

ENS 491 /2 CONTENTS

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- ❑ Project budgeting
- ❑ Project control
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- ❑ Project communication management

ENS 491 /2 WHAT IS A PROJECT?

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- ❑ A project is a *temporary* endeavor undertaken to create a *unique* product, service, or result.
- ❑ The *temporary* nature of projects indicates that a project has a definite *beginning* and *end*. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists.
- ❑ *Temporary* does not necessarily mean the duration of the project is short. It refers to the project's engagement and its longevity.
- ❑ Projects have life cycles just as the products.

ENS 491 /2 WHAT IS A PROJECT?

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- *The outcome of the project may be tangible or intangible.* Although repetitive elements may be present in some project deliverables and activities, this repetition does not change the fundamental, unique characteristics of the project work. For example, office buildings can be constructed with the same or similar materials and by the same or different teams. However, each building project remains unique with a different location, different design, different circumstances and situations.
- *Because of the unique nature of projects,* there may be uncertainties or differences in the products, services, or results that the project creates.
- A project can involve a single individual or multiple individuals, a single organizational unit, or multiple organizational units from multiple organizations.

ENS 491 /2 PROJECT OBJECTIVES

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- ❑ An objective is a clear statement of intent, what one's efforts are directed toward. (Ex. To design, develop, and be ready for production by May 21, 2018 product ABC within approved expense and capital budget limits.)
- ❑ The language of objectives should be clear and precise.
- ❑ Objectives should be verifiable and attainable.
- ❑ Objectives should be consistent with the available or anticipated resources.
- ❑ Objectives should be consistent with the organization's missions, values, and objectives.

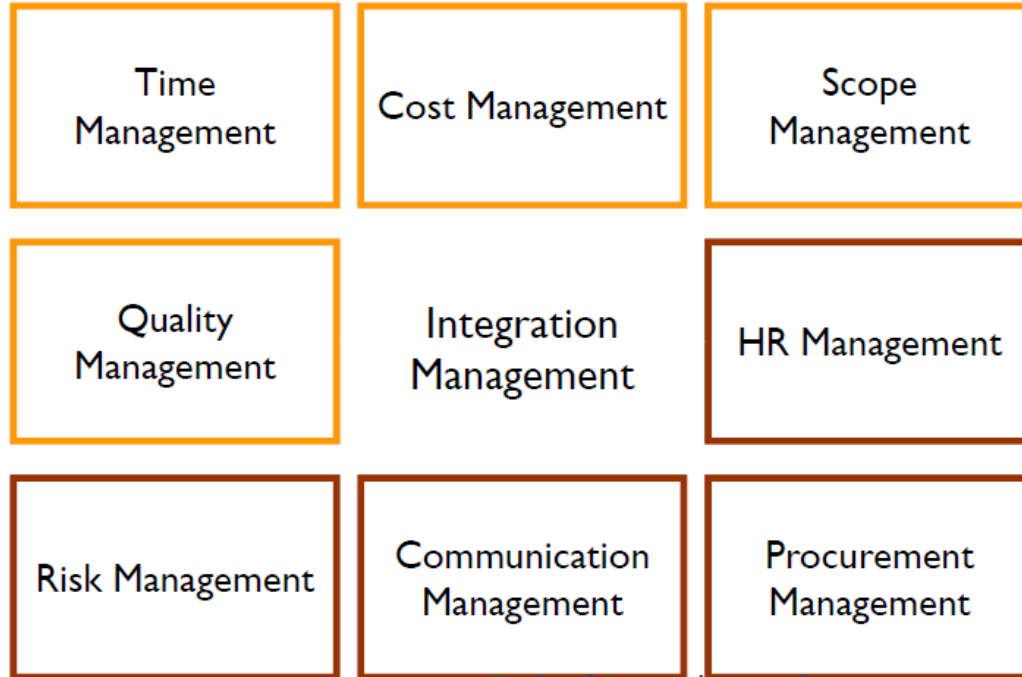
ENS 491 /2 THE TRIPLE CONSTRAINT

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ENS 491 /2 PROJECT MANAGEMENT FRAMEWORK

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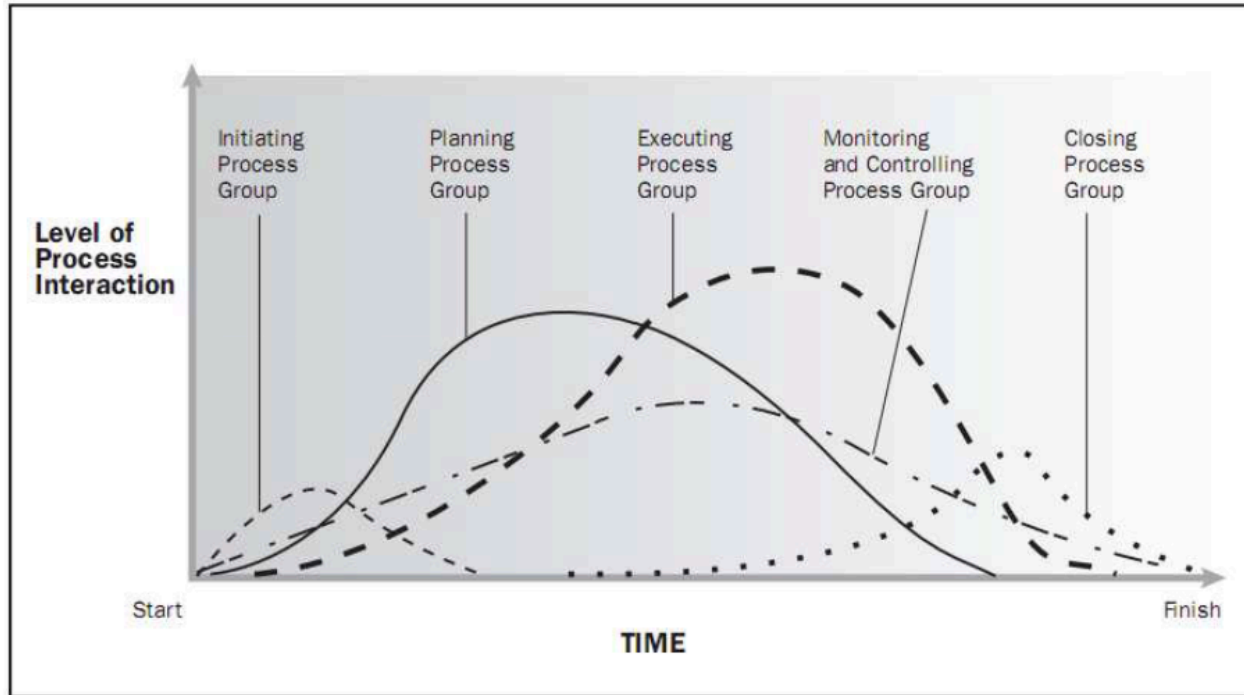
ENS 491 /2 WHAT IS PROJECT MANAGEMENT

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- ❑ Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.
- ❑ Project management is accomplished through the appropriate application and integration of the 47 logically grouped project management processes, which are categorized into five Process Groups.
- ❑ These five Process Groups are:
Initiating,
Planning,
Executing,
Monitoring and Controlling,
Closing.

ENS 491/2 PROCESS GROUPS AND THEIR INTERACTION

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Process Groups

The planning process group defines and refines goal(s), and plans the course of action required to attain the objectives and scope. The executing process group integrates people and other resources to carry out the project plan. The monitoring and controlling process group measures and monitors the progress to identify variances from the plan. The closing process group formalizes the acceptance of the product, service or result and brings the project phase to an end.

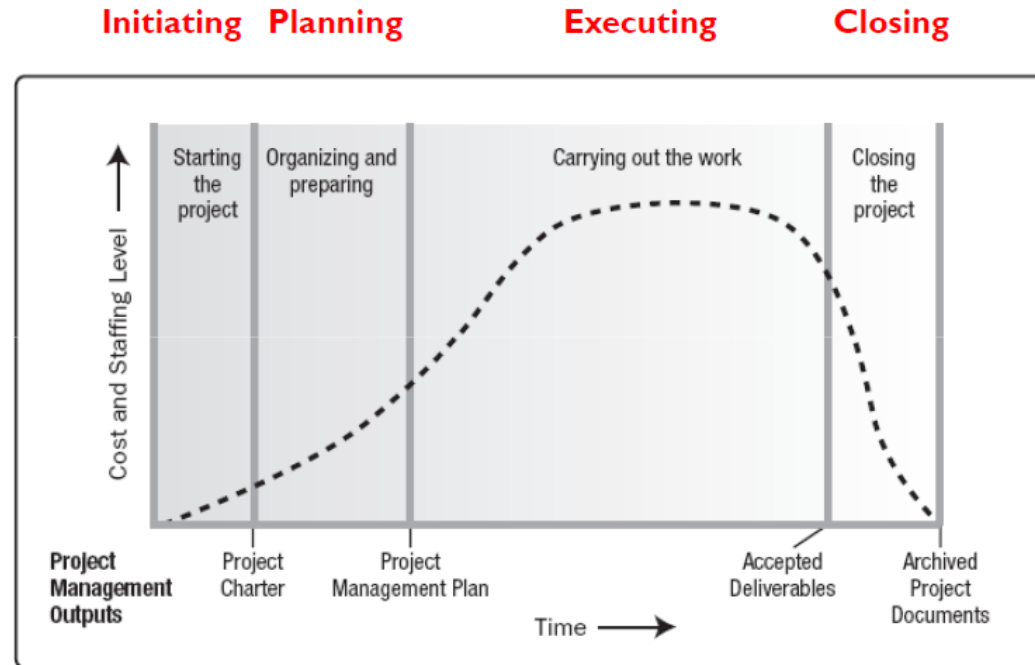
ENS 491 /2 PROJECT LIFE CYCLE

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- ❑ Projects follow a life path. They are born as a concept; they mature as they are defined and planned as a project; they grow with implementation; and they die off once they are finished.
- ❑ **Project Life Cycle** consists of four sequential phases in time through which every project passes: *Project initiation, Planning, Execution, Termination*.
- ❑ Organizations performing projects will usually divide each project into several phases, collectively known as the *Project Life Cycle* to provide better management control.
- ❑ Note that the project life cycle phases are associated with the process groups of project management. The phases are sequential in nature but this does not imply that the overall process is *linear*. The monitoring and controlling process continues throughout the project life cycle allowing for feedback loops in each phase.

ENS 491/2 A GENERIC PROJECT LIFE CYCLE

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ENS 491 /2 PROJECT SPONSOR

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- Project sponsor is an upper level manager responsible from the overall project. The project sponsor is not concerned with the day-to-day operation of the project
- The responsibilities of the project sponsor are:
 - ▣ Managing the stakeholders of the project.
 - ▣ Securing initially and throughout the implementation of the project that the business case is a valid one.
 - ▣ Takes part in the process of setting the priority of the project among other projects in the organization.
 - ▣ Presenting and selling the business case in the organization.
 - ▣ Acting as the champion for the project in the organization.
 - ▣ Appointing the project manager.
 - ▣ Approving the budget funds.
 - ▣ Acting as the mediator between the decision makers in the organization and the project manager for the critical issues beyond the authority of the project manager.
 - ▣ Acts as the Chairperson of the Steering Committee of the project, if one is established.
 - ▣ Decides on major overhaul or the termination of the project.

□

ENS 491 /2 PROJECT MANAGER

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- The project manager is appointed to deliver the project as it is defined in the project charter or project plan. They have the authority to use cash and other resources up to the limit set in the project charter. If they believe at any stage that the project cannot be delivered within the assigned budget and timescale then they must notify the project sponsor so that remedial action can be taken.
- The project manager must have experience in the domain of the project as well as knowledge in the project management processes.
- Project manager is responsible of
 - ▣ Delivery of defined product within scope, time, and cost.
 - ▣ Use of monetary and other resources up to project charter limits.
 - ▣ Day-to-day management of the project.
 - ▣ Reports to the Steering Committee about the progress of the project, if one is established; If not, then reports to the project sponsor.
 - ▣ Reports critical issues to the project sponsor where the project sponsor's authority is needed to reach a solution.

ENS 491 /2 PROJECT CHARTER

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Project Charter																																						
(c) Sigma Magic																																						
Analysis: Clear description of the project which is approved by the sponsor prior to working on the project.																																						
Conclusion:																																						
Last Updated: 04 07 2012 16:24																																						
Project Title: One-line clear description of the project																																						
Business Case Example: This project was initiated to fix the problem of poor customer response cycle time. One of the items on the business balanced scorecard is to improve this performance. If this project is not undertaken, then we could potentially lose a major customer resulting in a potential revenue loss of \$1M.		Problem/Opportunity Statement Example: The historical average current cycle time (primary metric) is 41 days. This data was collected from Jan-June 2009 for the North American region.																																				
Goal Statement Example: The goal of this project is to reduce the cycle time from 41 days to 15 days by December 2009.		Scope Example: In-Scope: Product ABC, Out-of-Scope: All other Products																																				
Team Members <table border="1"> <tr> <th>Key Stakeholders</th> <th>Member Names</th> </tr> <tr> <td>Project Leader:</td> <td>ABC</td> </tr> <tr> <td>Project Sponsor:</td> <td>XYZ</td> </tr> <tr> <td>Team Members:</td> <td>Member 1, Member 2, Member 3</td> </tr> <tr> <td>Subject Matter:</td> <td>Member 4, Member 5</td> </tr> <tr> <td>Process Owner:</td> <td>PQR</td> </tr> <tr> <td>Key Stakeholders:</td> <td></td> </tr> </table>		Key Stakeholders	Member Names	Project Leader:	ABC	Project Sponsor:	XYZ	Team Members:	Member 1, Member 2, Member 3	Subject Matter:	Member 4, Member 5	Process Owner:	PQR	Key Stakeholders:		Project Timeline <table border="1"> <tr> <th>Key Milestone</th> <th>Target Date</th> <th>Comm</th> </tr> <tr> <td>Start Date:</td> <td>1-Jun-09</td> <td></td> </tr> <tr> <td>D Phase Tollgate:</td> <td>15-Jun-09</td> <td></td> </tr> <tr> <td>M Phase Tollgate:</td> <td></td> <td></td> </tr> <tr> <td>A Phase Tollgate:</td> <td></td> <td></td> </tr> <tr> <td>I Phase Tollgate:</td> <td></td> <td></td> </tr> <tr> <td>C Phase Tollgate:</td> <td></td> <td></td> </tr> </table>		Key Milestone	Target Date	Comm	Start Date:	1-Jun-09		D Phase Tollgate:	15-Jun-09		M Phase Tollgate:			A Phase Tollgate:			I Phase Tollgate:			C Phase Tollgate:		
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I Phase Tollgate:																																						
C Phase Tollgate:																																						
Approval Project Sponsor: _____																																						

ENS 491 Workshop 2
Date: _____

Project Charter

A project charter is a document that states a project exists and provides the project manager with written authority to begin work. The document helps the project manager to communicate his authority and explain to project participants and stakeholders why the project is needed, who it involves, how long the project will take to complete, how much it will cost, what resources are needed and how the successful completion of the project will help the organization. Once created, the document is rarely (if ever) amended.

ENS 491 /2 WORK BREAKDOWN STRUCTURE

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- ❑ Work breakdown structure (WBS) accomplishes the unbundling of the project into its major parts in a mutually exclusive way. These parts are further broken down into sub-parts, again in a mutually exclusive way, to obtain the next lower level of the work breakdown structure.
- ❑ The relatively major parts are called *work packages*. A work package consists of one or more *activities*.
- ❑ The unbundling of the project continues until the desired level of detail is reached useful for managing the project.
- ❑ No effort should be made to extend the WBS to the same number of levels for all project tasks.

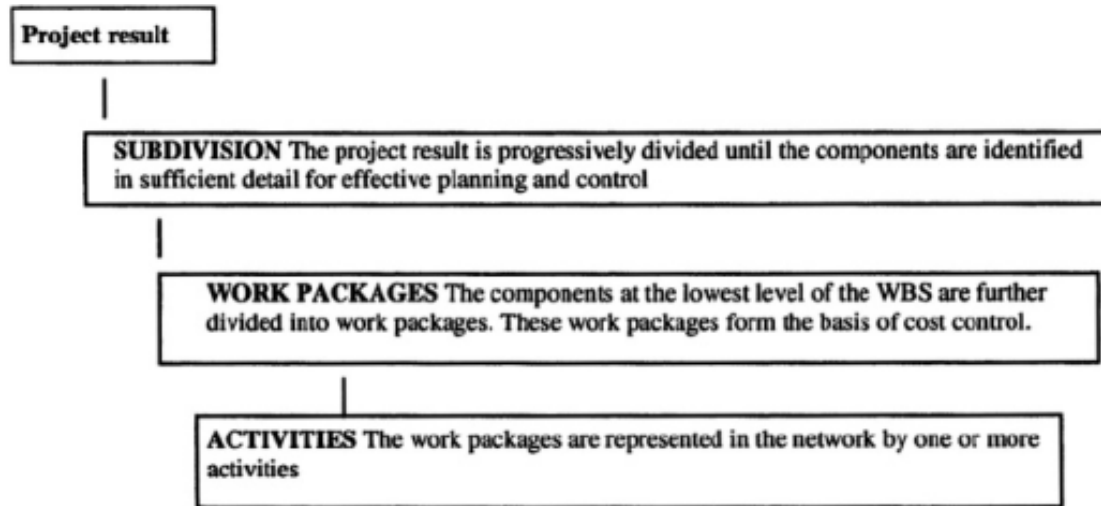
ENS 491 /2 WORK BREAKDOWN STRUCTURE

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- ❑ No effort should be made to introduce timing relationships, dependencies, or sequences.
- ❑ Lowest level WBS tasks should not involve ridiculously small costs.
- ❑ It should be possible to construct a schedule or a network for a WBS task, if that is desired.
- ❑ Routine, repetitive work should not be excessively subdivided.

ENS 491 /2 WORK BREAKDOWN STRUCTURE

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- ❑ The work breakdown structure constitutes a hierarchical structure, which can be represented either in a *list form* or in a *graphical form*.

ENS 491 /2 WORK BREAKDOWN STRUCTURE

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□ A WBS FOR CONFERENCE PLANNING (*List Form*)

□ 1. Conference Planning

□ 1.1. Develop the conference program

- 1.1.1. Establish theme and topics
- 1.1.2. Obtain speakers
- 1.1.3. Prepare handout materials
 - 1.1.3.1. Obtain handout materials from the speakers
 - 1.1.3.2. Prepare and print conference proceedings

□ 1.2. Set the conference site and the date

- 1.2.1. Set conference date
- 1.2.2. Select and commit conference site
- 1.2.3. Confirm arrangements

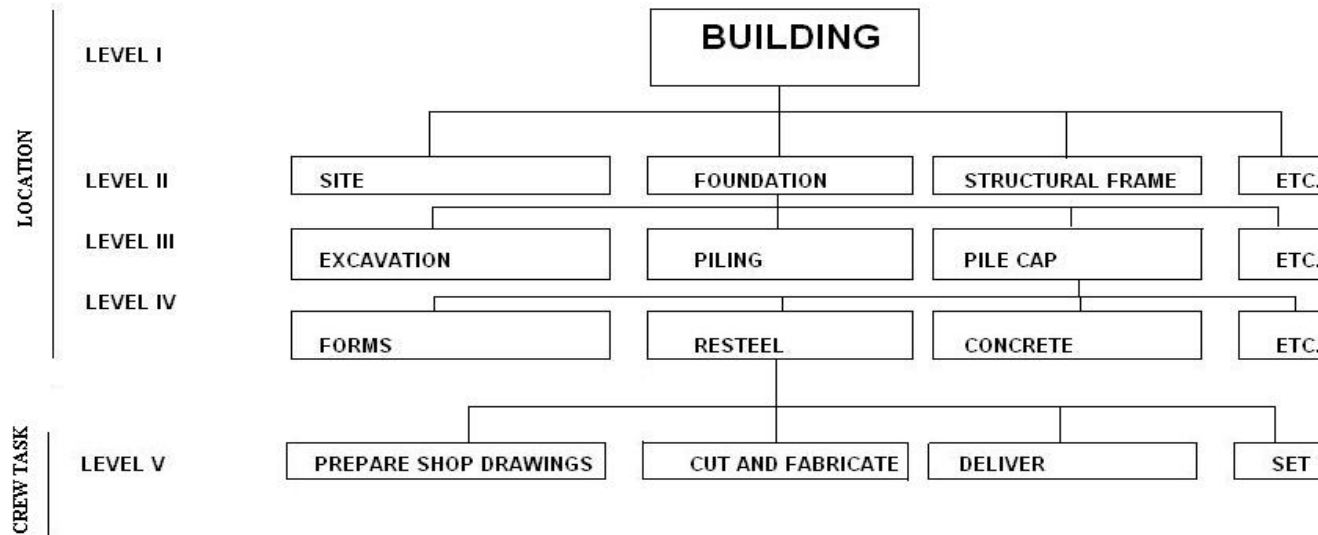
□ 1.3. Design and implement the marketing plan

- 1.3.1. Develop and print conference brochure
- 1.3.2. Obtain label sets for direct mail
- 1.3.3. Mail conference brochure
- 1.3.4. Receive and acknowledge registrations

ENS 491 /2 WORK BREAKDOWN STRUCTURE

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WBS FOR A BUILDING CONSTRUCTION (*Graphical Form*)



ENS 491 /2 PRECEDENCE RELATIONS

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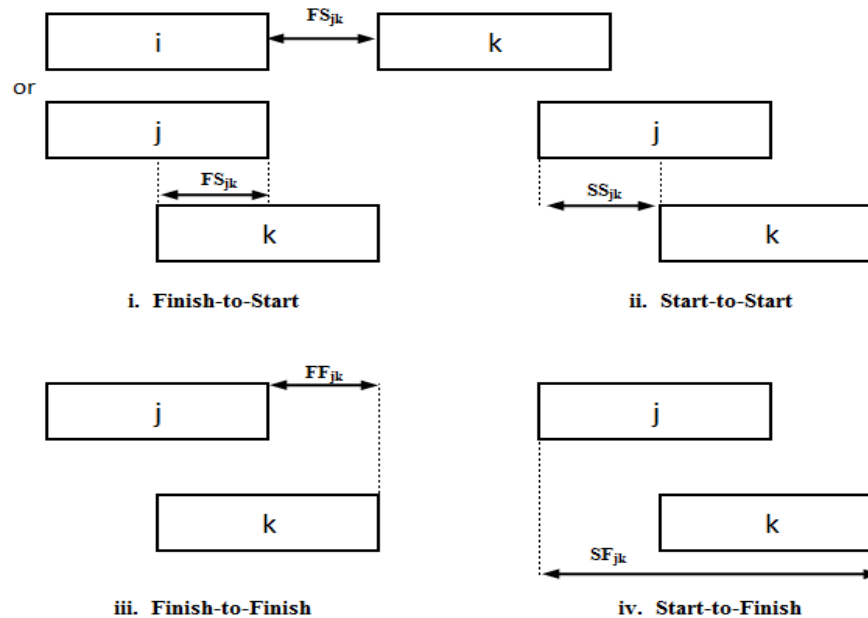
- When two activities are asked to be accomplished in sequence with or without a break, then the activity to be accomplished first (Activity 1) is called the *immediate predecessor* of the second one (Activity 2); and the second is called the *successor* of the first one. Below Activity 1 is the predecessor of activity 3.



ENS 491 / 2 PRECEDENCE RELATIONS

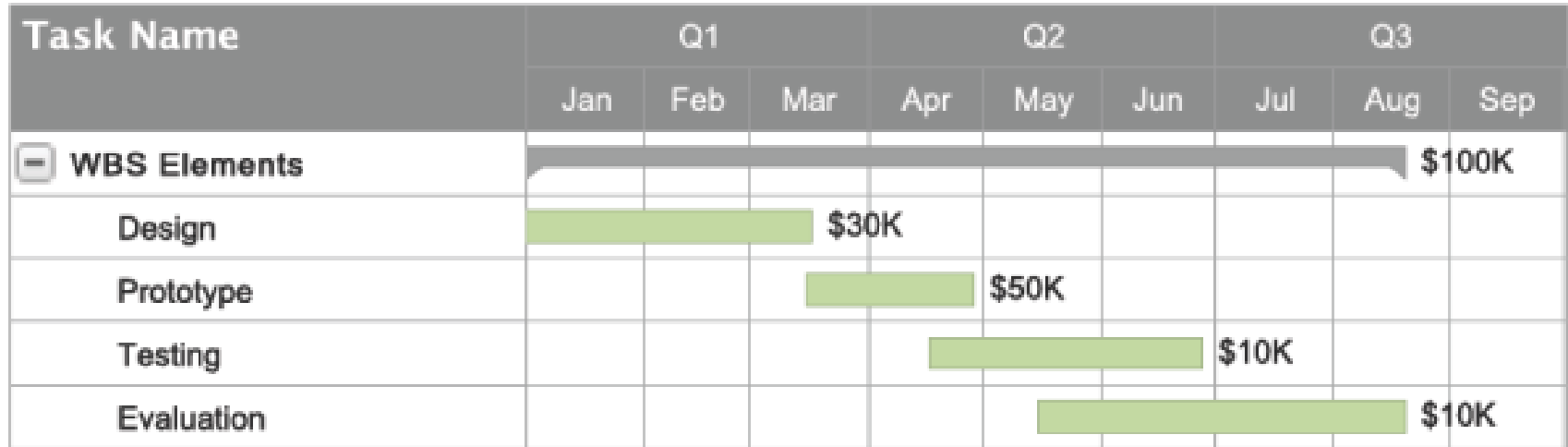
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□ Generalized precedence relations (GPR)



ENS 491 /2 GANTT CHART

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- Each horizontal bar corresponds to an activity or a work package.
- The length of a bar represents its duration and is drawn to *scale*.
- The starting times of the bars are determined such that they do not violate the precedence relations.

ENS 491 /2 ESTIMATING DURATION AND COST

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□ Estimating Activity Duration

- The time to complete an activity is *random*. Various reasons contribute to this result such as skill of people doing the activity, machine and material variations, material availability, unexpected events, etc.
- A way to obtain an estimate for the mean activity duration is suggested as follows: Asking experienced personnel associated with the particular activity for the *most likely*, *optimistic*, and *pessimistic* activity duration estimates and then combining those into a mean value.
- The reliability of the estimate is expected to increase, if we acquire these sets of estimates from different people.

ENS 491 /2 ESTIMATING DURATION AND COST

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- If you obtain an estimate from p different people, then you can aggregate them to a single estimate by taking its *geometric mean*. $(o_1 * o_2 * \dots * o_p)^{1/p}$.
- *Optimistic estimate (a)*: For a particular activity to be executed, what is the activity duration value for which there is a 5% chance that it will not be exceeded by the actual activity duration?
- *Most likely estimate (m)*: For a particular activity to be executed, what is the most likely activity duration value?
- *Pessimistic estimate (b)*: For a particular activity to be executed, what is the activity duration value for which there is a 95% chance that it will not be exceeded by the actual activity duration?

ENS 491 /2 ESTIMATING DURATION AND COST

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- The estimation for the mean activity duration is obtained through the following relation:

$$D = (a + 4m + b) / 6.$$

- And the estimate for the standard deviation of the activity duration is given as:

$$s = (b - a) / 3.2.$$

ENS 491 /2 ESTIMATING DURATION AND COST

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- *Estimating Activity Cost.* For that we need to know the work requirements for that activity (or work package).
- Total activity cost consists of:
 - ▣ Direct labor cost
 - ▣ Direct material cost
 - ▣ Project overheads
 - ▣ General overheads

ENS 491 /2 MAJOR STEPS IN PROJECT SCHEDULING

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- ❑ Define the project objectives.
- ❑ Divide the project into manageable parts (WBS).
- ❑ Decide in detail what has to be done and in what sequence. Use the activity duration estimates to calculate *the estimated project duration* and the relative significance of each activity to timescale objective; i.e., critical activities.
- ❑ Develop Gantt charts for various project levels and by organization by starting each activity at its earliest possible start time. Determine the maximum amount of delay for an activity called the slack, which will not result in an increase of the project duration. Activities with no slack are called critical activities.
- ❑ Reconcile the planned project with the resources that are available. Determine *the final project duration*.
- ❑ If desirable, readjust the starting time of an activity without exceeding its slack.

ENS 491 /2 TEAM MEMBER RESPONSIBILITY CHART

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	Act A	Act B	Act C	Act D	Act E	Act F	Load (hrs)
Team Member 1	x		x		x		126
Team Member 2	x	x				x	98
Team Member 3			x	x		x	109
Team Member 4	x	x		x	x		145
Team Member 5		x	x			x	111

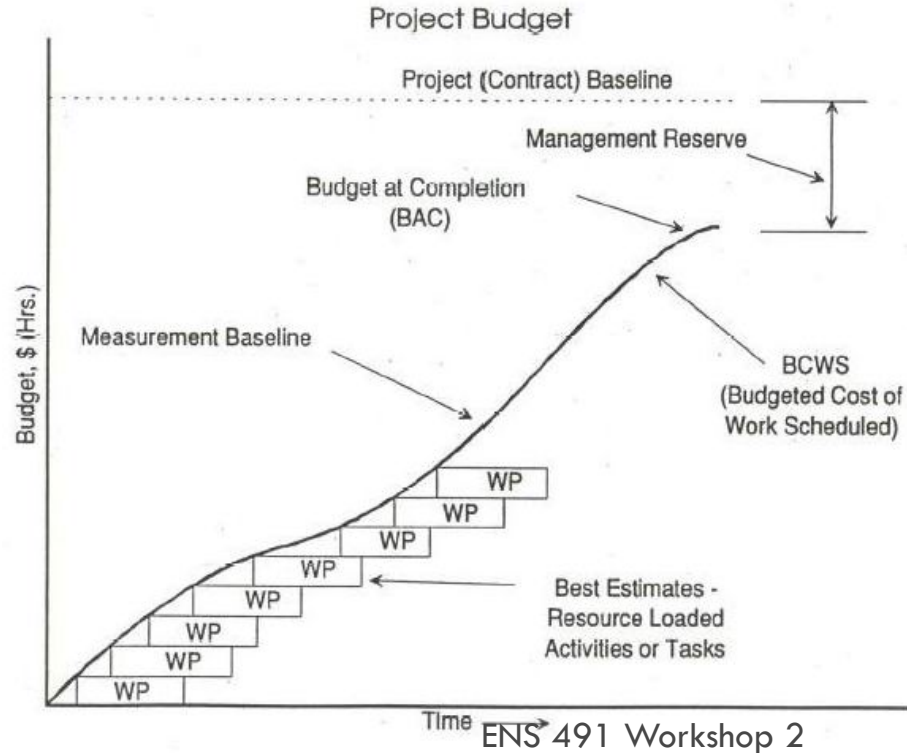
ENS 491 /2 BUDGETING

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- ❑ We have already developed WBS.
- ❑ Decide upon the base case.
- ❑ Estimate the cost of the activities from the WBS.
- ❑ Conduct risk analysis and establish management reserves.
- ❑ Review the costs with upper management.
- ❑ Document the results in a project plan.

ENS 491 /2 PROJECT BUDGET

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ENS 491 /2 PROJECT CONTROL

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Project control can be defined as the process which:

1. Forecasts and evaluates potential hazards prior to occurrence so that preventive action can be taken.
2. Reviews trends or actual situations to analyze their impact and, if possible, proposes action to alleviate the situation.
3. Provides constant surveillance of project conditions to effectively and economically create a "no-surprise" condition.

ENS 491 /2 PROJECT CONTROL

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Three steps in Controlling:

1. *Measuring*: determining through formal and informal reports the degree to which progress toward objectives is being made.
2. *Evaluating*: determining cause of and possible ways to act upon significant deviations from planned performance.
3. *Correcting*: taking control action to correct an unfavorable trend or to take advantage of an unusually favorable trend.

These three steps constitute a feedback mechanism.

ENS 491 /2 PROJECT CONTROL

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Systems for Evaluating Performance

□ *A Scheduling System*

- ▣ Here we compare planned performance with actual performance (Gantt chart).

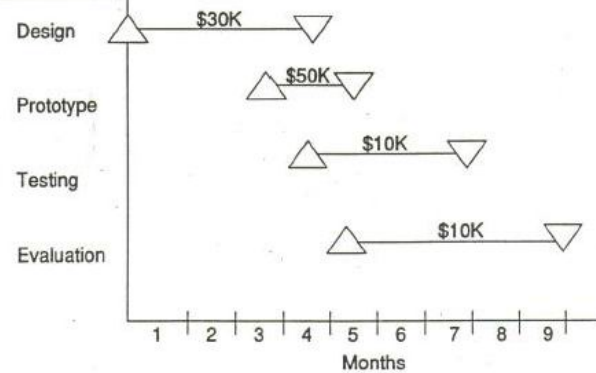
□ *A Budgeting System*

- ▣ Here we compare budgeted expenditures with the actual expenditures.

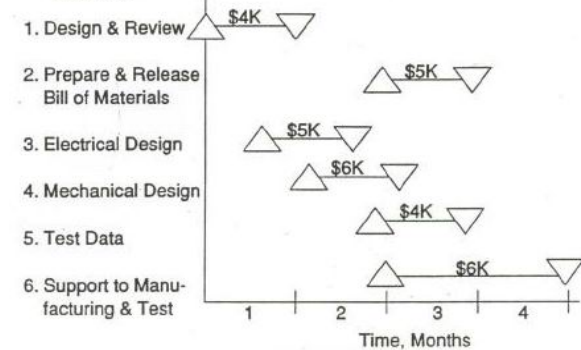
ENS 491/2 PROJECT CONTROL

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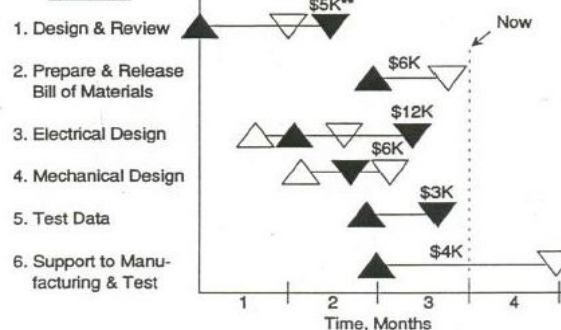
WBS Elements



Activities



Activities



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ENS 491/2 PROJECT CONTROL

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PV: Project value

AC: Actual cost

EV: Earned value

SV: Schedule variance

CV: Cost variance

$SV = EV - PV$

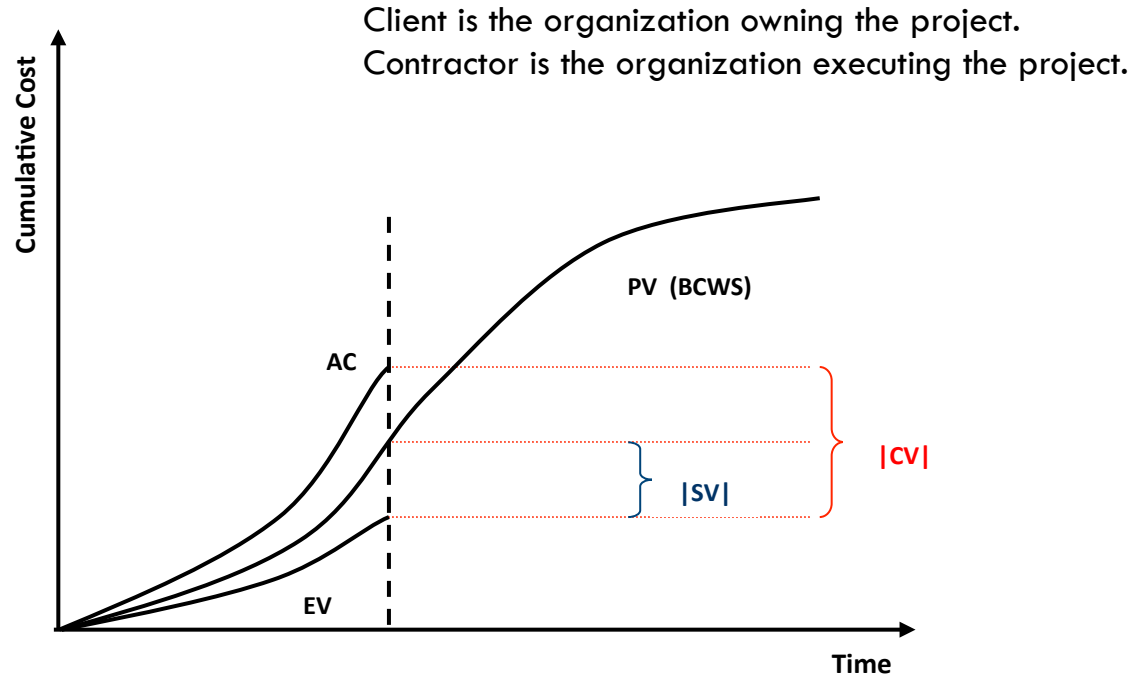
$CV = EV - AC$

SPI: Schedule performance index

CPI: Cost performance index

$SPI = EV / PV$

$CPI = EV / AC$



ENS 491 /2 PROJECT RISK MANAGEMENT

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- ❑ Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project.
- ❑ The objectives of project risk management are to increase the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project.
- ❑ *Plan Risk Management*
 - Identify Risks*
 - Perform Qualitative Risk Analysis*
 - Perform Quantitative Risk Analysis*
 - Plan Risk Responses*
 - Control Risks*

ENS 491 /2 PROJECT RISK MANAGEMENT

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From project management perspective, uncertainty in project management can be reduced mainly to uncertainty in two entities: Activity duration and cost. Cost here is not only limited to monetary cost but refers to other types of resources as well such as, for example, the availability of a bottleneck resource. The reasons for uncertainty in these two entities can be classified under the following headings:

- i. *Change in the contents of an activity.* During the progress of the project, a task may be redefined or the way the task is to be performed can be redefined. Such a change might eliminate the need for some resources; might introduce the need for new resources; and implies in general a change in the predicted rate and level of resources needed. All these result in new estimations regarding the associated rates and levels of expenditures.
- ii. *Availability of the resources.* The resources might not be available when needed. The shortage of human and/or material resources causes delay in a certain activity and subsequent activities and hence, all these result in increased cost.
- iii. *Quality issues.* Lack of resources at required levels of quality might lead to quality defects in processes as well as in products reducing the value of the output and increasing the cost.
- iv. *Price and wage uncertainty.* There can be uncertainties in prices and wages. Any change in prices and wages will reflect itself into the cost of the project.
- v. *Productivity.* The duration of an activity, the level of resources employed or consumed by an activity and their costs are all interrelated through the concept of productivity. Productivity is the output from a production process per unit input. The productivity of a construction worker laying plaster would be expressed for example as x m² per hour. Productivity depends strongly on internal and external conditions such as motivation, organization, professional and human qualifications, environmental factors, etc.

ENS 491 /2 THE RISK CHECKLIST-1

Identification and Assessment

Risk Categories	Risk Classes	Risk Causes
Customer Related	Uncertainty in the communication with the customer	No previous experience of working together with the customer
		Customer violating the written and oral agreements / understandings
	Uncertainty in customer requests	Frequent change requests by the customer
	Project budget	Project aborted by the customer Payment delays / cash flow irregularities
External- Predictable	Material / service acquisition	No previous experience of working together with the supplier / consultant
		Difficulty in material procurement
		Limited service alternatives
		Interruption of provided services
		Problems in deliveries
	Competitive environment	New technologies developed by the competitors
External- Unpredictable	Natural hazards National / international economic crises International relations and legal regulations	Changes in standards and regulations
		Earthquake, flood, etc.
		Economic crises and exchange rate fluctuations affecting the project
		Changes in international relations affecting the project Legal and bureaucratic obstructions affecting the project

ENS 491 / 2 THE RISK CHECKLIST-2

Identification and Assessment

Risk Categories	Risk Classes	Risk Causes
Technical	Maturity level of the technology used	Use of new-to-the-firm technology Use of new-to-the-world technology
	Complexity and uncertainty of the technical content	High uncertainty in technical content Difficulty in defining the project scope
	Inadequacy of the technical personnel	Absence of qualified people (person who has the experience and knowledge about the technology)
Resource Management	Inadequate resources	Inadequacy of labour units for this project because of overloading
		Inadequacy of laboratories / equipment because of overloading
		No experience with the use of the laboratories / equipment
		Equipment breakdown / lack of maintenance
	Changes in team members	Reduction in project team size Turnover in project team
Non-technical Internal (Managerial – Project Management)	Inadequate communication	Inadequacy of communication with upper management
		Inadequacy of communication within the project team
	Changes in strategy / project priorities	Changing objectives / expectations
	Inadequate project experience	Inexperienced project leader
		Lack of teamwork experience in the project team

<u>Probability</u>	Scale
Very low probability of risk to happen (%0-%5)	1
The risk less likely to happen than not (%6-%20)	2
The risk is just as likely to happen as not (%21-%50)	3
The risk is more likely to happen than not (%51-%90)	4
The risk will happen almost definitely (%91-%100)	5

<u>Quality Impact</u> (Quality is defined here as the conformance quality of the project end item with its technical specifications)	
Quality degradation barely noticeable	1
	2
Quality degradation noticeable but acceptable	3
	4
Project end item is effectively not usable	5
<u>Schedule Impact</u>	
Insignificant schedule slippage	1
Overall project slippage <10%	2
Overall project slippage 10-20%	3
Overall project slippage 20-50%	4
Overall project slippage >50%	5
<u>Cost Impact</u>	
Insignificant cost increase	1
<5% cost increase	2
5-10% cost increase	3
10-20% cost increase	4
>20% cost increase	5

ENS 491 /2 THE OVERALL IMPACT SCORE

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- The overall impact I is taken as the integer value of the weighted average calculated as follows:

$$I = [a*x + b*y + c*z]$$

under the condition: $(a + b + c) = 1$, where:

a : Schedule impact coefficient

b : Quality impact coefficient

c : Cost impact coefficient

x : Value of the time impact in 1-5 scale

y : Value of the quality impact in 1-5 scale

z : Value of the cost impact in 1-5 scale

One of the weaknesses of the scoring model is its failure to incorporate systematic checks on the consistency of judgments. Also, using a scoring model imputes a degree of precision that simply does not exist. A halo effect (i.e., if a risk scores high on one criterion, it tends to score high on many of the remaining criteria) is also possible for a scoring model.

Risk severity matrix

Probability of Occurrence (Likelihood)	5	19	14	9	4	1
	4	21	16	11	6	2 A
	3	23 C	18	13 B	8	3
	2	24	20	15	10	5
	1	25	22	17	12	7
		1	2	3	4	5
	Overall Impact					

A=High severity, B=Moderate severity, C=Low severity.

ENS 491 /2 PROJECT RISK MANAGEMENT

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The Risk Response Development Phase

- In this phase, the project manager will define response and contingency plans for the prioritized risks. Strategies that can be used in this phase could rely upon acceptance, mitigation, transfer and avoidance. When developing risk response plans, past project data will provide useful information about what has been done for a specific risk in the previous projects. Making the examples of response and contingency plans used in past projects available will support the development of effective risk responses. After the definition of the risk response plan, a document containing identified risks, severities, response plans, risk symptoms, and risk owners will be prepared and approved by the project sponsor.

ENS 491 /2 PROJECT RISK MANAGEMENT

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The Risk Monitoring and Control Phase

The following events, which are of interest in the context of risk management, can take place during the execution of a project:

- ❑ Applying a response plan by monitoring risk symptoms.
- ❑ Identification of new risks and determination of associated response plans.
- ❑ Changes in the response plans.
- ❑ Identification of the risks realized.
- ❑ Changes in the level of severity of risks.

ENS 491 /2 PROJECT RISK MANAGEMENT

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- In the proposed process, all these events are entered into the database and then monitored. To adapt to the changing environment, project plan may be revised. In this revision, a document containing for each risk the planned response, applied response (if any), severity of risk as conceived at the initiation of the project, the most recent severity assessment of the risk and the risk owner will be prepared and approved by *the project sponsor*.

Risk monitoring and control is a *continuous process*.

ENS 491 /2 PROJECT RISK MANAGEMENT

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- By the end of the project, all the risk-related data will be stored in the knowledge base and ready for future use.
 - With the closeout documents,
 - ▣ identified and realized risks,
 - ▣ not identified but realized risks,
 - ▣ identified but not realized risks
- will be separately declared with their applied responses, estimated impact on project objectives at the initial plan, realized impact on project objectives, and recommendations for the future.

ENS 491 /2 PROJECT COMMUNICATIONS MANAGEMENT

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- ❑ Project Communications Management includes the processes that are required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.
- ❑ Effective communication creates a bridge between diverse stakeholders who may have different cultural and organizational backgrounds, different levels of expertise, and different perspectives and interests, which impact or influence the project execution or outcome.
- ❑ Plan Communications Management
 - Manage Communications
 - Control Communications

ENS 491 /2 PROJECT COMMUNICATIONS MANAGEMENT

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Communication of the project manager with ...

- ❑ the stakeholders,
 - ❑ the project sponsor,
 - ❑ the owner(s) of the project.
 - ❑ the project team members...
-
- ❑ Communication among the project team members.
 - ▣ Meeting minutes (determining the agenda, preparing the minutes, distribution of the minutes, ...)

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Thank You and Wish You All The Best
With Your Projects.