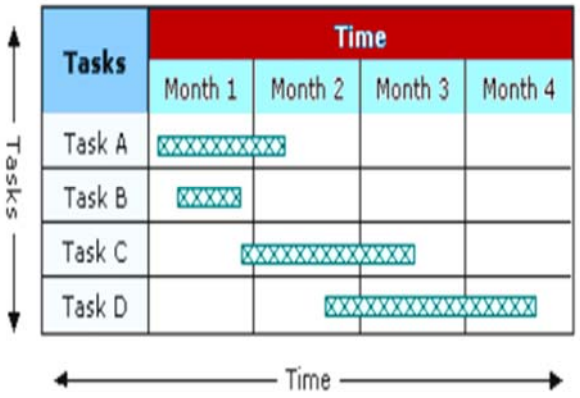


Typical project life cycle (2)

—Project life cycle prescribed by 5000.2 regulations of the US Department of Defense (only as an example)



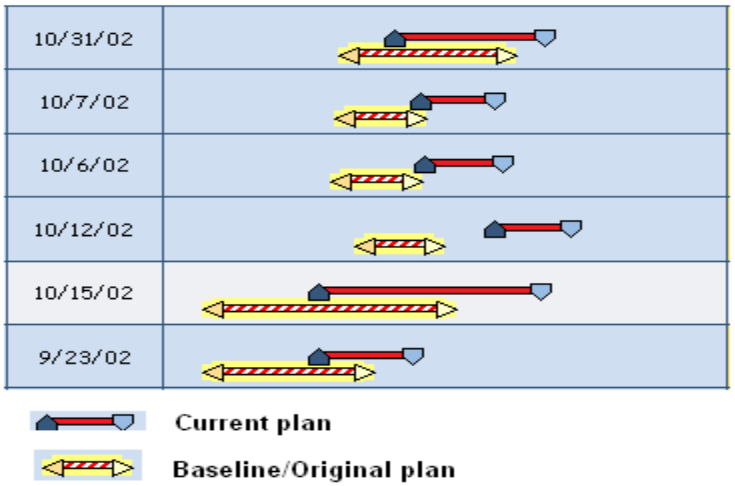
Gantt Chart — a useful tools for project management



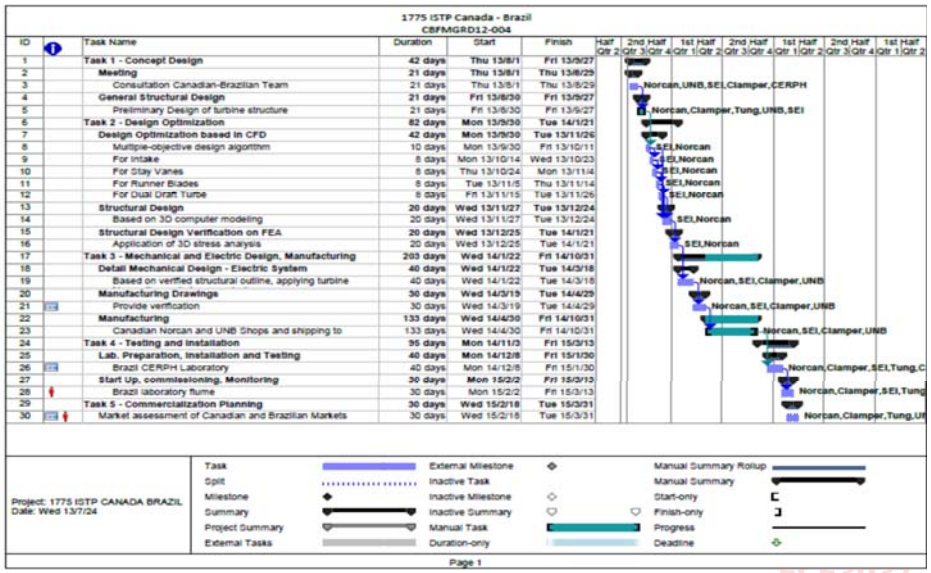
- Gantt charts are bar charts that help plan and monitor project development or resource allocation on a horizontal time scale

Typical Gantt charts

—Baseline Gantt chart



Typical Gantt charts



Schedule planning

- Project schedule planning
- Graphics of project schedule planning

  Gantt chart, milestone chart, etc.
- Detailed accessory information
  - ♦ Resource requirements proposed for periods of time
  - ♦ backup time-planning
  - ♦ Schedule risk estimate
- Resource requirement backup planning

Quality Management of Projects

"Quality is a predictable degree of uniformity and dependability, at low cost and suited to the market."

— Dr. Edwards Deming

---Totality---

Quality

- Production related quality - number of defects/production unit
- Custom-perceived quality – several factors
  - Performance
  - Features
  - Reliability
  - Conformance
  - Durability
  - Serviceability
  - Aesthetics
  - Perceived quality

ISO 9000 (or 900x)

- ***ISO 9000*** **is one of a series of quality management systems (QMS) developed over a long period of time beginning with quality standards in the defence industry.**
- ***ISO 9000*** **is currently accepted as the standard for quality practice in most countries**.
- A formal record (documentation and process) of an organization's method of managing the quality of its products or services.
- Meeting the accreditation standards permits the organization to claim quality certification for its products and services and to advertise the fact.

ISO 9000

ISO 9000 Series

Serial Number	Content
ISO 9000 – 0	Concepts and applications
ISO 9000 – 1	Quality management and assurance standards: guide
ISO 9000 – 2	ISO 9001/ 9002/ 9003application guide
ISO 9000 – 3	ISO 9001 applied to software development, supply and maintenance
ISO 9000 – 4	Dependability Program Management Guide
ISO 9001	Quality systems: design, development, production, installation and service
ISO 9002	Quality systems: quality assurance production and installation
ISO 9003	Quality systems: quality assurance, final inspection and test
ISO 9004 – 1	Quality management and quality systems elements: guide
ISO 9004 – 2	Quality management and quality system elements: guide for services
ISO 9004 – 3	Processed materials: guide
ISO 9004 – 4	Quality improvement: guide
ISO 9004 – 5	Quality plan: guide
ISO 9004 – 6	Quality assurances for project management: guide
ISO 9004 – 7	Configuration management: guide

Thirteen steps to a quality management system:

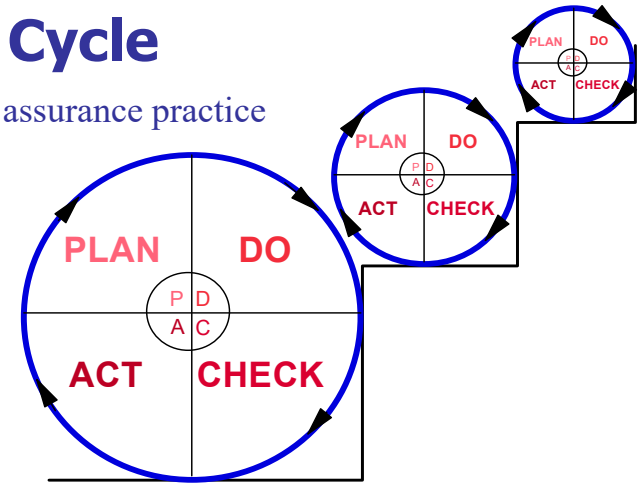
Steps	Content
Step 1	Obtain management understanding of, and commitment to, the quality management approach
Step 2	Define the scope of the activities to be included in the QMS
Step 3	Define the organizational structure and responsibilities of those within the scope of the QMS
Step 4	Audit the existing systems and procedures against the requirements of the standard
Step 5	Develop a plan to write the necessary procedures
Step 6	Train sufficient personnel to write their own procedures
Step 7	Draft and edit the procedures and gain agreement to them
Step 8	Compile a draft quality manual
Step 9	Implement the system on a trial basis
Step 10	Train internal auditors to carry out audits of the system and its operation
Step 11	Revise the operation of the system in light of the results of audits and other information
Step 12	Apply for registration (sometimes called third party approval) from an accredited body
Step 13	Maintain the system by internal audit, using it as an opportunity to improve

Quality Assurance (QA) (Part of the Quality Management Systems)

- Quality Assurance aims at improving and stabilizing production and associated processes to prevent or minimize issues that may led to the defects.
- Quality Assurance covers all activities from design, development, production, installation, servicing and documentation.
- One of the most widely used paradigms for QA management is the PDCA (Plan-Do-Check-Act) approach, also known as the Shewhart cycle.

PDCA Cycle

—Quality assurance practice



Plan: **Design the process**
Do: **Implement the plan**
Check: **Measure and evaluate the results to decision makers**
Act: **Decide on improvements to the process**

Cost Management of Projects

- In a project, cost management involves the overall planning, coordination, control and reporting of all cost-related aspects from project initiation to operation and maintenance.
- Cost management is the process of identifying all the costs associated with the project, making informed choices about the options that will deliver best value for money and managing those costs throughout the life of the project.
- "What is the cost of achieving this objective in this way?"

Reasons of cost over-runs

- Objectives that are unclear and changed during the course of the project
- Unrealistic estimates (usually too optimistic)
- A project brief that is incomplete, unclear and/or inconsistent – communication skills
- Ambiguous risk allocation
- Inadequate management control

Process of Cost Management

- Estimates of entire life cycle costs - acquisition costs, operating costs and disposal costs.
- Cost controls - formal controls for authorizing planned expenditure and any required changes.
- Financial review - at each gateway or equivalent major decision point.

Cost estimate

- Cost estimate is to approximately estimate the costs of resources required to finish the activities of a project. When implementing the project in accordance with the contract, cost estimate and quotation should be distinguished.
- Cost estimate is to work out the costs of implementing the product or service provided by the project.
- Cost estimate includes confirming and considering all kinds of substitute estimation methods.

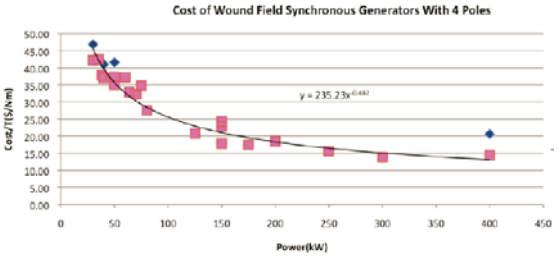
Cost estimate techniques

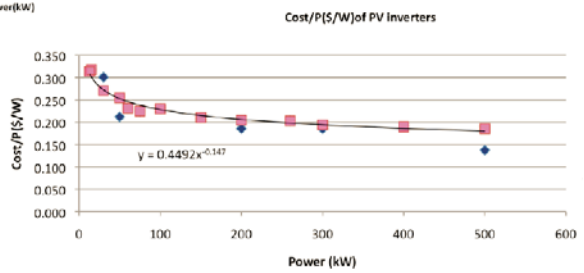
- Analogy estimation method – also called top-to-bottom estimation. It refers to estimate the cost of current project in accordance with the real costs of previous similar projects. (-see Analogy approach)
- Parameter model method – it refers to the estimation by the mathematic models with special parameters of the project as inputs. (-see Statistical approach)
- Bottom-to-top estimation – In this method, separated costs of every unit work are estimated first, then they are collected from bottom to top to estimate the total costs of the project. (-see Industrial Engineering approach)

Looks familiar? We looked into these at the production cost estimation

Cost estimate techniques

- Parameter model method – it refers to the estimation by the mathematic models with special parameters of the project as inputs.





Cost control

- Monitoring the cost implementation and finding out the difference between the real and the planned costs;
- Making sure all the variances being truly recorded in the cost benchmark plan;
- Avoiding incorrect, inappropriate, and unapproved variances being included in the cost;
- Noticing persons related to the project about the approved variances;
- Finding out what caused the positive and negative cost variance. This process should be closely related with other processes. For example, inappropriate measures for cost variance will cause quality or progress problems, or unacceptable risks appearing in the latter stage of the project.

Illustration of a Job Status Report

Category	Budgeted Cost	Estimated Total Cost	Cost Committed (firm costs)	Cost Exposure (estimated)	Cost To Date	Over or (Under)
Labor	$99,406	$102,342	$49,596	---	$52,746	$2,936
Material	88,499	88,499	42,506	45,993	---	0
Subcontracts	198,458	196,323	83,352	97,832	15,139	(2,135)
Equipment	37,543	37,543	23,623	---	13,920	0
Other	72,693	81,432	49,356	---	32,076	8,739
Total	496,509	506,139	248,433	143,825	113,881	**5,950**

Estimated Total Cost =
Cost Committed+Cost Exposed+Cost To Date

Risk Management of Project

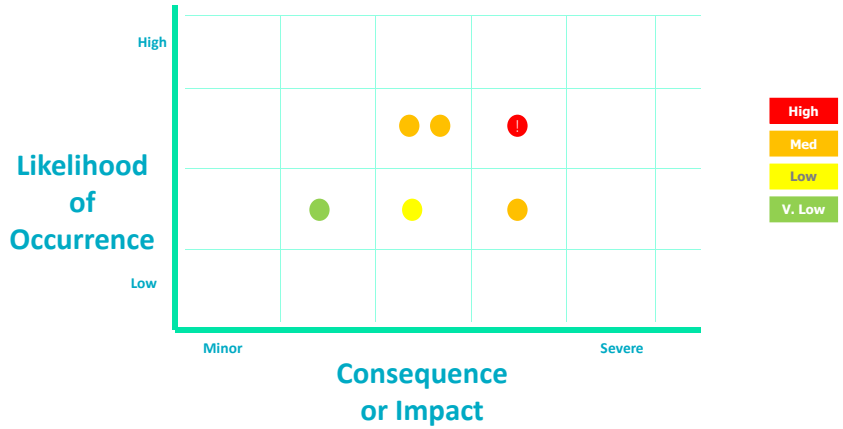
Risk management refers to a process to identify, evaluate, handle, and mitigate possible risks by project management organizations.

Objectives:

- Identifying risks (what?)
- Performing risk analysis (how often?)
- Risk classification/prioritization (how bad?)
- Working-out risk mitigation plans (what to do?)

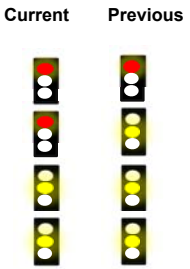
Technical Risks – example

- UNB – availability of researchers and developers to meet technical requirements and schedule



Project Risk Review

- Budget
- Wind forecast data
- Customer Engagement
- Utility Project Ramp-Up



Risks

- Possibility of failure, loss or injury
- Risk is a probability of occurrence of bad consequences. Need to anticipate the losses caused by potential damages in the future.
- Risk is a statistic concept; it describes the probability of impacts on persons or events by negative events and attitudes in a given time and space.
- R=f (P,C)
  - R: risks;
  - P: occurring probabilities of bad events;
  - C: Consequences of bad events.

Risk classification

- Classified by forms of potential losses : property risk, life risk, and responsibility risk;
- Classified by reasons for loss: nature risk, and man-made risk;
- Classified by objects affected by risks: microscopic risk and macroscopic risk;
- Classified by the range affected by risks: special risks and basic risks;
- Classified by if the risks are manageable: manageable risks and unmanageable risks;
- Classified by degree of losses caused by risks: serious, moderate, and minor risks;
- Classified by risk types: technology, management, culture, device, and material risks;
- Classified by categories of the project team: internal risks and external risks.

Four Stages of Project Risk Management

- Risk identification
- Risk analysis
- Risk prioritization
- Risk control/mitigation

How to manage risks successfully?

Risk identification (1)

- Risk identification includes ascertaining the possible risks causing influences on the project, and compiling characteristics of every risk. Risk identification is not an one-time activity. It should be performed frequently in the entire project process.
- Risk identification should notice the internal and external risks at the same time.
- Strictly, risk includes the probability of losses. However, for project, risk identification is also related to the opportunities and threats (a delay resulting in a loss of opportunities).

Risk identification (2)

- Sources

Risk sources:

—variance of requirements and supply;
—design errors, omission, and misunderstanding;
—inappropriate definition and understanding of role and responsibility;
—inappropriate evaluation;
—lack of skills of personnel;
—lack of other resources;
—external irresistible variances;

Description of risk sources should include the estimation of following items:

—the probability of causing risks by the source;
—the range of possible consequences;
—prediction of happening time;
—prediction of the frequency of causing risk accidents by the source.

Risk Identification (3)

- Tools and techniques

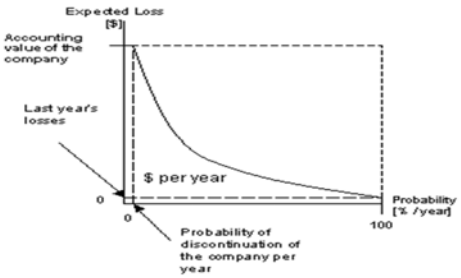
- **Check list:** it is usually formed by risk sources, including project contents, other risk outputs, project product and technology, and internal sources such as the skill of project teams.
- **Drawing flow charts:** it can help project teams have better understanding of reasons and results of the risks.
- **Visit and investigation:** visiting different project partners will be helpful to identify risks, which are difficult to be discovered in regular project activities. In addition, previous investigation records can be obtained.

Risk Symptoms

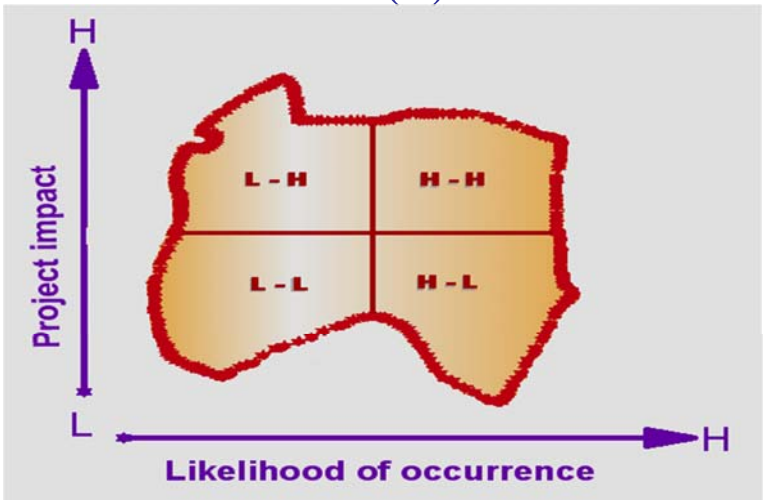
Risk symptoms, sometimes called triggers, are the tiny signals which cause the happening of real risk accidents. For example, low morale maybe is the early alarm signal of imminent delay of schedule; overspent costs in the early stage of activities are possibly the consequences of incorrect estimation; delay in deliverables may be caused by various reasons and are often an alarm.

Risk Evaluation/Analysis

- **Evaluation of the influence of risks and occurring probability**
  - Project management focuses on the risks having the maximum occurring probability and causing the maximum damages
  - A certain risk may cause various influences.
- **Evaluation tools**
  - Probability evaluation of risk occurrence
  - Risk influence evaluation
  - Risk life cycle evaluation
  - Risk classification
  - Risk rank sorting
  - Expression of risk information with charts



Risk Prioritization (1)



Risk Prioritization (2)

- **H-H:** High likelihood and high impact. These are critical risks that will have a severe impact and are likely to occur.
- **L-H:** Low likelihood and high impact. These are significant risks that are not likely to occur but will have a material impact to the project if they do.
- **H-L:** High likelihood and Low impact. These are significant risks that may be able to be avoided with careful planning and monitoring. Those that do occur however will have a low project impact which is likely to be manageable.
- **L-L:** Low likelihood and low Impact. Although these risks should still be monitored to ensure that they do not change category, the amount of time devoted to these should be proportionate with their likelihood and impact.

Risk Control

Risk Response Measures (1)

- **Risk avoidance:** avoiding actual threats, usually the reasons of threat occurrence;
- **Risk transfer:** transfering risk by contract agreements. To reduce or avoid threats, insurance, service, and other necessary agreements can be signed. The items and conditions of the agreements have great influence on the decrease of risks.
- **Risk reduction:** reducing risk occurring probability or reducing damage caused by risks, or reducing both at the same time.
- **Risk retention:** Acceptance of the results of risk accidents. The acceptance can be active (such as enforcing plans when risk accidents happen) or passive (such as accepting relative lower profits when the risk of overspent activities happen).

Risk Response Measures (2)

- **Emergency response planning:** it is to ascertain the action approaches that should be followed when the identified risk accidents really occur.
- **The strategy of substitute schemes:** risk accidents can be prevented to occur or totally avoided by changing the original scheme of the project. For example, extra design work can reduce the modification times during the implementation or construction stages. Extensive literature records the potential values of different tactics in many fields.
- **Insurance:** Insurance or other similar plans can handle some types of risks. The insurance variety and cost change with different application fields.

Risk Management Planning

- Allocating responsibility
- Establishing risk response plans
- Tabling the relationship between the project activities and relevant risks
- Analyzing risk reasons and its influence during risk planning
- Evaluating the costs and profits during risk planning
- Re-planning the project to alleviate the influence of risks
- Communication and follow-ups