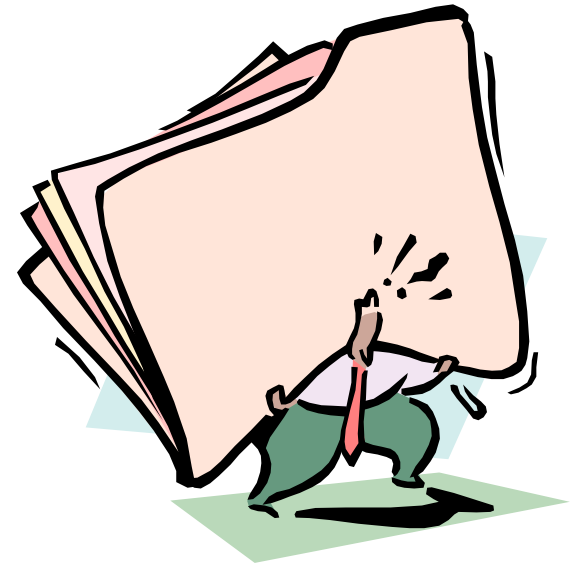


“Laws” of project management

“Projects progress quickly until they are 90% complete. Then they remain at 90% complete forever”



“Laws” of project management

*“When things are going well,
something will go wrong.
When things just cannot get
any worse, they will. When
things appear to be going
better, you have overlooked
something”*



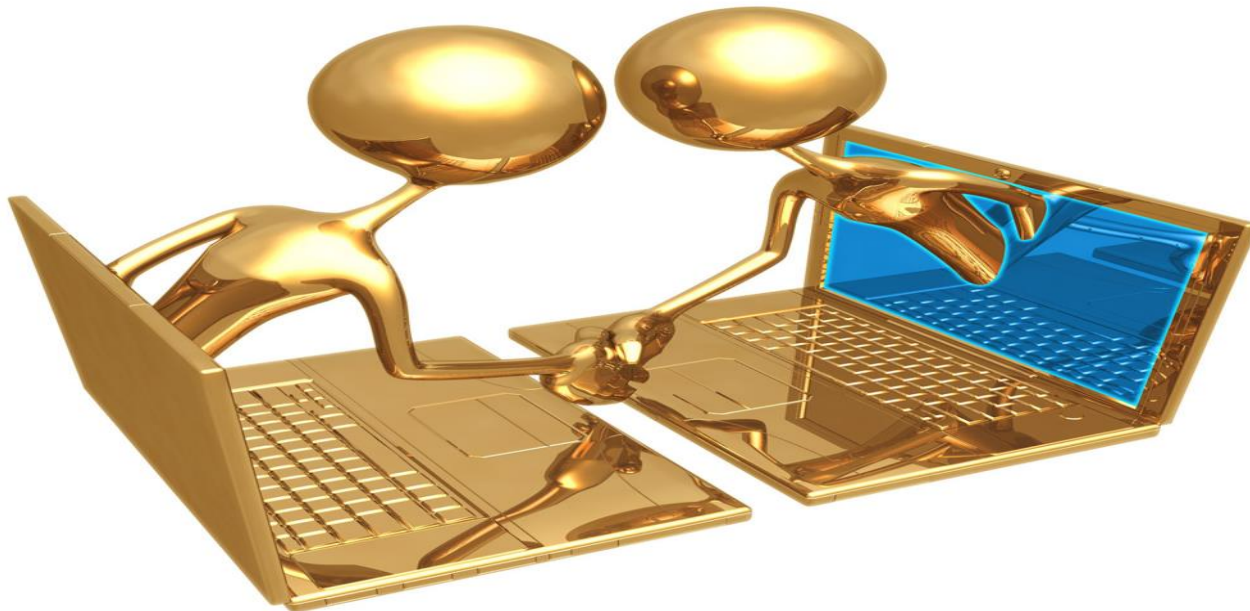
“Laws” of project management

“If project content is allowed to change freely, the rate of change will exceed the rate of progress”



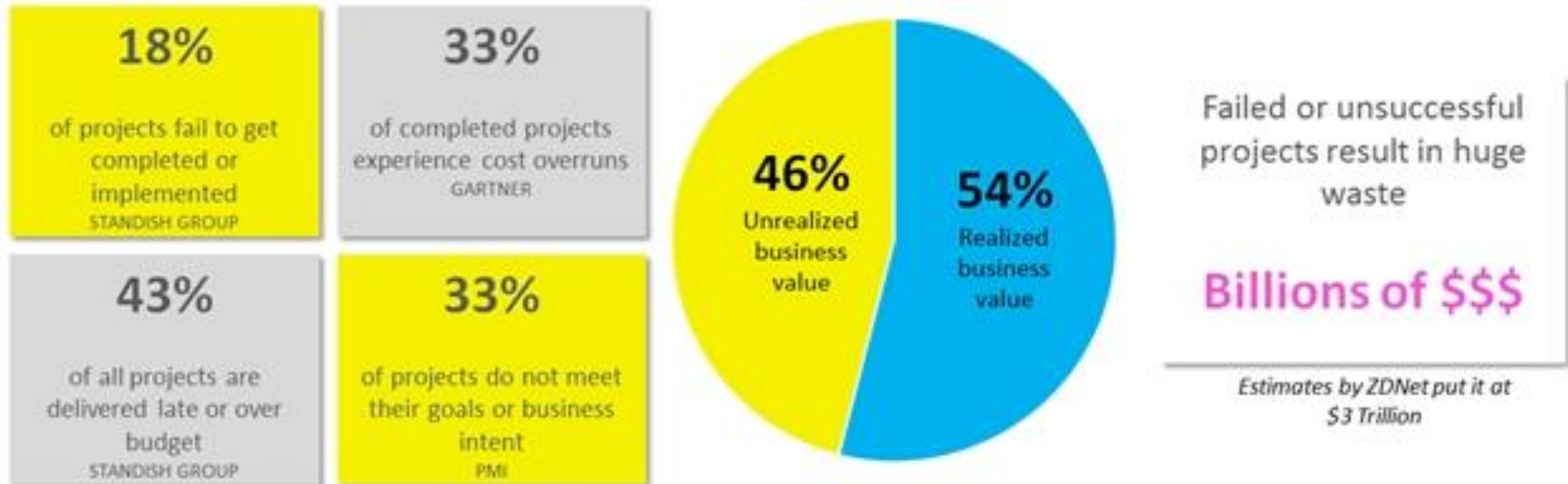
“Laws” of project management

“Project teams detest progress reporting because it manifests their lack of progress”



Group Discussion

What are the top causes of software project failure in the last decade?



Future Plans to Prevent Failures

- Improved project management
- Feasibility Study
- More user involvement
- More external advice



Risk Management



What is it?

Problem that has been analyzed and resolved ahead of time is far simpler to resolve than a problem that occurs unexpectedly.



Risk

- Risk is the possibility of loss.
- Loss (in software developments) implies increased costs, schedule slip, decreased functionality and/or decreased system performance.
- Risk is a function of three things:
 - the likelihood of a hazard occurring
 - the likelihood that the hazard will lead to an accident
 - the worst possible potential loss associated with that accident

Risk Management

- Risk management is the formalization of an “intuitive” process that has always been undertaken by project managers when planning a project.
- The purpose of the Risk Management process is to identify and mitigate the project risks continuously throughout the life cycle of a project.
- The process involves establishing a focus on monitoring of risks at both the project and organizational levels.

Risk Management (cont.)

- Risk management means “being prepared”.
- It involves foresight on the project manager’s part.
- It is a form of insurance, where there are costs associated with having an alternative solution at hand.
- Risk management seeks to tackle at least one of the three elements of risk by:
 - reducing the likelihood of the hazard occurring
 - reducing the likelihood of the hazard leading to accident or loss

Principles

- Global perspective
- Forward looking view
- Open communication
- Integrated management
- Continuous process
- Shared product
- Shared product vision
- Teamwork

Risk in software development

- Software is generally the most visible part of a system, most exposed to requirement changes and most subject to user complaint
- Software is generally more complex to design and build
- Many late-discovered hardware problems have to be addressed through software changes
- Software is often the element that integrates an entire system, adding to the software complexity and adding risks due to late changes
- Software changes appear to be easy to make
- Software design can be considered a form of wicked problem, where the solution to one aspect may reveal a more serious difficulty

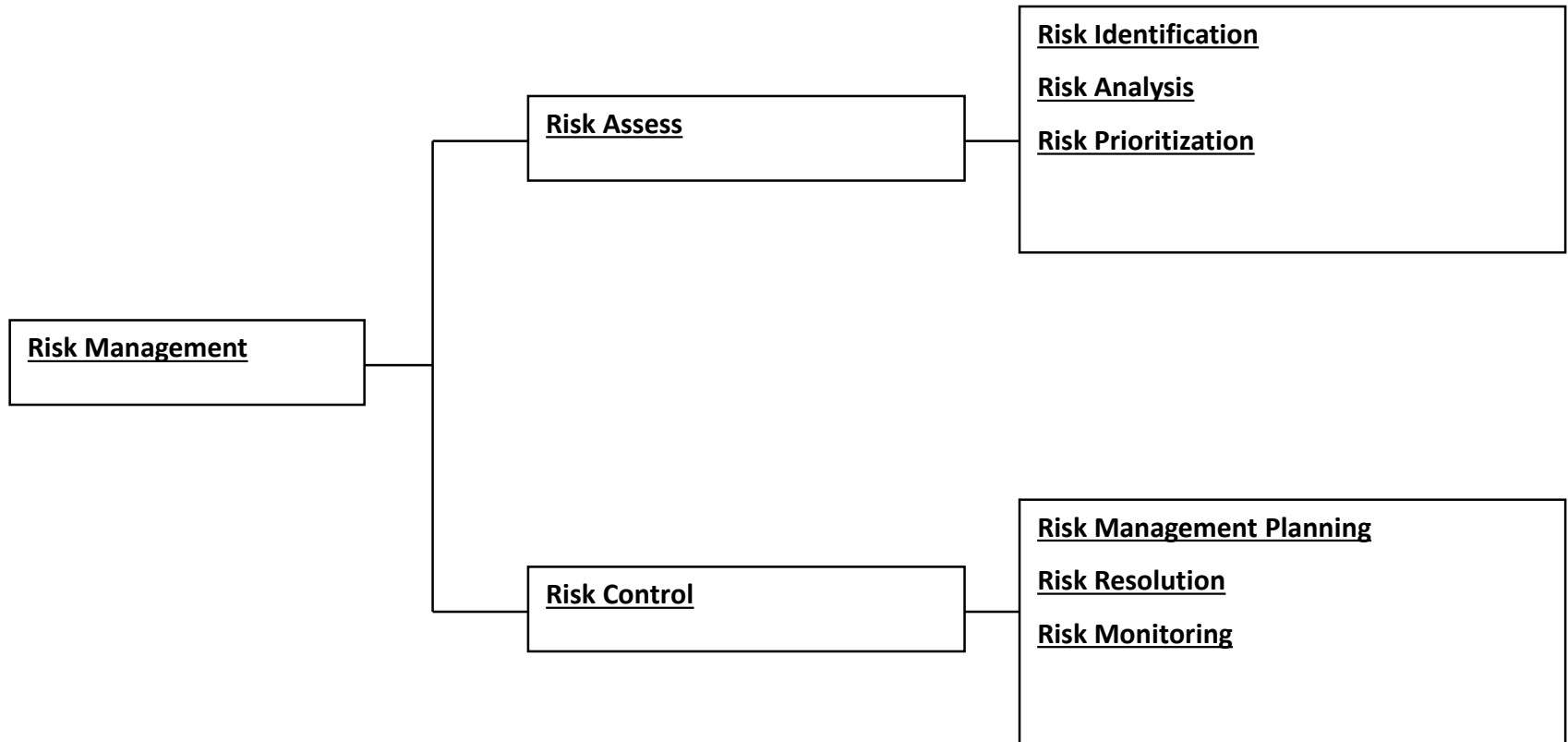
Practices

- The practice of risk management involves two primary steps each with three subsidiary steps:
 - risk assessment: involves risk identification, risk analysis and risk prioritization
 - risk control: involves risk management planning, risk resolution and risk monitoring
- Risk management provides an improved way to address and organize the life cycle of a project.

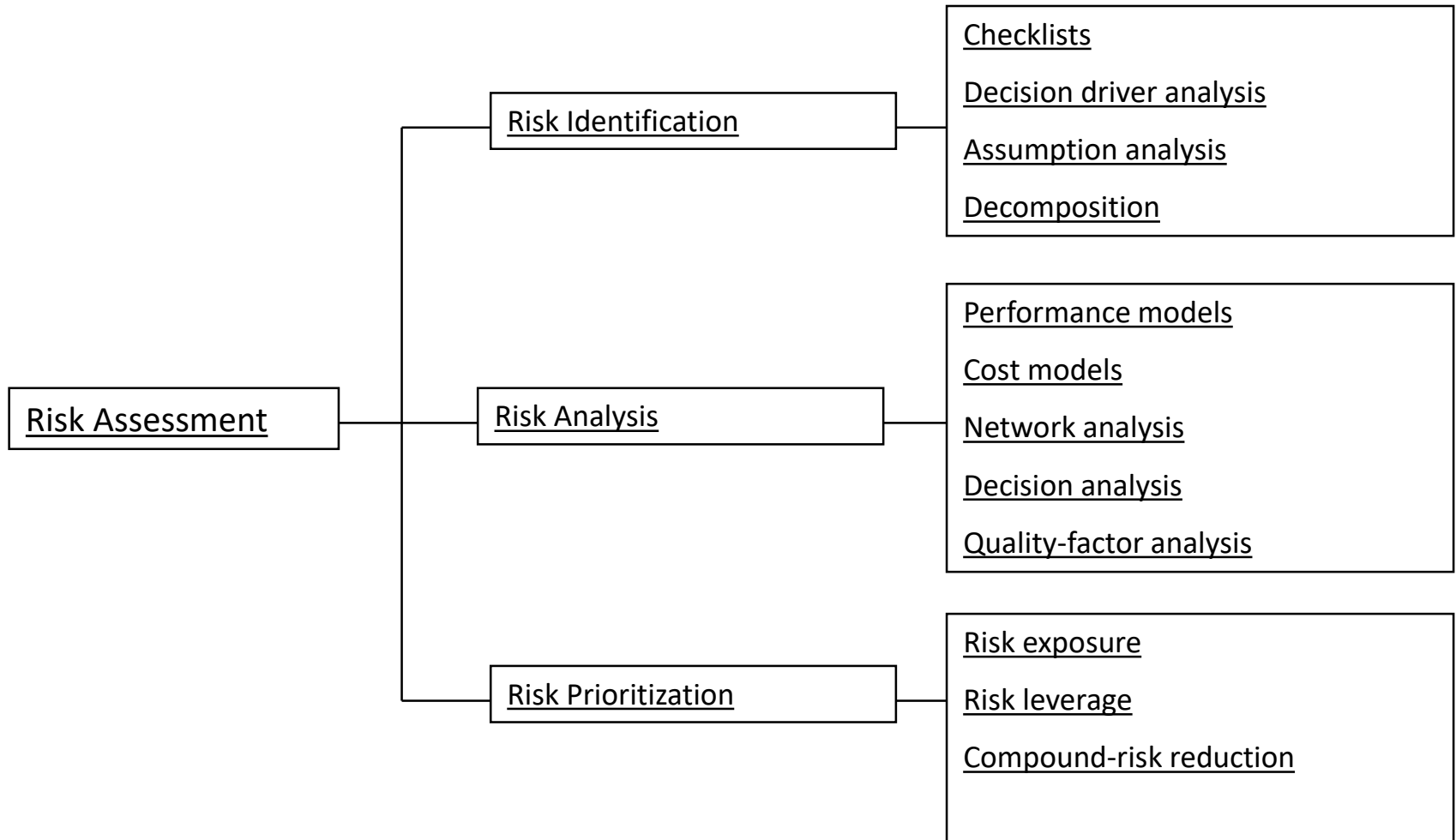
Practices

- Establish risk management scope
- Identify risks
- Analyze and prioritize risks
- Define risk management strategies
- Define risk measures
- Implement risk management strategies
- Assess results of risk management strategies
- Communicate and provide feedback
- Take corrective action

Software risk management steps



Risk assessment



Risk Identification Techniques

- Risk identification checklists
- Decision driver analysis
- Assumption analysis
- Decomposition



Risk Identification Techniques

- Risk Management Checklists

Risk Item	Risk Management Techniques
1. Personnel Shortfalls	Staffing with top talent, job matching, team building, key personnel agreements, training, pre-scheduling key people
2. Unrealistic schedules and budgets	Detailed multisource cost and schedule estimation, design to cost, incremental development, software reuse, requirements scrubbing
3. Developing the wrong software functions	Use cases, organization analysis, mission analysis, ops concept formulation, user surveys, prototyping, early user's manuals
4. Gold plating	Requirements scrubbing, prototyping, cost-benefit analysis, design to cost
5. Continuing stream of requirements changes	High change threshold, information hiding, incremental development
6. Developing the wrong user interface	Prototyping, scenarios, task analysis, user characterization
7. Shortfall in externally performed tasks	Reference checking, preaward audits, award-fee contracts, competitive design or prototyping, teambuilding
8. Shortfalls in externally furnished components	Benchmarking inspections, reference checking, compatibility analysis

Risk Analysis

- Determines the probability of occurrence and loss
- Determines alternative mitigation strategies
- Determines Rough Order Magnitude (ROM) costs associated with each of the alternative mitigation strategies
- Based on cost benefit tradeoffs results in a preferred mitigation approach
- Basis for development of the Individual Risk Element Management Plan

Risk Prioritization

- Product of Risk Analysis
- Risk Exposure (RE)
 - $RE = \text{Prob (UO)} \times \text{Loss (UO)}$

RE: Risk Exposure

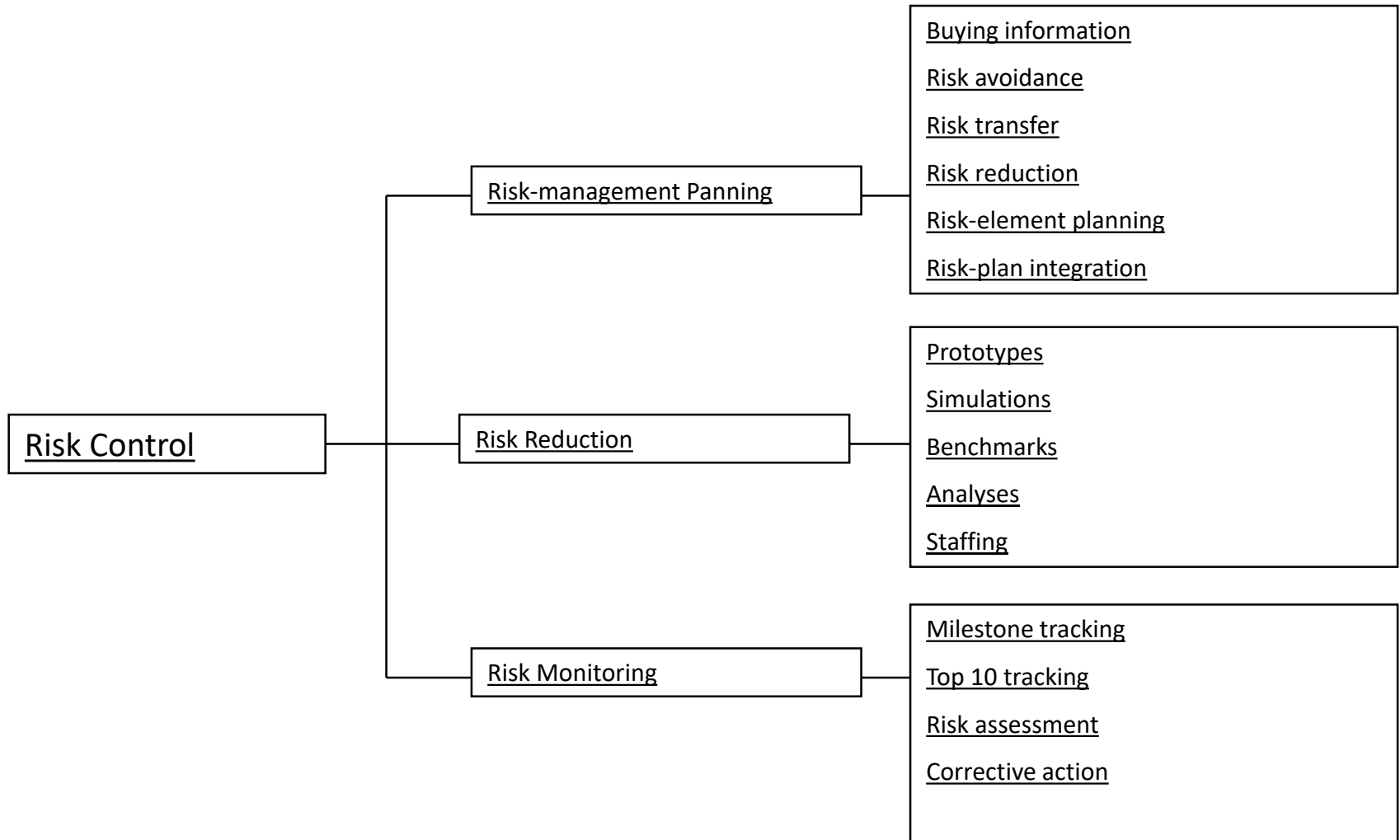
Prob (UO): probability of an unsatisfactory outcome

Loss (UO): the loss to the parties affected if the outcome is unsatisfactory

Risk Control

- Build a risk plan
 - Aversion strategies (avoid risk)
 - Transfer (insurance, etc.)
 - Protection strategies
 - Acceptance
 - Sharing (Team Risk Management)
- Manage (track & control) risk items in project plan
 - Informal processes
 - Formal processes

Risk Control



Risk Management Planning

- Establish risk management scope for the project
 - Issues to be considered include the severity, probability and type of risks to identify and manage
- Identify risks to the project as they develop
 - Risks include cost, schedule, effort, resource and technical risks
 - Brief all participants
 - Probe
 - Get involvement from the whole team

Risk Management Planning

- Perform contingency planning
- For each identified risk
 - Define alternative actions if risk occurs
 - Provide for alternative resources
 - Identify control points and triggers for action
 - Key dates
 - Key events
 - Special conditions
 - Identify who owns the risk
 - Record risk status and review periodically

Risk Reduction

- To determine the priority in which to apply resources to mitigate these risks, asses the:
 - Probability of occurrence
 - Impact
 - Time-frame
 - Causes
 - Interrelationships of risks

Risk Reduction

- At any time during your project, list your top 10 risks
 - Has a full time risk manager been assigned to the project?
 - Is there a process used for risk identification, assessment and mitigation on the project?
 - Is there a database of all risks in terms of probability, earliest expected visible symptom, estimated and actual schedule and costs effects?
 - Are all project personnel encouraged to become risk identifiers?
 - Are corrective action plans written, followed up and reported?
 - Are the top 10 risks updated regularly?
 - How are risks changing over time?
 - Are user requirements stable?

Risk Monitoring

- For each risk, define the measure that will help identify the change in the risk state and the progress of mitigation activities
 - Measures should cover changes in the probability, impact and time-frame of risks
 - Use a tool

Anticipating



- Common sense
 - a sense of uneasiness
- Past experience
 - learning from our mistakes or other people's
- Historical data
 - our memories are unreliable, our perceptions flawed, our experience limited
 - database of past events

Anticipating



- Tools and aids
 - check-lists, expert systems, event trees, fault trees
- Independent assessors
 - from elsewhere in the organization or brought in
 - may be able to spot things we miss
 - not always very effective (due to unfamiliarity, or over-emphasis on irrelevancies)
- Creative thinking
 - spotting unprecedented risks by asking “crazy” questions

Develop a risk management plan template for your class project

TOPIC 4: SOFTWARE PROJECT ENACTMENT

Project Enactment/Execution

- Plans are implemented
- Processes embodied in the plans are executed
- Focus on adherence to selected SDLC processes
 - This is hoped to lead to successful satisfaction of stakeholder requirements and achievement of the project's objectives.
- Fundamental execution are ongoing activities of
 - Monitoring
 - Control
 - reporting

Implementation of Plans

- Project activities should be undertaken in accordance with the project plan and supporting plans.
- Resources (personnel, technology and funding) are utilized.
- Work products (software design, codes and test cases) are generated.

Software Acquisition and Supplier Contract Management

- Involved issues in contracting with customers of software development organization who acquire the deliverable work products and with suppliers who supply products or services to the software engineering organization.
- May involve selection of appropriate kinds of contracts (fixed price, time and materials, cost plus fixed fee or cost plus incentive fee)
- Agreements with customer and suppliers specify the scope of work and deliverables.

Software Acquisition and Supplier Contract Management

- Agreements specify what the acquirer is paying for and what will be delivered to and owned by acquirer.
- Agreements for software being developed by suppliers (internal or external to the software development organization) indicate software quality requirements for acceptance of the delivered software.
- After agreement is in place, we must manage the execution of the project in compliance with the terms of the agreement.

Implementation of Measurement Process

- To ensure relevant and useful data are collected.



Monitor Process

- Continuous assessment of the adherence to the project plan and related plans.
- Outputs and completion criteria for each task should be assessed.
- Deliverables should be evaluated in terms of their required characteristics (inspection or demonstration).
- Effort expenditure, schedule adherence, and costs to date should be analyzed and resource usage examined.

Monitor Process

- The project risk profile should be revisited.
- Adherence to software quality requirements are evaluated.
- Measurement data should be analyzed.
- Variance analysis based on the deviation of actual from expected outcomes and values should be determined.
 - Cost overruns
 - Schedule slippage, etc

Monitor Process

- Identification and analysis of quality and other measurement data should be performed
 - Defect analysis
- Risk Exposure should be recalculated
- These activities can enable problem detection and identification of exception based on exceeded thresholds.
- Outcomes should be reported when thresholds have been exceeded.

Control Process

- Where appropriate and when the probability and impact of risk factors are understood, changes can be made to the project.
 - Corrective action e.g. retesting certain software components
 - May involve incorporating additional actions e.g. using a prototype to assist in software requirements validation
 - May need to revise project plan and other project documents e.g. SRS to accommodate unanticipated events and their implications.

Control Process

- Control process may lead to abandonment of project.
- Software configuration control and software configuration management procedures should be adhered.
- Decisions should be documented and communicated to all relevant parties.
- Plans should be revisited and revised when necessary.
- Relevant data must be recorded

Reporting

- At specified and agreed-upon times, progress to date should be reported
 - Within organization (e.g. project steering committee)
 - To external stakeholders (e.g. clients or users)
- Reports should focus on information needs of the target audience.
- Only project team gets the detailed status report.

TOPIC 5: SOFTWARE PROJECT REVIEW AND EVALUATION

Review and Evaluation

- We should evaluate the overall progress towards achievement of the objectives and requirements of the stakeholders (user and client).
- Assessments of the effectiveness of the software process, the personnel involved, the tools and methods employed must be undertaken regularly.

Determining Satisfaction of Requirements

- The principal goal of the software work package manager is to satisfy the stakeholder.
- Progress towards this goal should be assessed periodically based on
 - Major project milestones
 - Completion of an iterative development cycle resulting in a product increment
- Variances from software requirements should be identified and appropriate actions should be taken.

Reviewing and Evaluating Performance

- Periodic performance reviews for project personnel provide insights as to the likelihood of adherence to plans and processes as well as possible areas of difficulty (team members conflict)
- Various methods, tools and techniques employed should be evaluated for their effectiveness and appropriateness and the process being used by the project should also be systematically and periodically assessed for relevance, utility and efficacy in the project
- Make changes where appropriate

TOPIC 6: SOFTWARE PROJECT CLOSURE

When do we close?

- A project, a major phase of a project or an iterative development cycle reaches closure when all the plans and processes have been enacted and completed.
- Criteria success for the project/phase should be evaluated.
- Once closure is established, perform archive, retrospective and process improvement activities.

Determining Closure

- Closure occurs when the specified tasks for a project, phase or iteration have been completed and completion criteria has been satisfactorily achieved.
- Software requirements can be confirmed as satisfied or not.
- Closure process should involve relevant stakeholders.
- The result is the documentation of relevant stakeholders' acceptance.
- Any known problems should be documented.

Closure Activities

- Once closure is confirmed, archiving of project materials should be in accordance with stakeholder agreed-upon methods, location and duration.
- If necessary, destroy sensitive information, software and the medium on which copies were made.
- A project/phase/iteration retrospective analysis should be undertaken so that issues, problems, risks and opportunities encountered can be analyzed.
- Draw lessons learned from the project and feed them into the organizational learning and improvement endeavors.

TOPIC 7: SOFTWARE ENGINEERING MEASUREMENT

Why measure?

- Effective measurement is one of the cornerstones of organizational maturity.
- Measurement can be applied to organizations, projects, processes and work products.

Establish and Sustain Measurement Commitment

- Each measurement endeavor should be guided by organizational objectives and driven by a set of measurement requirements established by the organization & the project.
- Organizational unit to which each measurement requirement is to be applied should be established.
 - A functional area, a single project, a single site or an enterprise.
- Team commitment should be formally established, communicated and supported.

Establish and Sustain Measurement Commitment

- An organization's commitment to measurement is an essential factor for success.
- Assigning resources includes allocation of responsibility for the various tasks of the measurement process.
- Adequate funding, training, tools and support to conduct the process should be allocated.

Plan the Measurement Process

- The organization provides the context for measurement.
 - Explicit
 - Includes constraints imposed on the measurement process
- Identify information needs.
 - Based on goals, constraints, risks and organizational problems.
- Select measures with clear links to the information needs.
 - Cost of collection, degree of process disruption during collection, ease of obtaining accurate data, etc

Plan the Measurement Process

- Define procedures for
 - Data collection
 - Data analysis
 - Reporting procedures
 - This includes collection procedures, storage, verification, analysis, reporting and configuration management of data.
- Select information products evaluating criteria.
 - Based on technical and business objectives.

Plan the Measurement Process

- Provide resources for measurement tasks.
 - Reviewed and approved by appropriate stakeholders.
 - Establish review criteria
- Identify resources to implement the planned and approved tasks.
- Acquire and deploy supporting technologies.
 - Select most appropriate technology

Perform the Measurement Process

- Integrate measurement procedures with relevant software process.
- Collect data, verify and store it.
- Communicate results to users and stakeholders.

Evaluate Measurement

- Evaluate information products and measurement process against specified evaluation criteria.
 - Determine strengths and weaknesses.
 - Record lessons learned in appropriate database.
- Identify potential improvements
- Communicate proposed improvements to the measurement process owner and stakeholders for review and approval.

TOPIC 8: SOFTWARE ENGINEERING MANAGEMENT TOOLS

Management Tools

- Used to provide visibility and control of software engineering management processes
 - Automated
 - Manual

Measurement Tools

Project Planning & Tracking Tools

- To estimate project effort and cost
- To prepare project schedules
- Track project milestones, status meetings, etc

Risk Management Tools

- To track risk identification, estimation and monitoring.

Communication Tools

- Provide timely and consistent information to relevant stakeholders.
- Minutes, progress, backlogs, etc

Measurement Tools

- Gather, analyze and report project measurement data based on spreadsheets