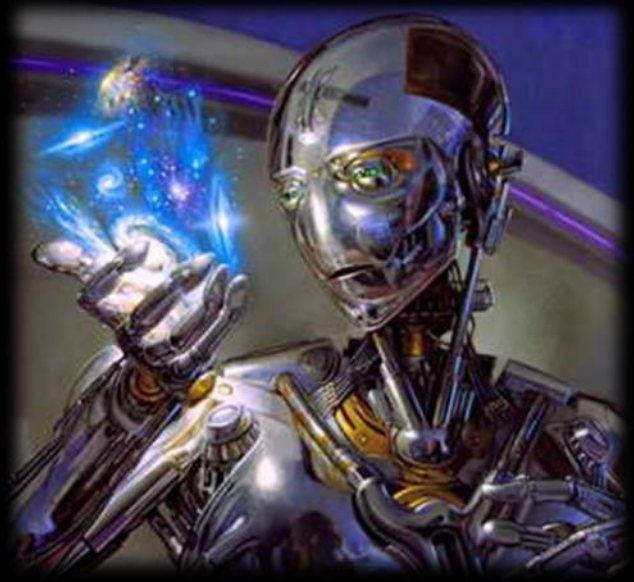

Software Engineering -1

Objectives

- ✓ To explain the main tasks undertaken by project managers
- ✓ To discuss project planning and the planning process
- ✓ To show how graphical schedule representations are used by project management
- ✓ To discuss the notion of risks and the risk management process

Topics covered

- ✓ Management activities
- ✓ Project planning
- ✓ Project scheduling
- ✓ Risk management



Artificial Intelligence

- **Artificial intelligence** (**AI**) is the intelligence of machines and the branch of computer science that aims to create it.
- There are many different definitions, AI textbooks define the field as "the study and design of intelligent agents“
- Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent.

Artificial Intelligence in Games

Artificial Intelligence

- An intelligent agent is a system that perceives its environment and takes actions that maximize its chances of success.
- "the science and engineering of making intelligent machines."

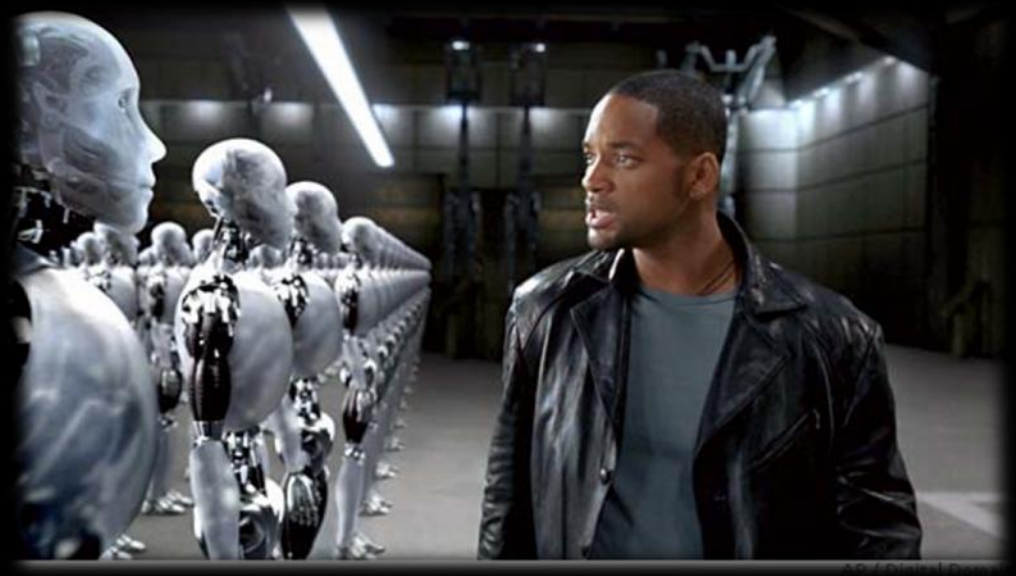
Artificial Intelligence in Games

Artificial Intelligence in Fighter Planes

Artificial Intelligence in Robots

Artificial Intelligence in Robots

Artificial Intelligence in Robots

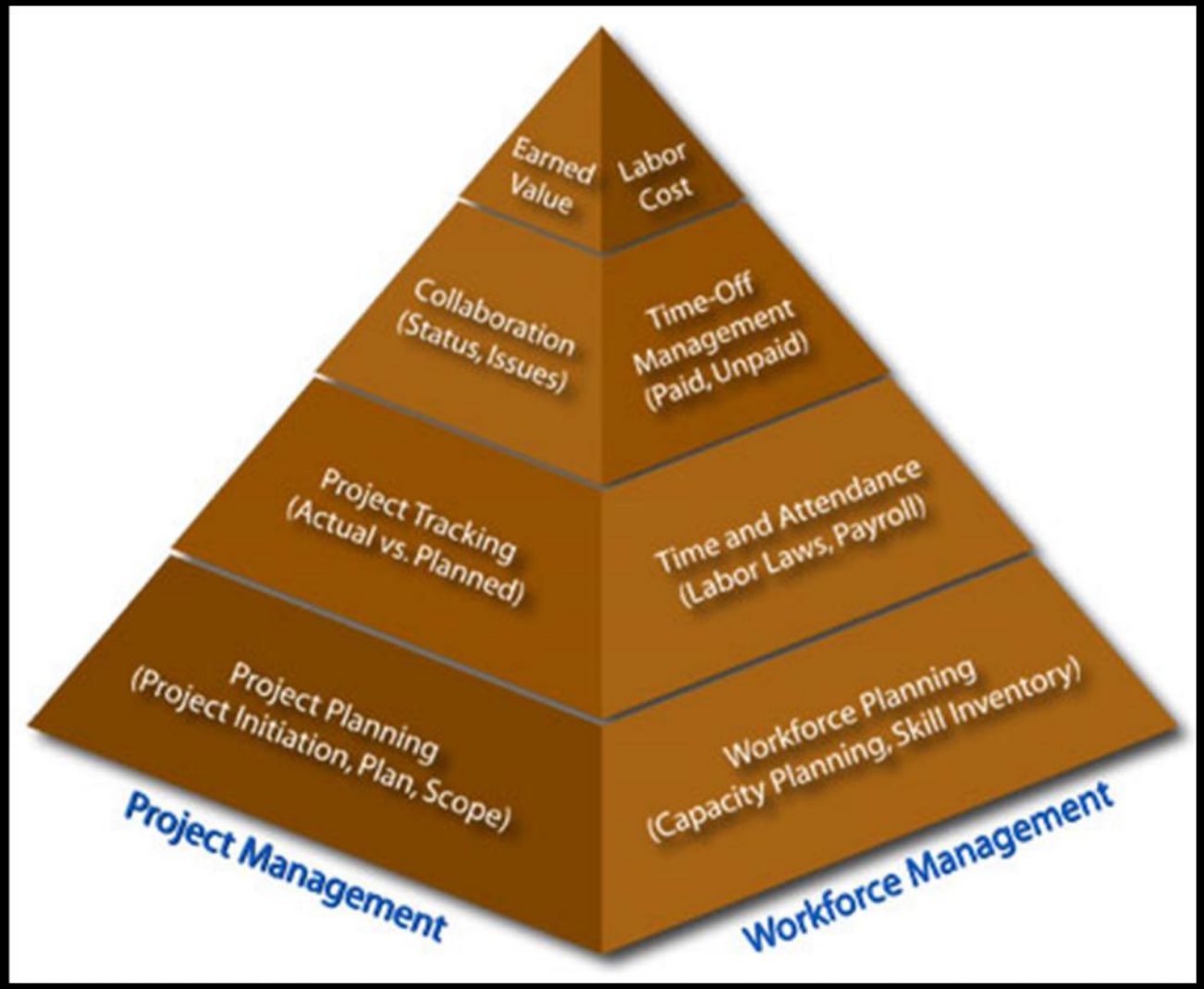


Software Project Management

- Software project management is the art and science of planning and leading software projects. It is a sub-discipline of project management in which software projects are planned, monitored and controlled.

- Concerned with activities involved in ensuring that software is delivered on time and on schedule and in accordance with the requirements of the organisations 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.



http://www.tenrox.com/en/enterprise-project-management/

Online Enterprise Project Management Software Tools Features

- **Project planning software**: plan projects at the task level
- **Resource assignment**: assign tasks to resources
- **Project tracking software**: track planned versus actual time spent on tasks
- **Collaboration: Managing projects** is simplified by enabling collaboration between project managers and project team members. The online project management system provides project dashboards, online status reports and risk/issue tracking
- **Earned Value**: combines planned work actually performed based on project schedule and budget to calculate how much work is actually accomplished (earned) and estimate the project completion date

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Resource Management Software Features

- **Resource Management & Scheduling software**: skill and availability resource management software keeps track of employee skill sets and availability for resource planning, capacity planning, training and hiring decisions
- **Web based project time tracking software**: track and approve employee/consultant work time, overtime and leave time. Validated time data is sent to a payroll system to process payroll .
- **Time-off, leave management**: manage vacation time accrual, holidays, sick or medical leave and other authorized time-off .
- **Project cost management and project accounting**: maintain resource cost information including exempt/non-exempt status, hourly rate or salary, bonuses, and other resource cost related rules.

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Analysis of Software Project Management Why Projects Fail

- Unrealistic or unarticulated project goals
- Inaccurate estimates of needed resources
- Badly defined system requirements
- Poor reporting of the project's status
- Unmanaged risks
- Poor communication among customers, developers, and users
- Use of immature technology
- Inability to handle the project's complexity
- Sloppy development practices
- Poor project management
- Stakeholder politics
- Commercial pressures

Project Planning, Monitoring and Control

COMMUNICATION IS IMPORTANT

Management activities

- Proposal writing.
- Project planning and scheduling.
- Project costing.
- Project monitoring and reviews.
- Personnel selection and evaluation.
- Report writing and presentations.

Proposal writing

A **project proposal is a detailed description of a series of activities aimed at solving** a certain problem. The proposal should contain a detailed explanation of the:

- Justification of the project
- Activities and Implementation timeline
- Methodology
- Human, material and financial resources required.

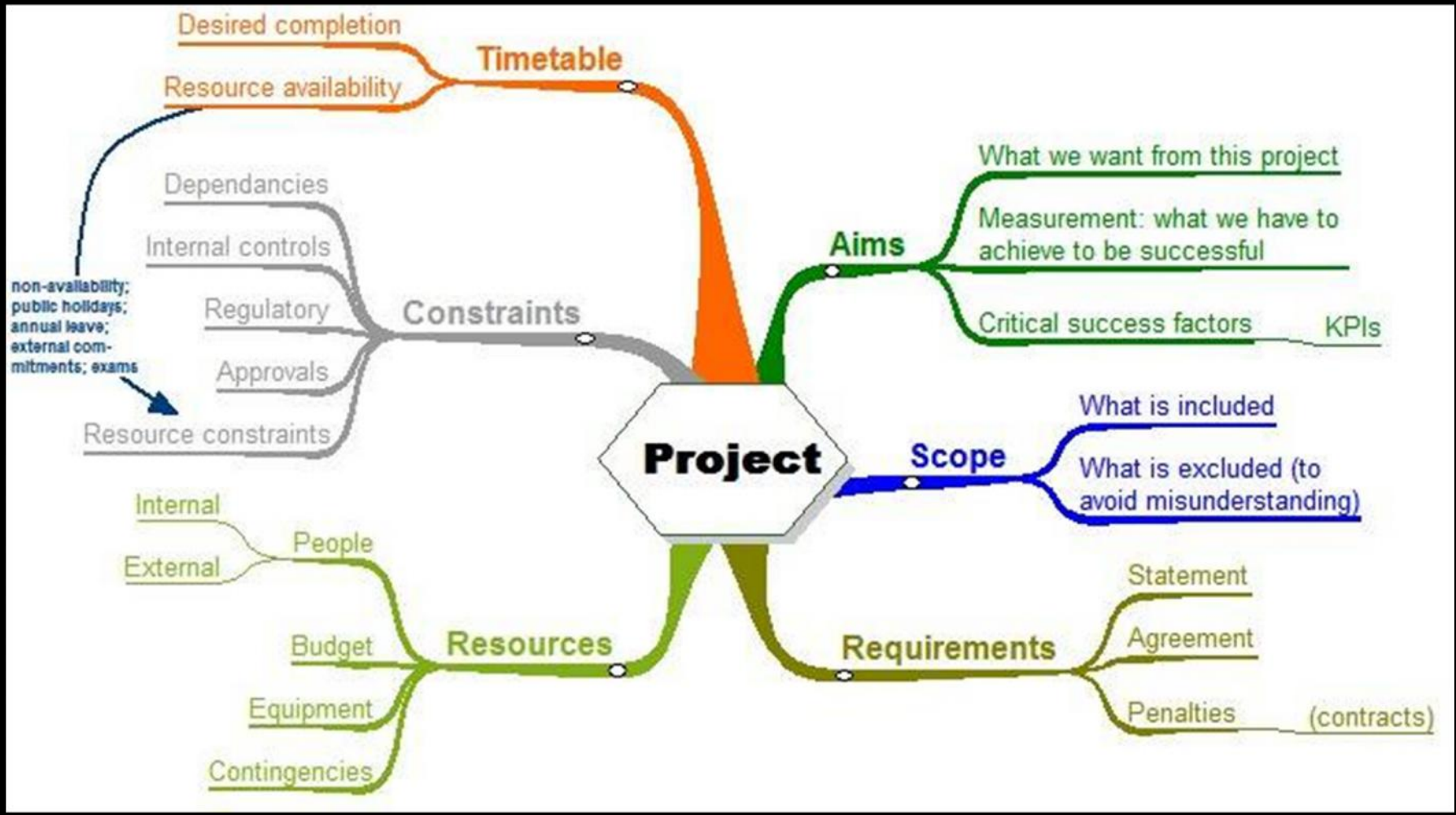
Project Planning and Scheduling

1.Introduce project planning

2. Examine the stages of project planning:

- Scoping
- Estimation
- Risk Analysis
- Scheduling

3. Focus on some of the tools and techniques available to a project planner



Project Planning

- Probably the most time-consuming project management activity.
- Continuous activity from initial concept through to system delivery. Plans must be regularly revised as new information becomes available.
- Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget.

Types of Project Plan

Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project.
Validation plan	Describes the approach, resources and schedule used for system validation.
Configuration management plan	Describes the configuration management procedures and structures to be used.
Maintenance plan	Predicts the maintenance requirements of the system, maintenance costs and effort required.
Staff development plan.	Describes how the skills and experience of the project team members will be developed.

Project Planning Process

```
Establish the project constraints
Make initial assessments of the project parameters
Define project milestones and deliverables
while project has not been completed or cancelled loop
        Draw up project schedule
        Initiate activities according to schedule
        Wait ( for a while )
        Review project progress
        Revise estimates of project parameters
        Update the project schedule
        Re-negotiate project constraints and deliverables
        if ( problems arise ) then
                Initiate technical review and possible revision
        end if
end loop
```

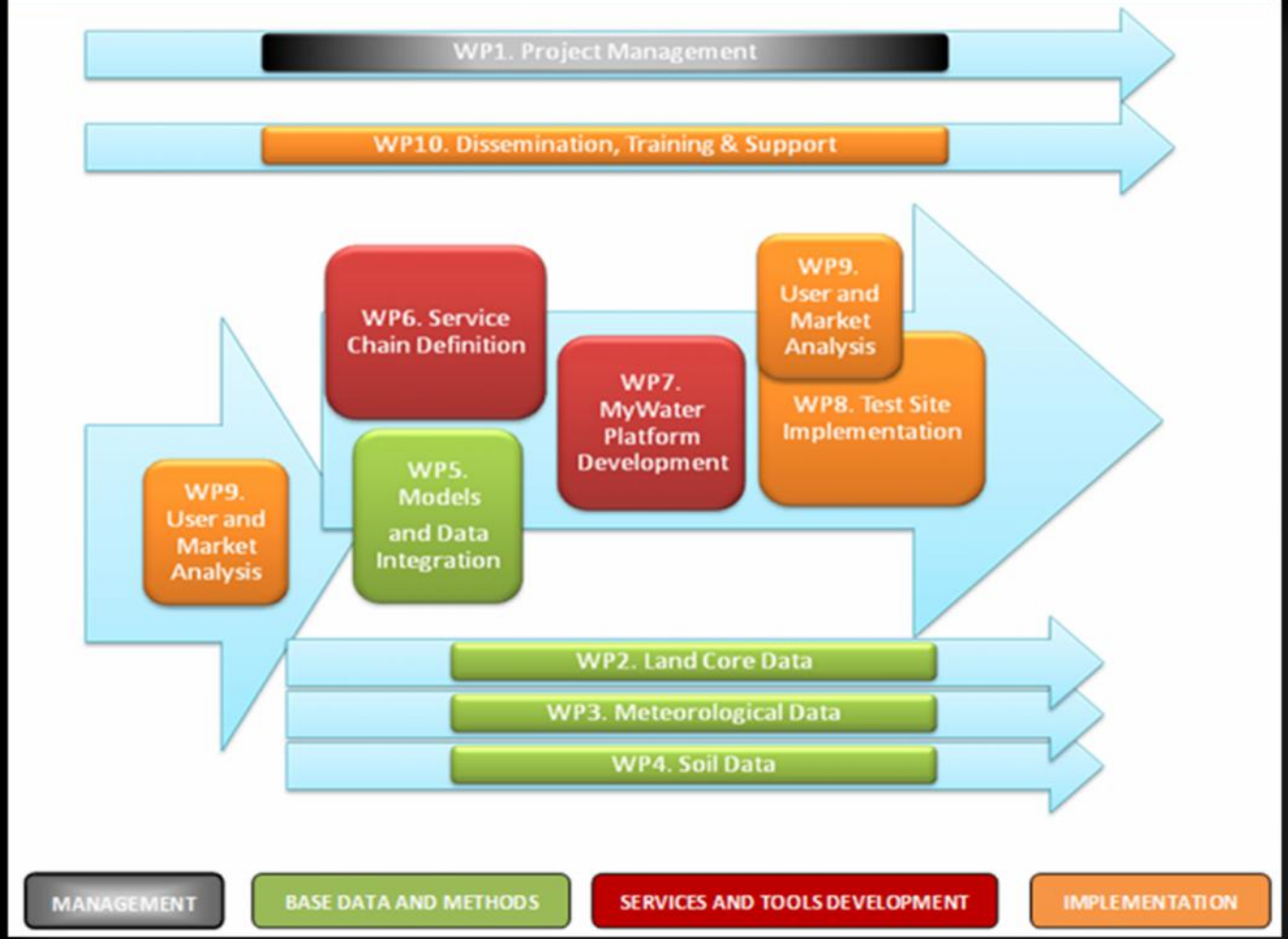
The project plan

- The project plan sets out:
  - The resources available to the project;
  - The work breakdown;
  - A schedule for the work.

Project Plan Structure

- Introduction.
- Project organisation.
- Risk analysis.
- Hardware and software resource requirements.
- Work breakdown.
- Project schedule.
- Monitoring and reporting mechanisms.

MyWater work plan structure



Project Costing

Project Monitoring & Reviews

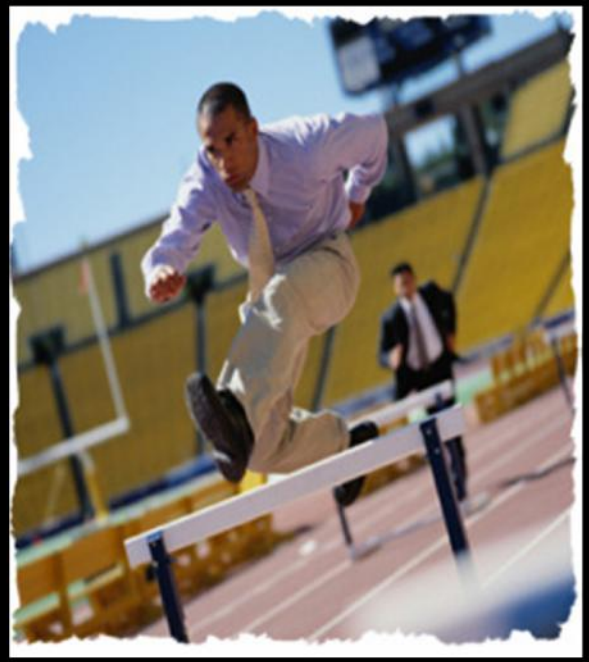
Project Monitoring is the continuous process of collecting and analyzing data (indicators), with a view to identifying any need for corrective actions to ensure Project execution towards attaining its Objective.

Project review is a specific formal examination of Project implementation towards attaining its Objective, as part of the Project monitoring Activities.

Personnel Selection & Evaluation

When it comes to selecting the right person for a given position, new hire or promotion, it is critical that any company make the best decision possible based on the candidate(s) and information available.

At **Hamilton Consulting Services, Inc**., our approach is to combine a comprehensive personality profile questionnaire with a face-to-face on-site personal interview. We use the results of the personality profile questionnaire as the basis for our interview with the candidate(s). We then prepare written reports for the client and the candidate as well as providing the client



Report Writing & Presentations

ROLE OF A PROJECT MANAGER

Project Staffing

- 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 organisation 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.

Activity Organization

- Activities in a project should be organised to produce tangible outputs for management to judge progress.
- *Milestones* are the end-point of a process activity.
- *Deliverables* are project results delivered to customers.
- The waterfall process allows for the straightforward definition of progress milestones.

DECEMBER 2011						
SUN	MON	TUES	WED	THURS	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
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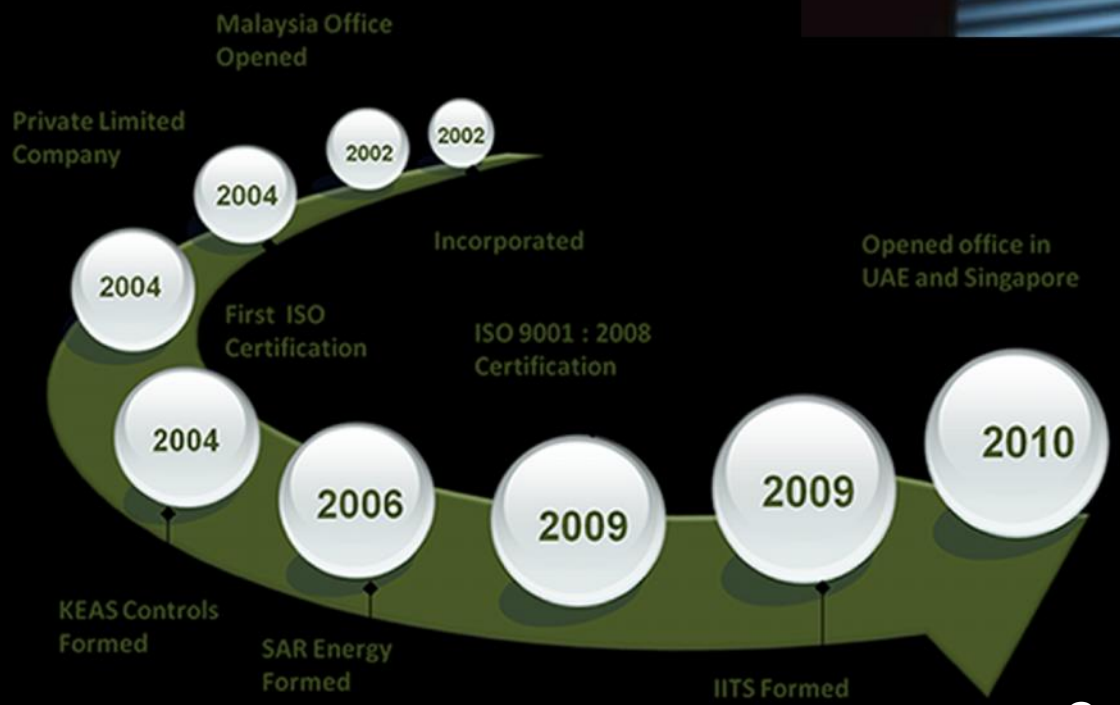
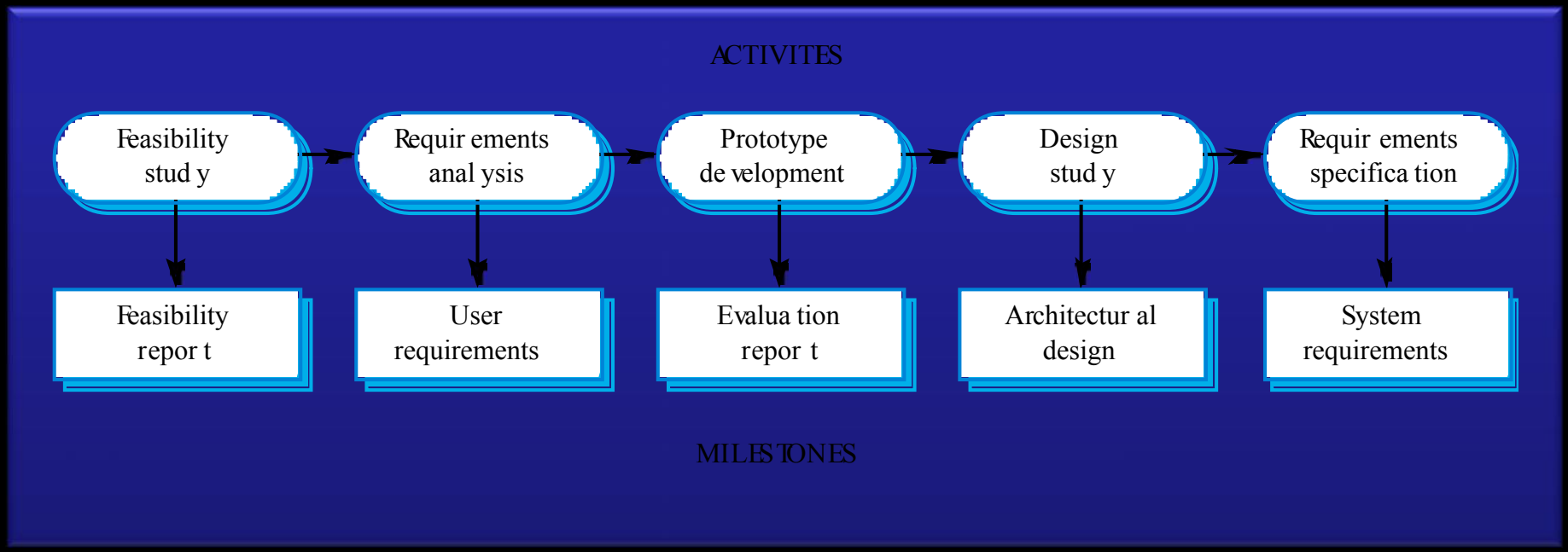
Christmas Party

CAO Exam



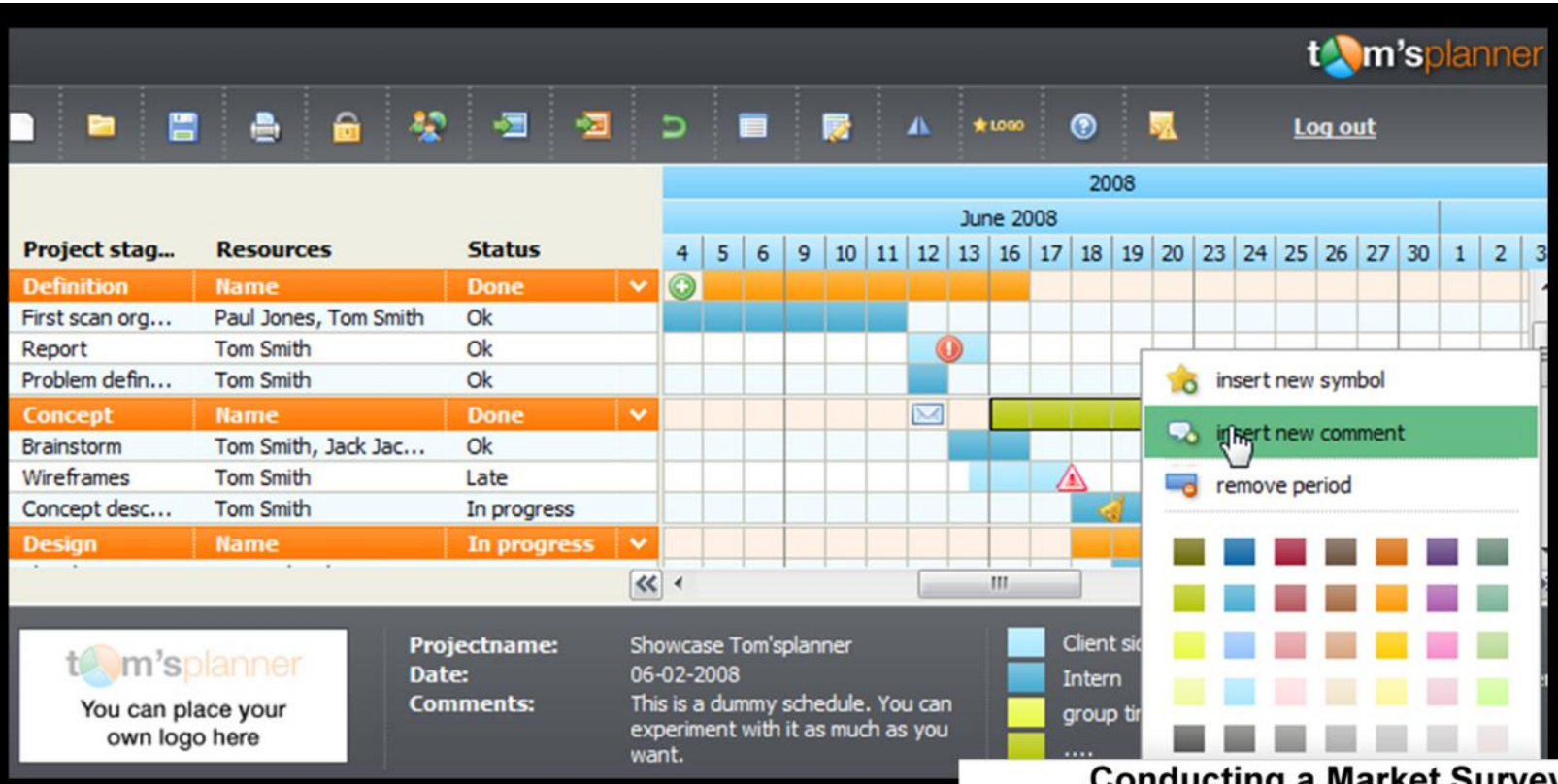
A PROJECT MANAGER SHOULD BE A GOOD LEADER

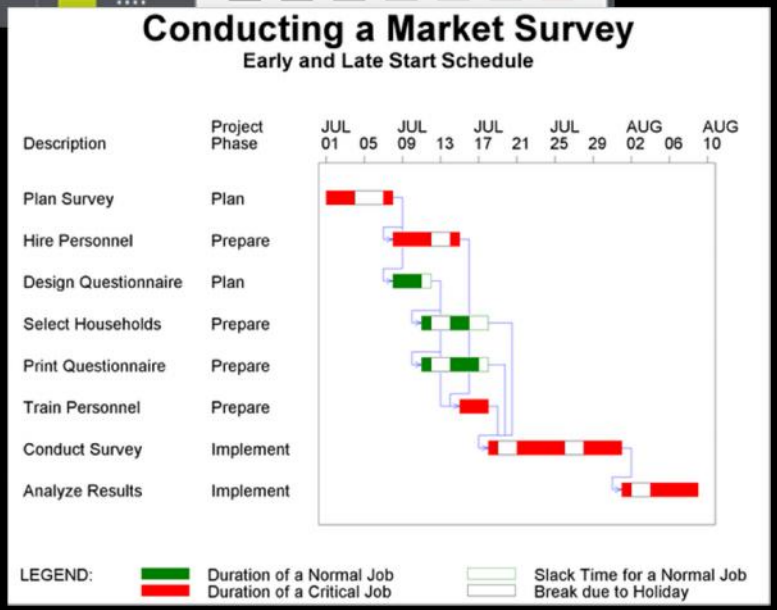
Milestones in the RE Process



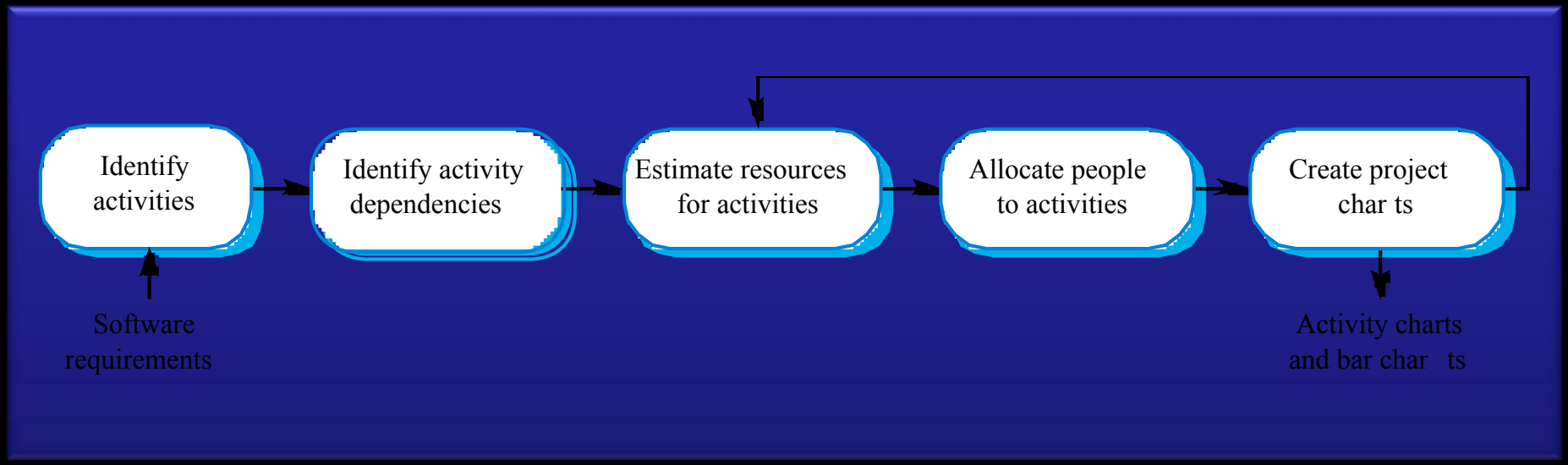
Project Scheduling

- Split project into tasks and estimate time and resources required to complete each task.
- Organize tasks concurrently to make optimal use of workforce.
- Minimize task dependencies to avoid delays caused by one task waiting for another to complete.
- Dependent on project managers intuition and experience.





The Project Scheduling Process

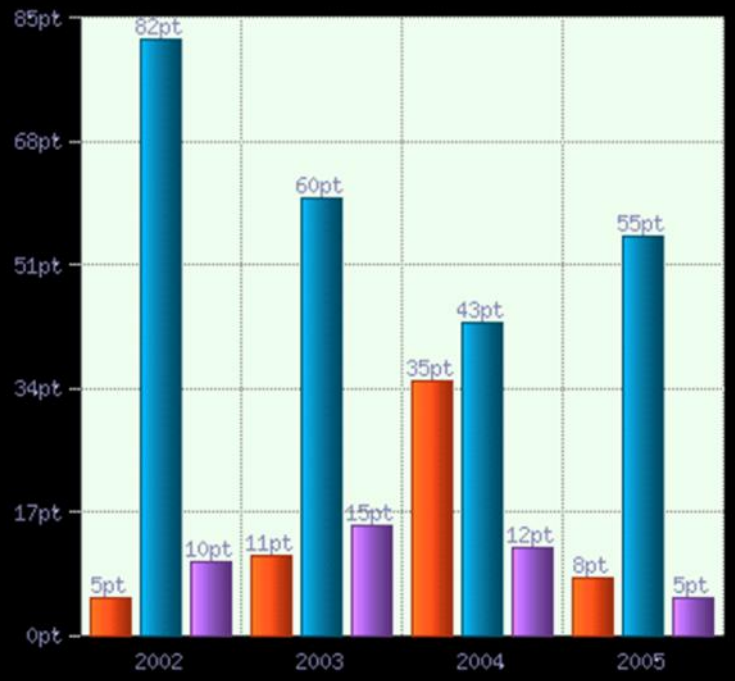


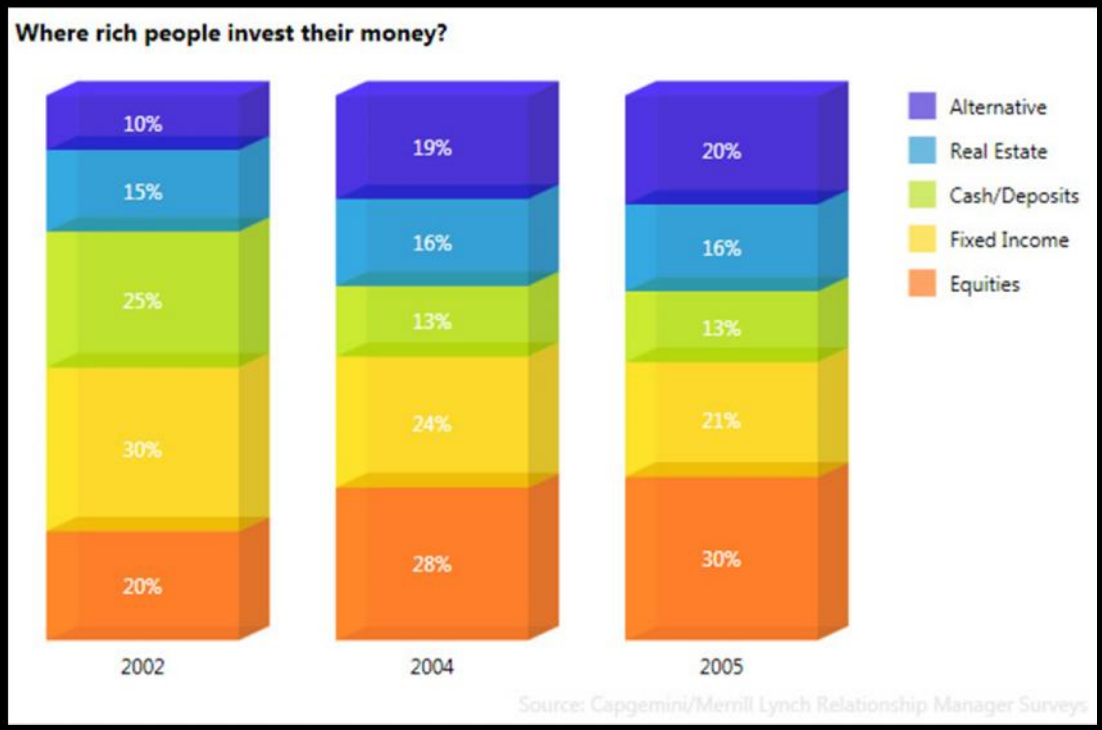
Scheduling Problems

- Estimating the difficulty of problems and hence the cost of developing a solution is hard.
- Productivity is not proportional to the number of people working on a task.
- Adding people to a late project makes it later because of communication overheads.
- The unexpected always happens. Always allow contingency in planning.

Bar Charts & Activity Networks

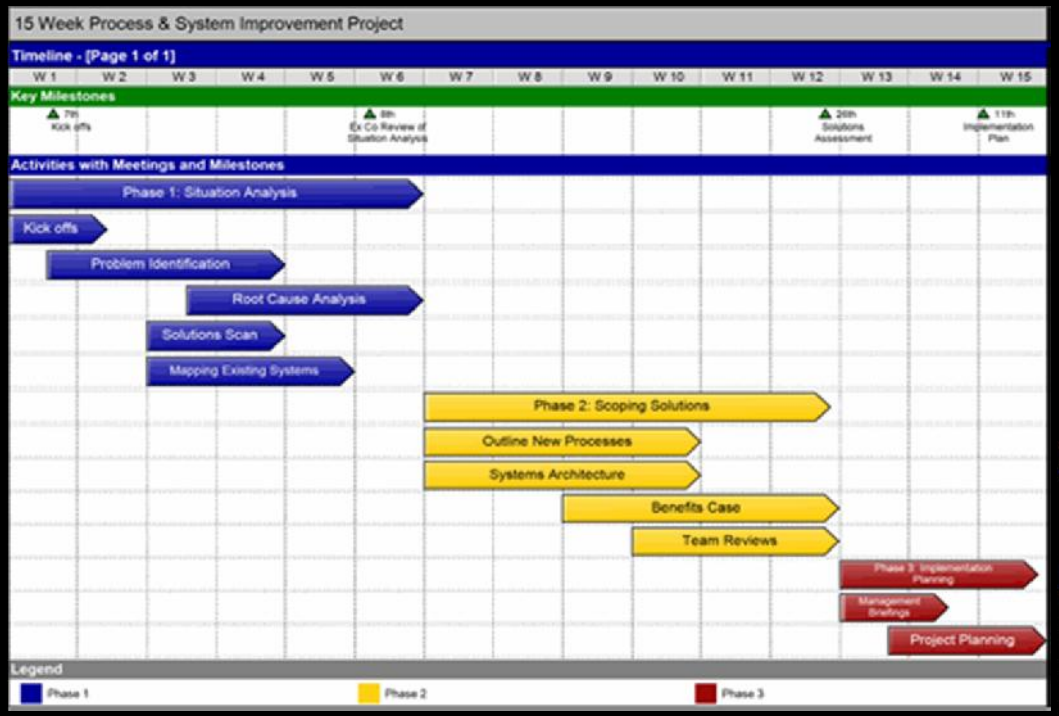
- Graphical notations used to illustrate the project schedule.
- Show project breakdown into tasks. Tasks should not be too small. They should take about a week or two.
- Activity charts show task dependencies and the the critical path.
- Bar charts show schedule against calendar time.

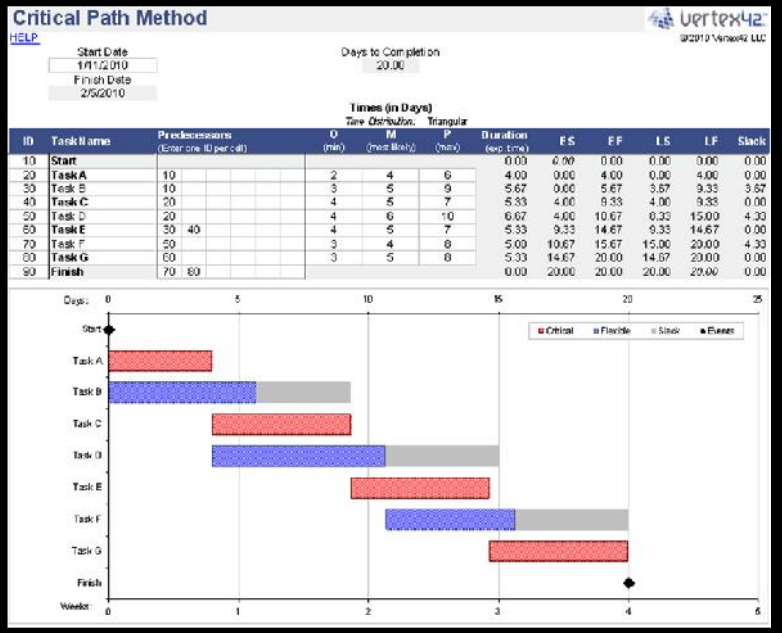




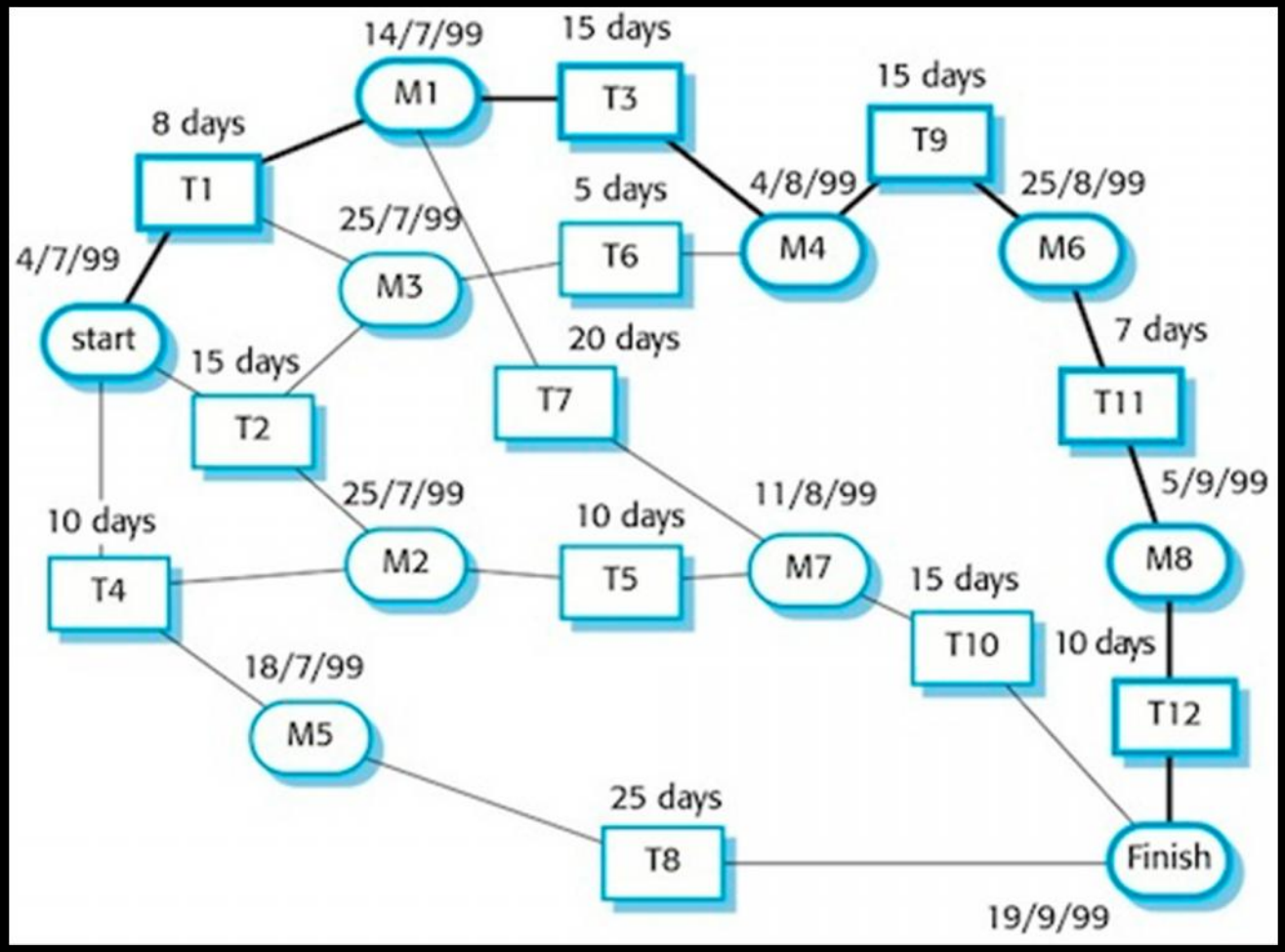
Task durations and dependencies

Activity	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1 (M1)
T4	10	
T5	10	T2, T4 (M2)
T6	5	T1, T2 (M3)
T7	20	T1 (M1)
T8	25	T4 (M5)
T9	15	T3, T6 (M4)
T10	15	T5, T7 (M7)
T11	7	T9 (M6)
T12	10	T11 (M8)

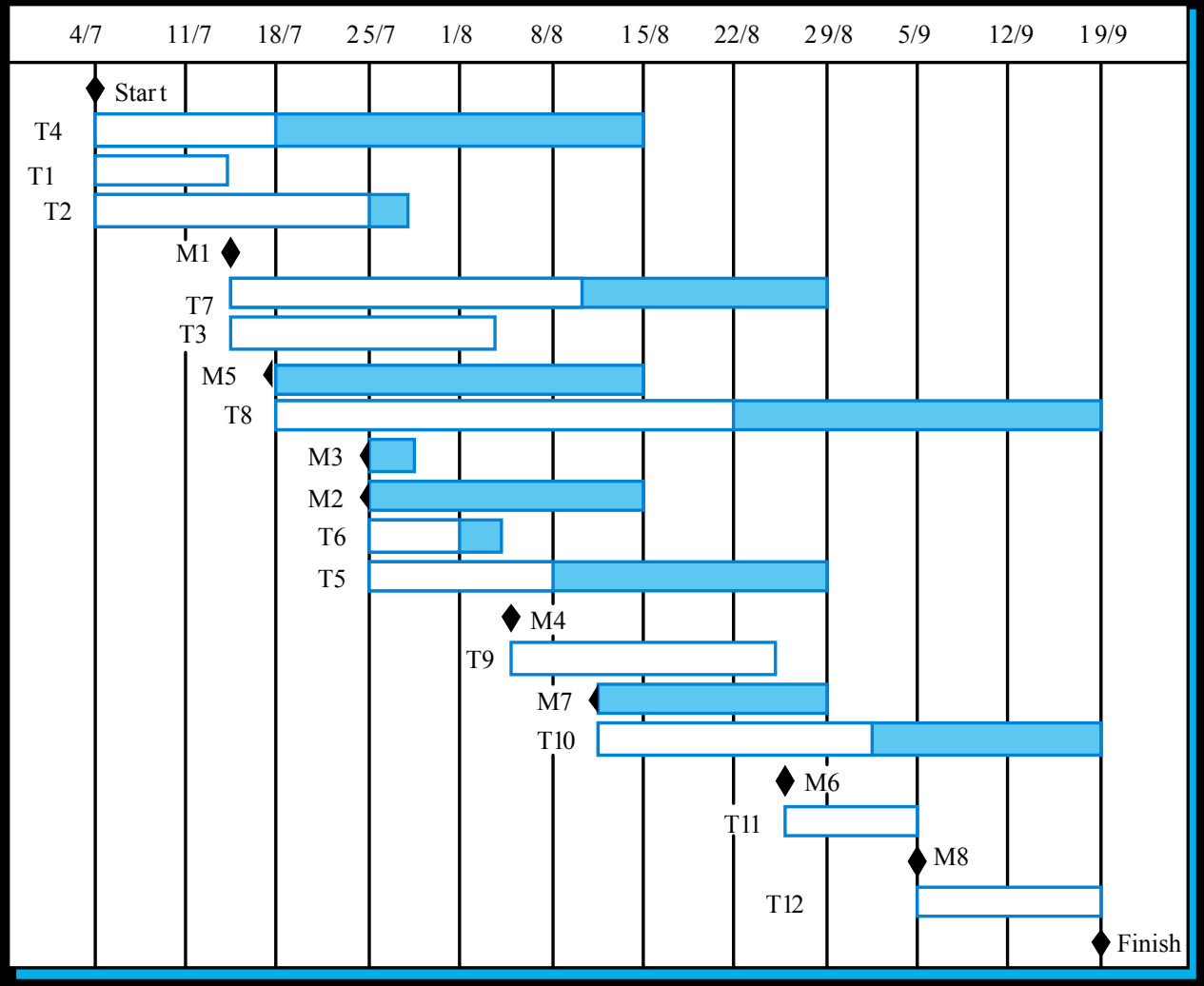




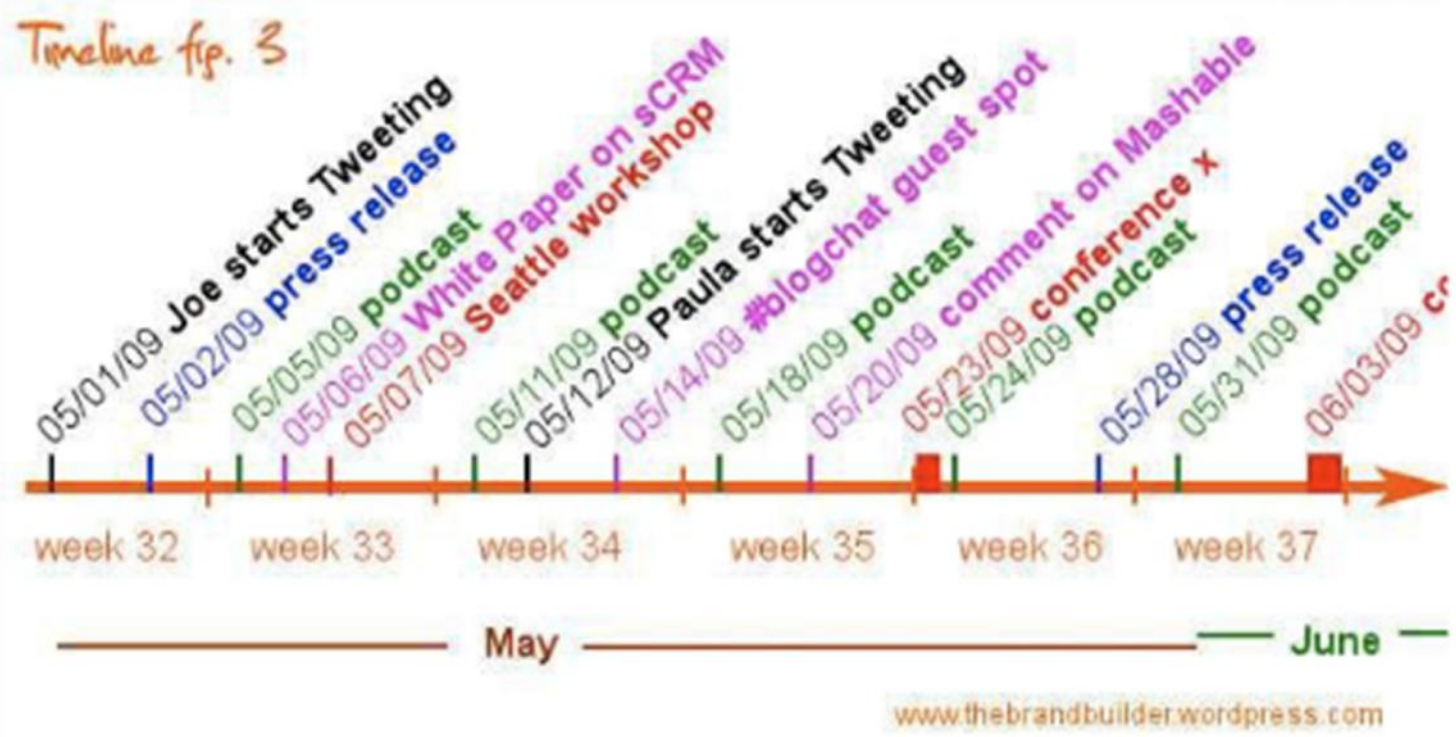
Activity Network



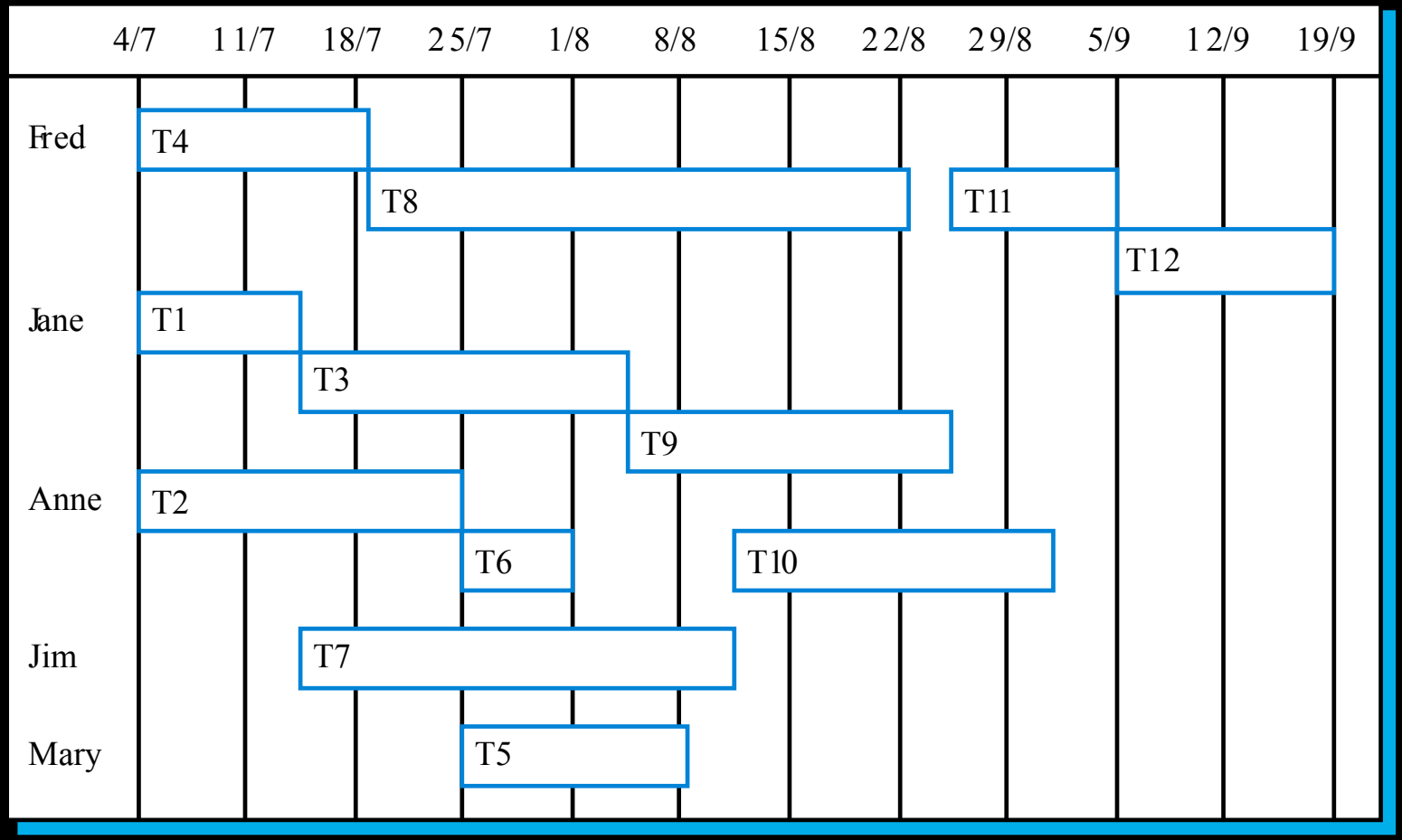
Activity Timeline

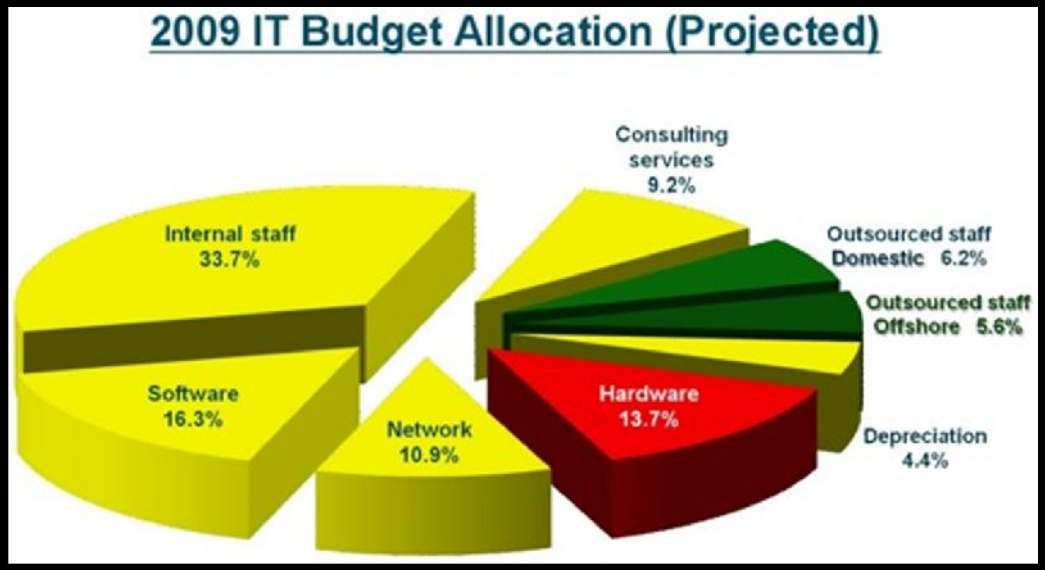


Step 2: Create Activity Timelines



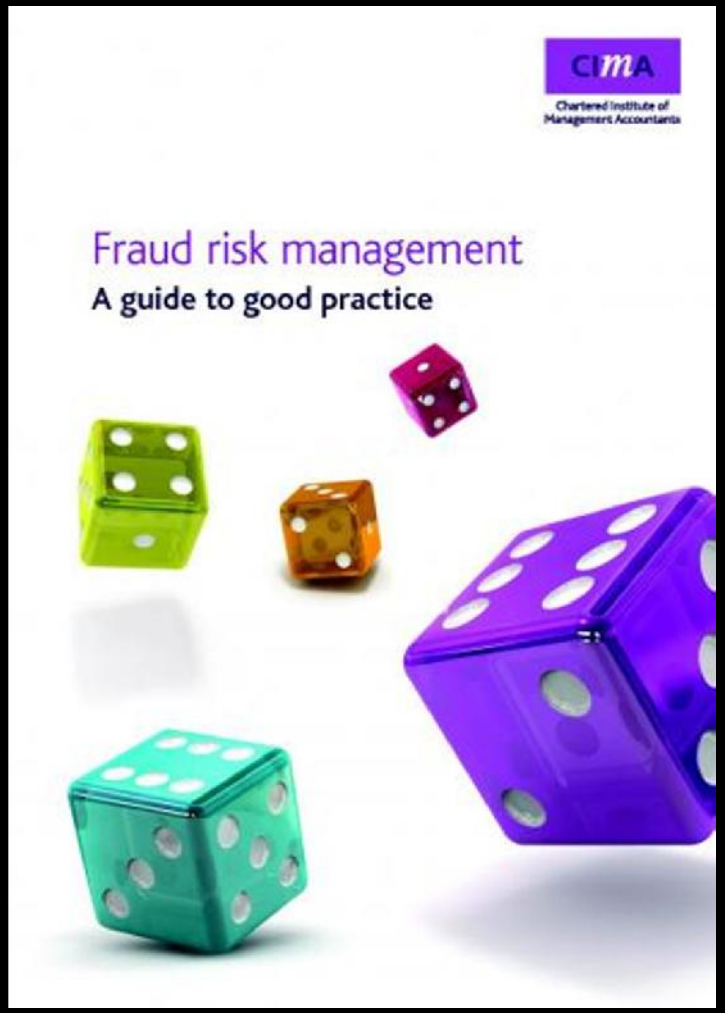
Staff Allocation





Risk Management

- Risk management is concerned with identifying risks and drawing up plans to minimise their effect on a project.
- A risk is a probability that some adverse circumstance will occur
  - 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.



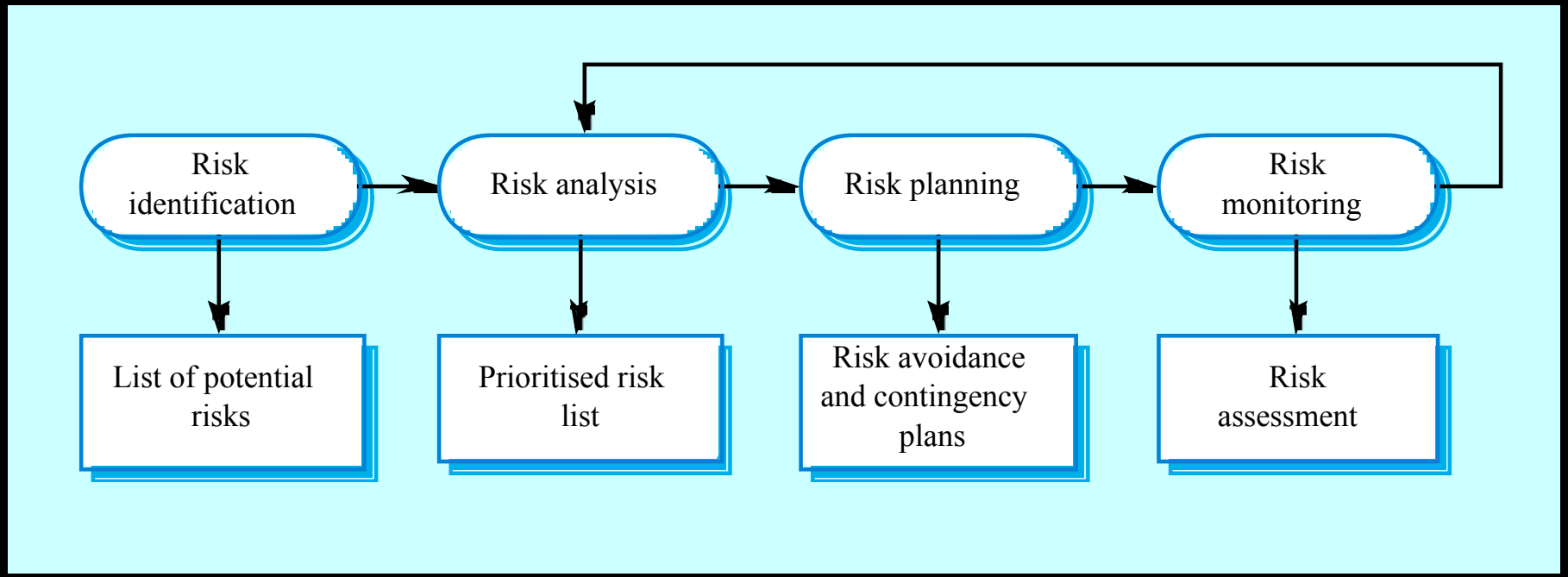
Software risks

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 organisational 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 under-performance	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.

The risk management process

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

The risk management process



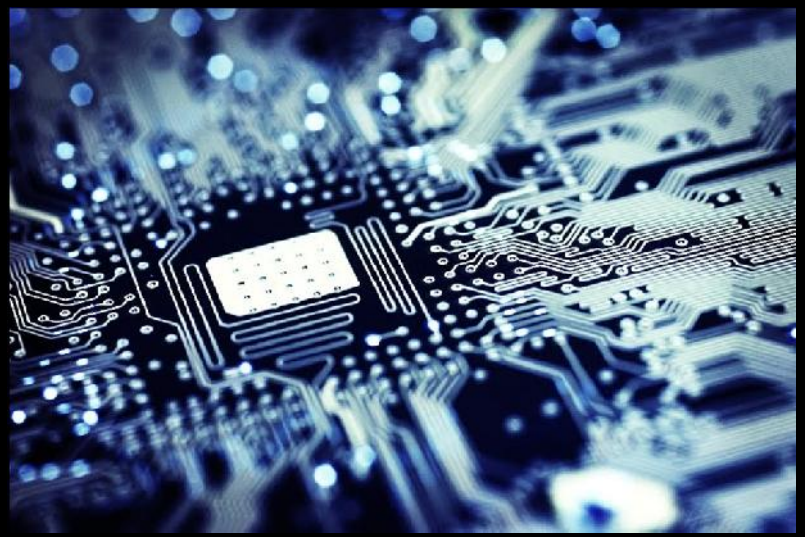
Risk Identification

- Technology risks.
- People risks.
- Organisational risks.
- Requirements risks.
- Estimation risks.

Risks & Risk Types

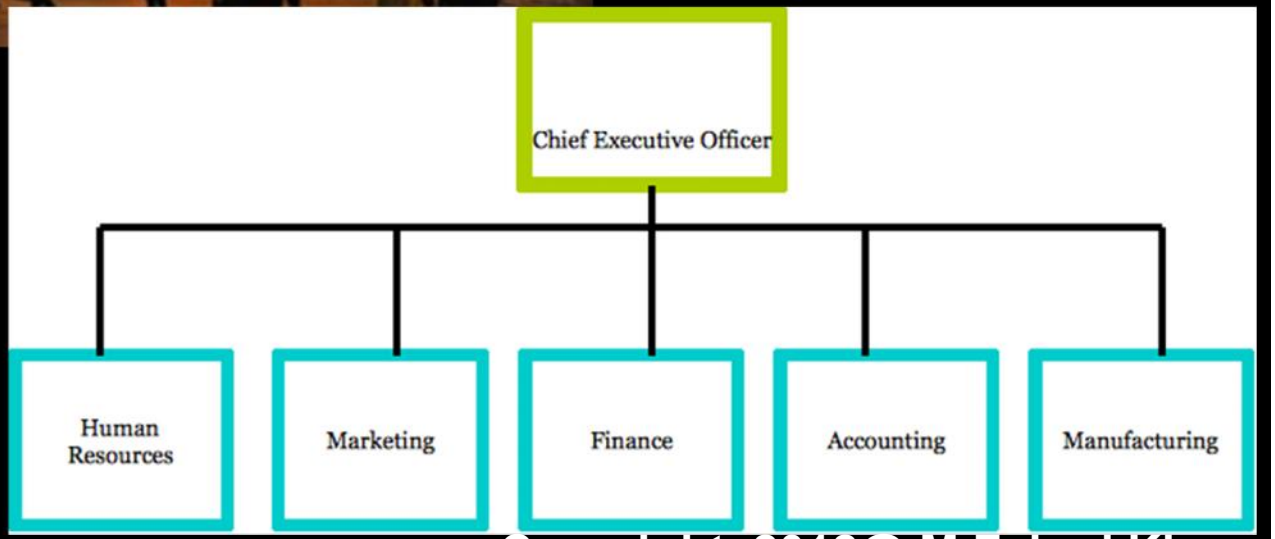
Risk type	Possible risks
Technology	The database used in the system cannot process as many transactions per second as expected. Software components that should be reused contain defects that limit their functionality.
People	It is impossible to recruit staff with the skills required. Key staff are ill and unavailable at critical times. Required training for staff is not available.
Organisational	The organisation is restructured so that different management are responsible for the project. Organisational financial problems force reductions in the project budget.
Tools	The code generated by CASE tools is inefficient. CASE tools cannot be integrated.
Requirements	Changes to requirements that require major design rework are proposed. Customers fail to understand the impact of requirements changes.
Estimation	The time required to develop the software is underestimated. The rate of defect repair is underestimated. The size of the software is underestimated.

Technology Risks



People Risks

Organisational Risks



Requirements Risks

Estimation Risks

Risk Analysis

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

Risk Analysis

Risk analysis (i)

Risk	Probability	Effects
Organisational financial problems force reductions in the project budget.	Low	Catastrophic
It is impossible to recruit staff with the skills required for the project.	High	Catastrophic
Key staff are ill at critical times in the project.	Moderate	Serious
Software components that should be reused contain defects which limit their functionality.	Moderate	Serious
Changes to requirements that require major design rework are proposed.	Moderate	Serious
The organisation is restructured so that different management are responsible for the project.	High	Serious

Risk analysis (ii)

Risk	Probability	Effects
The database used in the system cannot process as many transactions per second as expec ted.	Moderate	Serious
The time required to develop the software is underestimated.	High	Serious
CASE tools cannot be integrated.	High	Tolerable
Customers fail to understand the impact of requirements changes.	Moderate	Tolerable
Required training for staff is not available.	Moderate	Tolerable
The rate of defect repair is underestimated.	Moderate	Tolerable
The size of the software is underestimated.	High	Tolerable
The code generated by CASE tools is inefficient.	Moderate	Insignificant

Risk Planning

- Consider each risk and develop a strategy to manage that risk.
- Avoidance strategies
  - The probability that the risk will arise is reduced;
- Minimisation 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 Planning

Risk management strategies (i)

Risk	Strategy
Organisational financial problems	Prepare a briefing document for senior management showing how th e project is making a very important contribution to the goals of the business.
Recruitment problems	Alert customer of potential difficulties and the possibility of delays, investigate buying-in components.
Staff illness	Reorganise 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 strategies (ii)

Risk	Strategy
Requirements changes	Derive traceability information to assess requirements change impact, maximise information hiding in the design.
Organisational restructuring	Prepare a briefing document for senior management showing how th e 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

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 Monitoring

Risk indicators

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

Key points

- Good project management is essential for project success.
- The intangible nature of software causes problems for management.
- Managers have diverse roles but their most significant activities are planning, estimating and scheduling.
- Planning and estimating are iterative processes which continue throughout the course of a project.

Key points

- A project milestone is a predictable state where a formal report of progress is presented to management.
- Project scheduling involves preparing various graphical representations showing project activities, their durations and staffing.
- Risk management is concerned with identifying risks which may affect the project and planning to ensure that these risks do not develop into major threats.

If you have any query please feel free to ask

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