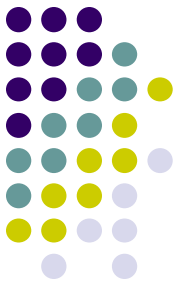


Chapter 3

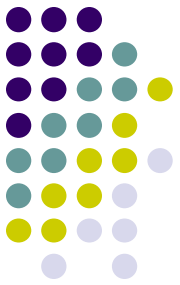
Project Scope Management

3.1.What is Project Scope Management?



- **Scope** refers to all the work involved in creating the products of the project and the processes used to create them. It defines what is or is not to be done
- **Deliverables** are products produced as part of a project, such as hardware or software, planning documents, or meeting minutes
- The project team and stakeholders must have the same understanding of what products will be produced as a result of a project and how they'll be produced

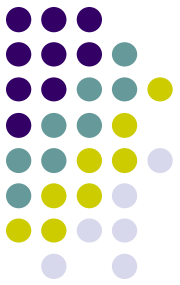
3.1.What is Project Scope Management?



Project Scope Management includes the processes involved in defining and controlling what is or is not included in a project

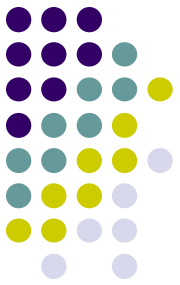
- Initiation: beginning a project or continuing to the next phase
- Scope planning: developing documents to provide the basis for future project decisions
- Scope definition: subdividing the major project deliverables into smaller, more manageable components
- Scope verification: formalizing acceptance of the project scope
- Scope change control: controlling changes to project scope

3.2. Project Initiation: Strategic Planning and Project Selection



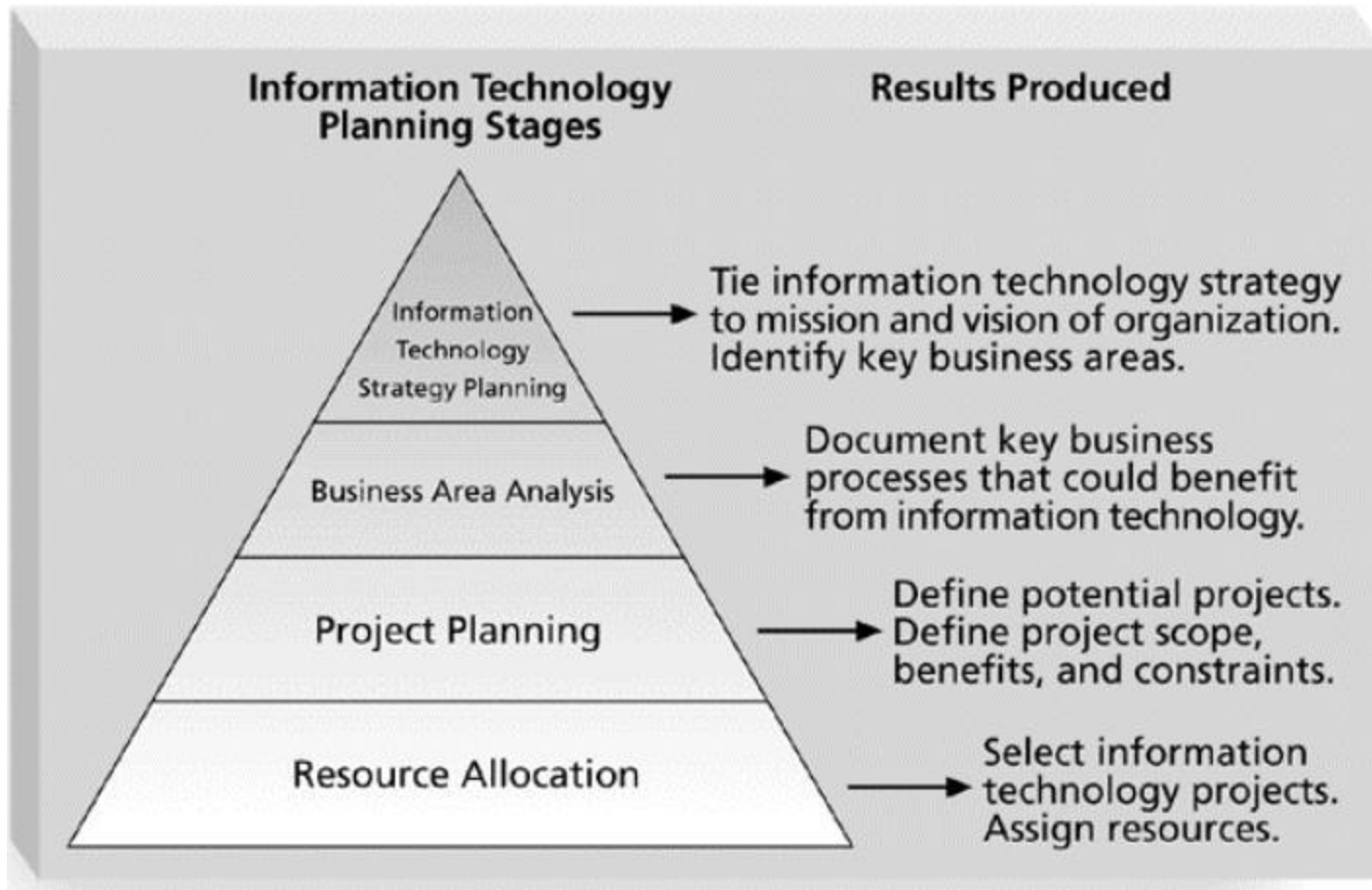
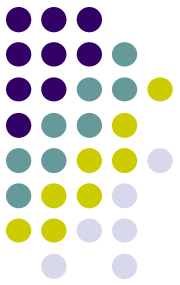
- The first step in initiating projects is to look at the big picture or strategic plan of an organization
- Strategic planning involves determining long-term business objectives by analyzing the strengths and weaknesses of an organization, studying opportunities and threats in the business environment, predicting future trends, and projecting the need for new products and services
- IT projects should support strategic and financial business objectives

a) Identifying Potential Projects

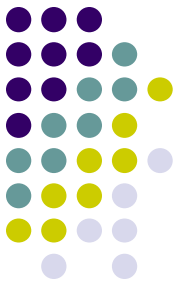


- Many organizations follow a planning process for selecting IT projects
- First develop an IT strategic plan based on the organization's overall strategic plan
- Then perform a business area analysis
- Then define potential projects
- Then select IT projects and assign resources

Figure 3-1. IT Planning Process

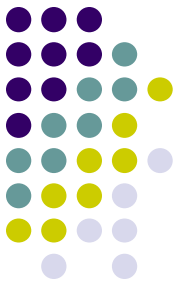


b) Methods for Selecting Projects



- Methods include:
 - focusing on broad organizational needs
 - categorizing IT projects
 - performing financial analyses
 - using a weighted scoring model

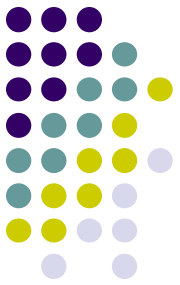
1) Focusing on Broad Organizational Needs



Three important criteria for projects:

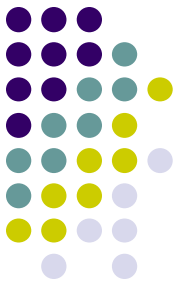
- There is a ***need*** for the project: Do people in the organization agree that the project needs to be done?
- There are ***funds*** available: Is the organization willing to provide adequate funds to do the project?
- There's a strong ***will*** to make the project succeed: Is there a strong will to make the project succeed?

2) Categorizing IT Projects



- One categorization is whether the project addresses
 - **Problems:** are undesirable situation that prevent an organization from achieving its goals.
 - **Opportunities:** are chances to improve the organization.
 - **Directives:** are new requirements imposed by management, government, or some external influence.
- Another categorization is how long it will take to do and when it is needed.
- Another is the overall priority of the project. Many organizations prioritize IT projects as being high, medium, or low priority.

3) Financial Analysis of Projects

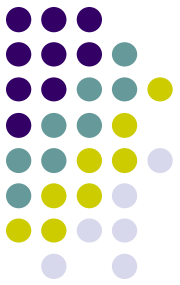


- Financial considerations are often an important consideration in selecting projects
- Three primary methods for determining the projected financial value of projects:
 - Net present value (NPV) analysis
 - Return on investment (ROI)
 - Payback analysis

① Net Present Value (NPV) Analysis

- If we invest \$100 at 20% interest, after one year it will be worth \$120 and after two years compounded it will be worth \$144
- Now NPV is the reverse of compound interest
- If you were offered \$120 one year from now and the inflation and interest rate was 20%, working backwards its value in today terms would be \$100
- This is called the present value
- And when the cash flow over a number of years is combined in this manner the total figure is called the *net present value* (NPV)
- Net present value (NPV) analysis is a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time
- Projects with a positive NPV should be considered if financial value is a key criterion
- The higher the NPV, the better

* NPV Formula

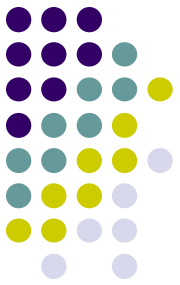


$$NPV = \sum_{t=1}^n A * DF$$

Cash flow = Benefit - Cost

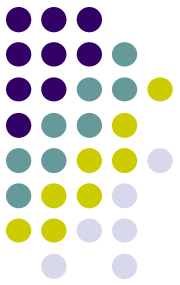
- DF: Discount factor = $1/(1+r)^t$
- t : equals the year of cash flows
- r : discount rate
- A : the amount of cash flow each year

* Table of NPV Discount Factors



Year	Discount rate (%)					
	5	6	8	10	12	15
1	0.9524	0.9434	0.9259	0.9091	0.8929	0.8696
2	0.9070	0.8900	0.8573	0.8264	0.7972	0.7561
3	0.8638	0.8396	0.7938	0.7513	0.7118	0.6575
4	0.8227	0.7921	0.7350	0.6830	0.6355	0.5718
5	0.7835	0.7473	0.6806	0.6209	0.5674	0.4972
6	0.7462	0.7050	0.6302	0.5645	0.5066	0.4323
7	0.7107	0.6651	0.5835	0.5132	0.4523	0.3759
8	0.6768	0.6274	0.5403	0.4665	0.4039	0.3269
9	0.6446	0.5919	0.5002	0.4241	0.3606	0.2843
10	0.6139	0.5584	0.4632	0.3855	0.3220	0.2472
15	0.4810	0.4173	0.3152	0.2394	0.1827	0.1229
20	0.3769	0.3118	0.2145	0.1486	0.1037	0.0611
25	0.2953	0.2330	0.1460	0.0923	0.0588	0.0304

Example 1



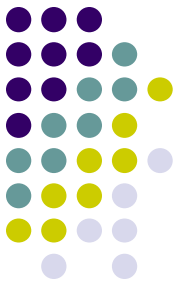
Discount Rate 10%

Year	1	2	3	4	5
Project 1					
Costs	\$5,000	\$1,000	\$1,000	\$1,000	\$1,000
Benefits	\$0	\$2,000	\$3,000	\$4,000	\$5,000
Project 2					
Costs	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
Benefits	\$1,000	\$2,000	\$4,000	\$4,000	\$4,000

- $NPV_1 = -5,000 \cdot 0.9091 + 1,000 \cdot 0.8264 + 2,000 \cdot 0.7513$
 $+ 3,000 \cdot 0.6830 + 4,000 \cdot 0.6209 = \$2,316.35$
- $NPV_2 = -1,000 \cdot 0.9091 + 0 \cdot 0.8264 + 2,000 \cdot 0.7513$
 $+ 2,000 \cdot 0.6830 + 2,000 \cdot 0.6209 = \$3,201.41$

$NPV_2 > NPV_1 \Rightarrow$ We select Project 2 (We can also calculate [in Excel](#))

Example 2

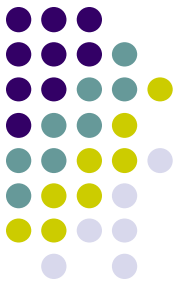


Discount Rate 10%

Year	0	1	2	3	4
Machine A					
Cash flow	(\$35,000)	\$20,000	\$15,000	\$10,000	\$10,000
Discount factor	1	0.9091	0.8264	0.7513	0.6830
Machine B					
Cash flow	(\$35,000)	\$10,000	\$10,000	\$15,000	\$20,000
Discount factor	1	0.9091	0.8264	0.7513	0.6830

- $NPV_A = -35,000 * 1 + 20,000 * 0.9091 + 15,000 * 0.8264$
 $+ 10,000 * 0.7513 + 10,000 * 0.6830 = \$9,921$
- $NPV_B = -35,000 * 1 + 10,000 * 0.9091 + 10,000 * 0.8264$
 $+ 15,000 * 0.7513 + 20,000 * 0.6830 = \$7,284.5$

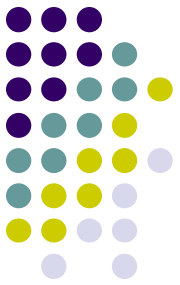
$NPV_A > NPV_B \Rightarrow$ We select Machine A



* NPV Calculations

- Determine estimated costs and benefits for the life of the project and the products it produces
- Determine the discount rate (check with your organization on what to use)
- Calculate the NPV
- Notes: Some organizations consider the investment year as year 0, while others start in year 1. Some people enter costs as negative numbers, while others do not. Check with your organization for their preferences.

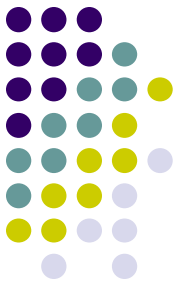
② Return on Investment



- Return on investment (ROI) is calculated by subtracting the project costs from the benefits and then dividing by the costs

$$\text{ROI} = \frac{(\text{total discounted benefits} - |\text{total discounted costs}|)}{|\text{total discounted costs}|}$$

- The higher the ROI, the better
- Many organizations have a required rate of return or minimum acceptable rate of return on an investment



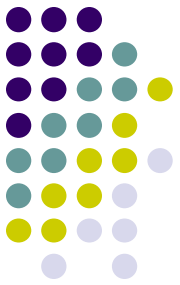
Where

- Discounted benefits for each year = Discount factor * Benefit for each year
- Discounted costs for each year = Discount factor * Cost for each year
- Discount factor = $1/(1+r)^t$

Another calculating of NPV

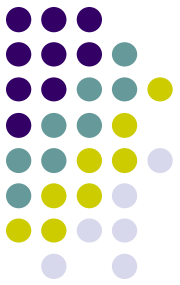
$$\text{NPV} = \text{total discounted benefits} - |\text{total discounted costs}|$$

③ Payback Analysis



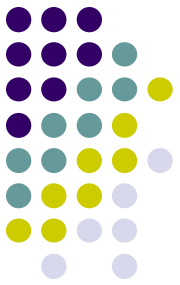
- Another important financial consideration is payback analysis
- The payback period is the amount of time it will take to recoup, in the form of net cash inflows, the net dollars invested in a project
- Payback occurs when the cumulative discounted benefits and costs are greater than zero
- Many organizations want IT projects to have a fairly short payback period

③ Payback Period



- The payback period is the time taken to gain a financial return equal to the original investment
- The time period is usually expressed in years and months
- Consider this example where a company wishes to buy a new machine for a four year project
- The manager has to choose between machine A or machine B, so it is a mutually exclusive situation
- Although both machines have the same initial cost (\$35,000) their cash flows perform differently over the four year period

Example



- To calculate the *payback period*, simply work out how long it will take to recover the initial outlay

Year	Cash Flow Machine A	Cash Flow Machine B
0	(\$35,000)	(\$35,000)
1	\$20,000	\$10,000
2	\$15,000	\$10,000
3	\$10,000	\$15,000
4	\$10,000	\$20,000
Payback period	2 years	3 years

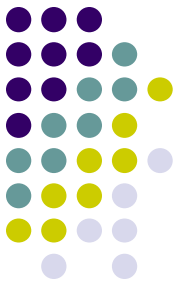
- Table 3.2: Payback period (Machine A 2 years, Machine B 3 years)
- Machine A will recover its outlay one year sooner than machine B
- Machine A is selected in preference to machine B

Example in Excel file

Year	1	2	3	4	5
Project 1					
Row 11	(\$4,545.45)	\$826.45	\$1,502.63	\$2,049.04	\$2,483.69
Cumulative Row 11	↓ + (\$4,545.45)	↓ + (\$3,719.01)	↓ + (\$2,216.38)	↓ + (\$167.34)	↓ \$2,316.35

Year	1	2	3	4	5
Project 2					
Row 23	(\$909.09)	\$0.00	\$1,502.63	\$1,366.03	\$1,241.84
Cumulative Row 23	↓ + (\$909.09)	↓ + (\$909.09)	↓ + \$593.54	↓ + \$1,959.57	↓ \$3,201.41

③ Payback Period

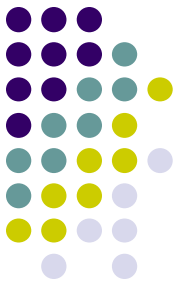


* Formula

- To calculate payback period of a project depends on whether the cash flow per period from the project is even or uneven.
- In case they are even, the formula to calculate payback period is:

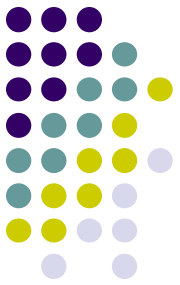
Payback Period= initial Investment/Cash inflow per period

Example



- You invest 100\$ in 4 years period. You will get the cash inflow as following
 - Year1: 40
 - Year2: 30
 - Year3: 30
 - Year4: 40
- **Payback Period is in Year 3 = (40+30+30)**

③ Payback Period



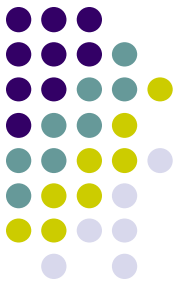
* Formula

- When cash inflows are uneven, we need to calculate the cumulative net cash flow for each period and then use the following formula for payback period::

$$\text{Payback Period} = A + (B/C)$$

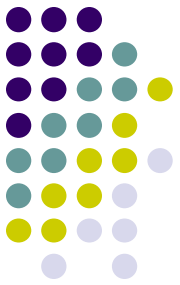
- **A** is the last period with a negative cumulative cash flow;
- **B** is the absolute value of cumulative cash flow at the end of the period A;
- **C** is the total cash flow during the period after A

Example



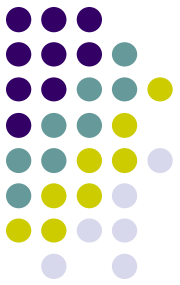
- You invest 100\$ in 4 years period. You will get the cash inflow as following
 - Year1: 40
 - Year2: 30
 - Year3: 45
 - Year4: 40
- **Calculate: $B/C = |70-100| / 45 = 0.66$**
- **So payback period will be in: $A + (B/C) = 2 + 0.66 = 2.66$ Year Then you can calculate in month, week, day.**
- **Convert 2.66 year to month = $2.66 \times 12 = 32$ months = 2 years and 8 months**

* Advantages of Payback Period



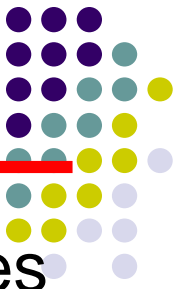
- The advantages of the *payback* method are:
 - It is simple and easy to use
 - It uses readily available accounting data to determine cash flows
 - It reduces the project's exposure to risk and uncertainty by selecting the project that has the shortest *payback period*
 - The uncertainty of future cash flow is reduced
 - It is an appropriate technique to evaluate high technology projects where the technology is changing quickly and the project could run the risk of being left holding out of date stock
 - It is an appropriate technique for fashion projects where the market demand tends to change seasonally
 - Faster payback has a favorable short-term effect on earning per share
 - The *payback period* quantifies the selection criteria in terms the decision-makers are familiar with

* Disadvantages of Payback Period



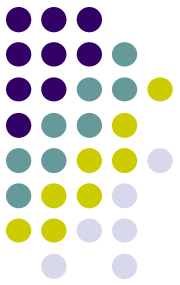
- The disadvantages of the *payback period* calculation are:
 - It does not consider the time value of money. The payback period is indifferent to the timing of the cash flow. The project with a high, early income (cash inflow) would be ranked equally with a project had late income if their *payback periods* were the same
 - The payback period calculation does not look at the total project. What happens to the cash flow after the payback period is not considered
 - It is not a suitable technique to evaluate long term projects where the effects of differential inflation and interest rates could significantly change the results
 - The figures are based on project cash flow only. All other financial data are ignored
 - Although payback period would reduce the duration of risk. It does not quantify the risk exposure
- The *payback period* is the most widely used project selection calculation, even if this is an initial filter. Its main strength is that it is simple and quick

4) Weighted Scoring Model



- A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria
 - First identify criteria important to the project selection process
 - Then assign weights (percentages) to each criterion so they add up to 100%
 - Then assign scores to each criterion for each project
 - Multiply the scores by the weights and get the total weighted scores
- The higher the weighted score, the better

Example in Excel file



Project 1

$$25\%*90 + 15\%*70 + 15\%*50 + 10\%*25 + 5\%*20 + 20\%*50 + 10\%*20 = 56$$

Project 2

$$25\%*90 + 15\%*90 + 15\%*90 + 10\%*90 + 5\%*20 + 20\%*70 + 10\%*50 = 78.5$$

Project 3

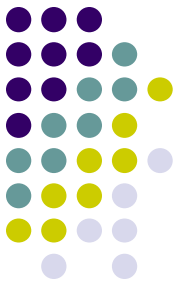
$$25\%*50 + 15\%*50 + 15\%*50 + 10\%*50 + 5\%*50 + 20\%*50 + 10\%*50 = 50$$

Project 4

$$25\%*20 + 15\%*20 + 15\%*20 + 10\%*70 + 5\%*90 + 20\%*50 + 10\%*90 = 41.5$$

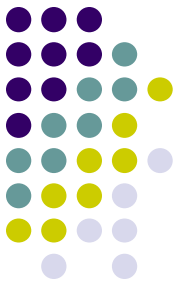
⇒ **Select Project 2**

c) Project Charters



- After deciding what project to work on, it is important to formalize projects
- A project charter is a document that formally recognizes the existence of a project and provides direction on the project's objectives and management
- A project charter is a document that anyone can use to understand what the project is all about without needing to understand the details or technical aspects of the effort
- Key project stakeholders should sign a project charter to acknowledge agreement on the need and intent of the project

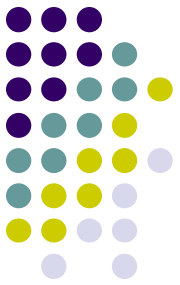
c) Project Charters



*** The key parts of the project charter are:**

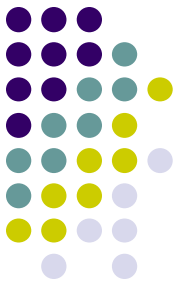
- The project's title and date of authorization
- The project manager's name and contact information
- A brief scope statement for the project
- A summary of the planned approach for managing the project
- A roles and responsibilities matrix
- A sign-off section for signature of key project stakeholders
- A comments section in which stakeholders can provide important comments related to the project

* *Sample Project Charter*



- **Project Title:** Information Technology (IT) Upgrade Project
- **Project Start Date:** March 4, 2005 **Project Finish Date:** December 4, 2005
- **Project Manager:** Kim Nguyen, 691-2784,
knguyen@abc.com
- **Project Objectives:** Upgrade hardware and software for all employees (approximately 2,000) within 9 months based on new corporate standards. See attached sheet describing the new standards. Upgrade may affect servers and midrange computer, as well as network hardware and software. Budgeted \$ 1,000,000 for hardware and software costs and \$ 500,000 for labor costs.

* *Sample Project Charter*

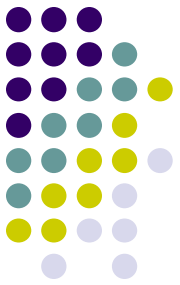


- Approach:

- Update the information technology inventory database to determine upgrade needs
- Develop detailed cost estimate for project and report to CIO
- Issue a request for quotes to obtain hardware and software
- Use internal staff as much as possible to do the planning, analysis, and installation

ROLES AND RESPONSIBILITIES:		
Name	Role	Responsibility
- Walter Schmidt	CEO, Project sponsor	Provide direction and funding
- Mike Zwack	CIO	Monitor project, provide staff
- Kim Nguyen	Project Manager	Plan and execute project
- Jeff Johnson	Director of Information, Technology Operations	Mentor Kim
- Nancy Reynolds	VP, Human Resources	Provide staff, issue memo to all employees about project
- Steve McCann	Director of Purchasing	Assist in purchasing hardware and software

* *Sample Project Charter*



- **Sign-off:** (Signatures of all the above stakeholders)

Walter Schmidt

Jeff Johnson

Mike Zwack

Nancy Reynolds

Kim Nguyen

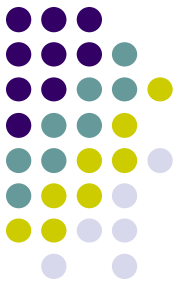
Steve McCann

- **Comments:** (Typed or handwritten comments from above stakeholders, if applicable)
 - “This project must be done within ten months at the absolute latest,” Mike Zwack, CIO
 - “We are assuming that adequate staff will be available and committed to supporting this project. Some work must be done after hours to avoid work disruptions, and overtime will be provided.” Jeff Johnson and Kim Nguyen, Information Technology Department

3.3. Scope Planning and the Scope Statement

- A scope statement is a document used to develop and confirm a common understanding of the project scope. It should include
 - a project justification: Describes the business need that sparked creation of the project
 - a brief description of the project's products: Summarizes the characteristics of the product or services that the project will produce
 - a summary of all project deliverables: Would list the deliverables of the project (include documentation such as a project plan, a WBS, a detailed cost estimate, a communication management plan, performance reports,...)
 - a statement of what determines project success: Lists the quantifiable criteria that must be met for project success, such as cost, schedule, and quality measures.

3.4. Scope Definition and the Work Breakdown Structure

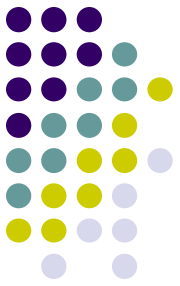


- After completing scope planning, the next step is to further define the work by breaking it into manageable pieces
- Good scope definition
 - helps improve the accuracy of time, cost, and resource estimates
 - defines a baseline for performance measurement and project control
 - aids in communicating clear work responsibilities

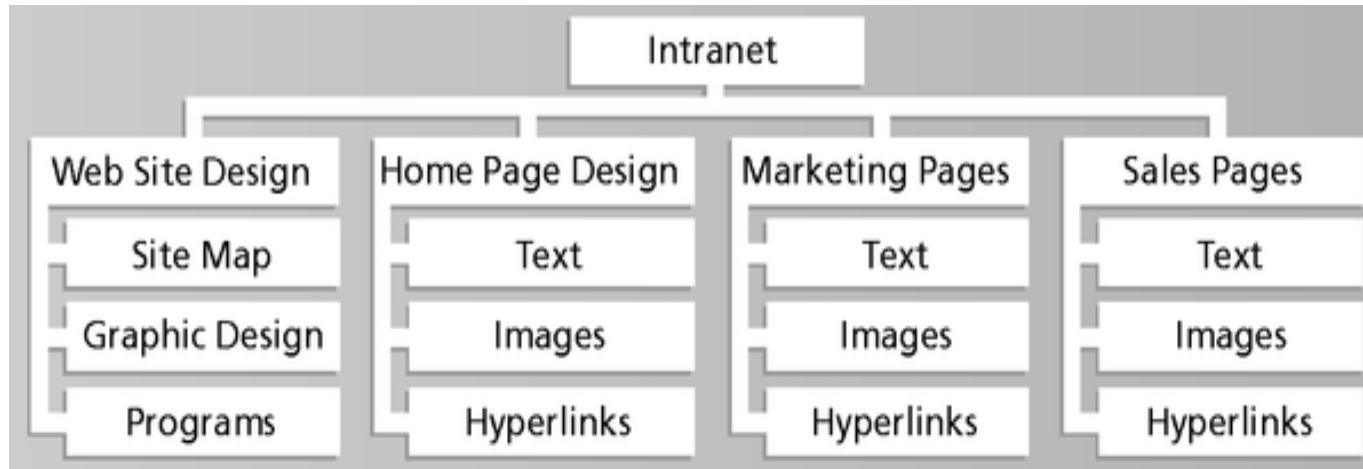
a) The Work Breakdown Structure

- A work breakdown structure (WBS) is a deliverable-oriented grouping of the work involved in a project that defines the total scope of the project
- It is a foundation document in project management because it provides the basis for planning and managing project schedules, costs, and changes

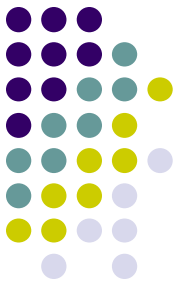
3.4. Scope Definition and the Work Breakdown Structure



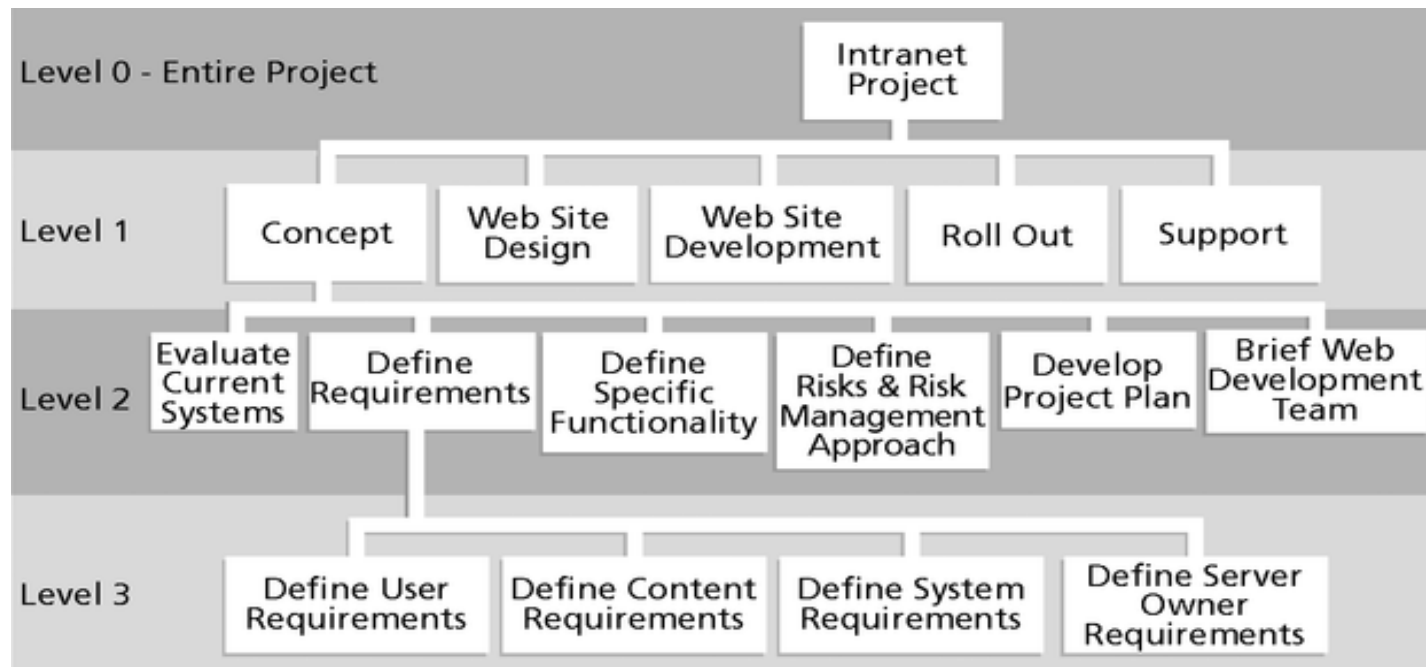
b) Sample Intranet WBS Organized by Product



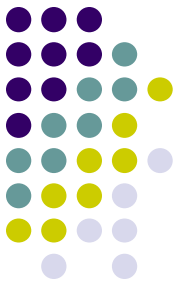
3.4. Scope Definition and the Work Breakdown Structure



c) Sample Intranet WBS Organized by Phase



3.4. Scope Definition and the Work Breakdown Structure



d) Intranet WBS in Tabular Form

1.0 Concept

- 1.1 Evaluate current systems

- 1.2 Define Requirements

 - 1.2.1 Define user requirements

 - 1.2.2 Define content requirements

 - 1.2.3 Define system requirements

 - 1.2.4 Define server owner requirements

- 1.3 Define specific functionality

- 1.4 Define risks and risk management approach

- 1.5 Develop project plan

- 1.6 Brief Web development team

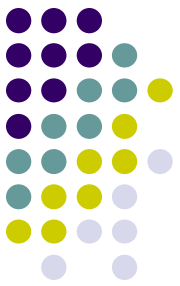
2.0 Web Site Design

3.0 Web Site Development

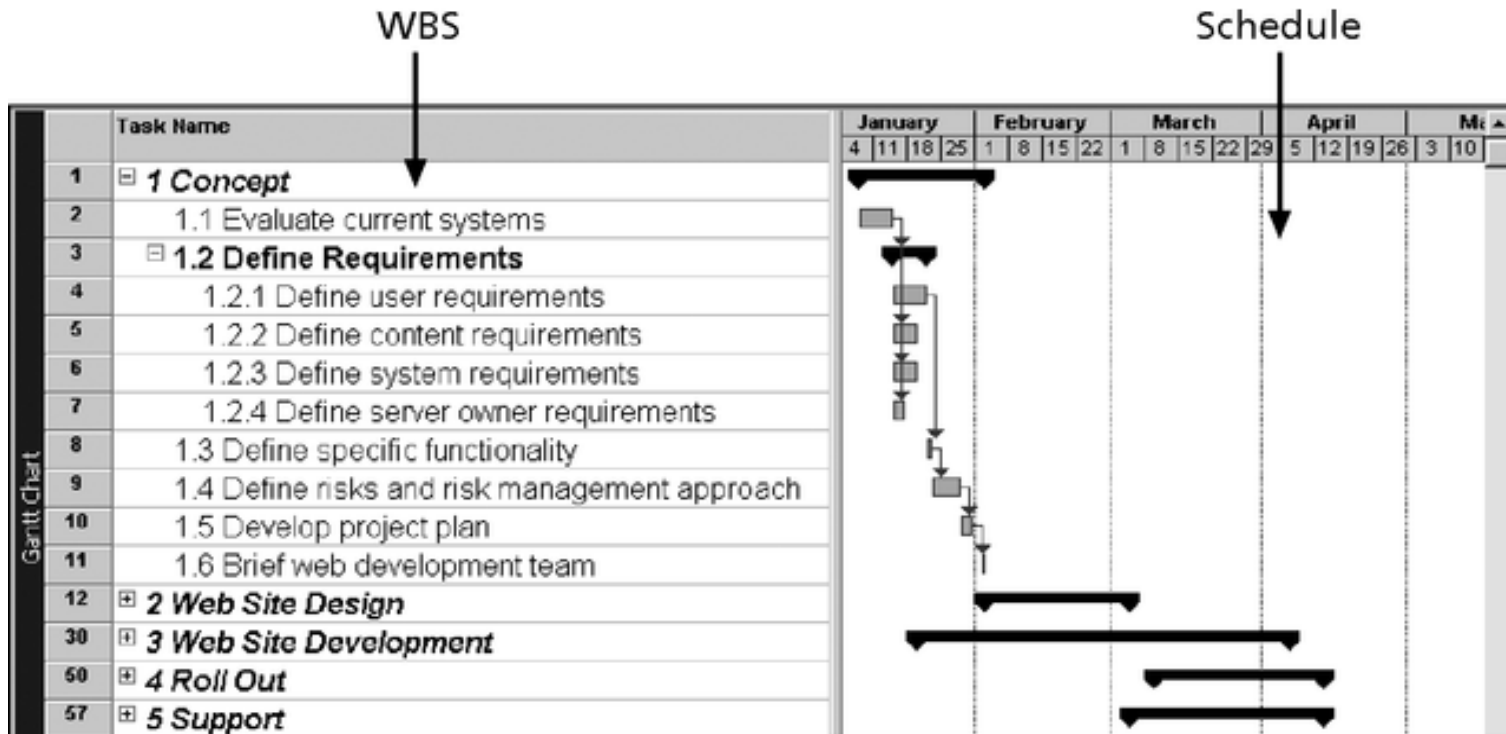
4.0 Roll Out

5.0 Support

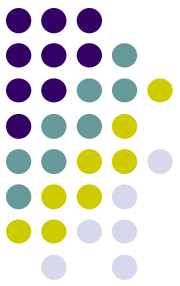
3.4. Scope Definition and the Work Breakdown Structure



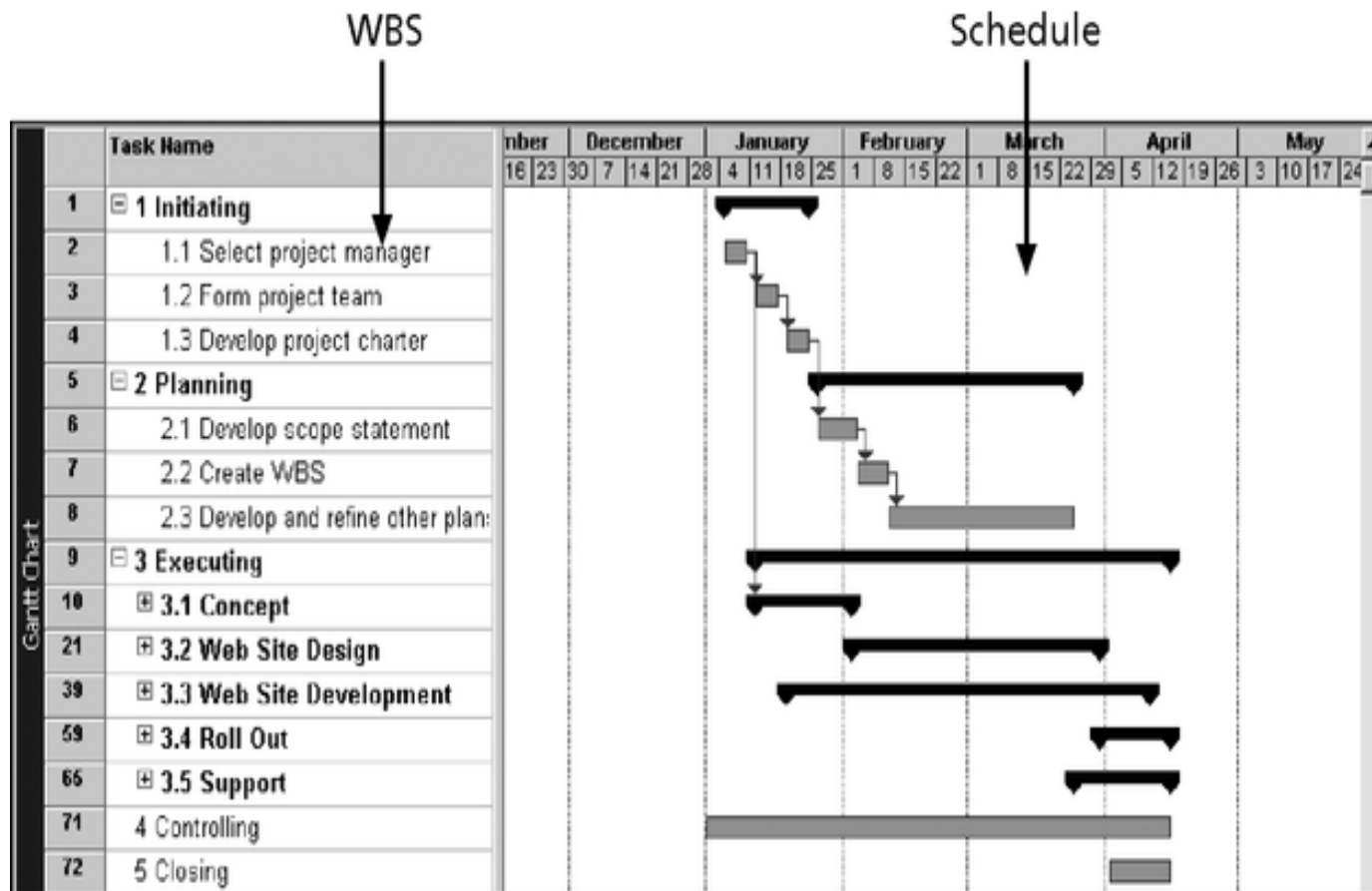
e) Intranet WBS and Gantt Chart in MS Project



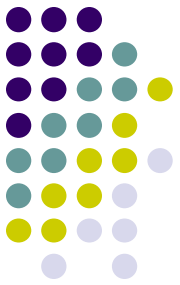
3.4. Scope Definition and the Work Breakdown Structure



f) Intranet WBS and Gantt Chart Organized by Project Management Process Groups



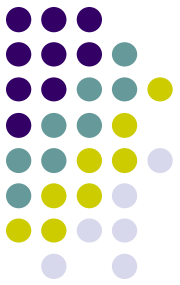
3.4. Scope Definition and the Work Breakdown Structure



g) Approaches to Developing WBSs

- Using guidelines: Some organizations, like the DoD, provide guidelines for preparing WBSs
- The analogy approach: Review WBSs of similar projects and tailor to your project
- The top-down approach: Start with the largest items of the project and break them down
- The bottom-up approach: Start with the detailed tasks and roll them up

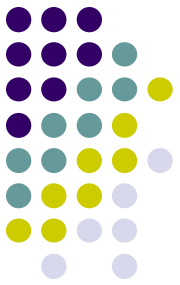
3.4. Scope Definition and the Work Breakdown Structure



h) Basic Principles for Creating WBSs

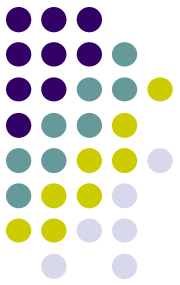
1. A unit of work should appear at only one place in the WBS.
2. The work content of a WBS item is the sum of the WBS items below it.
3. A WBS item is the responsibility of only one individual, even though many people may be working on it.
4. The WBS must be consistent with the way in which work is actually going to be performed; it should serve the project team first and other purposes only if practical.
5. Project team members should be involved in developing the WBS to ensure consistency.
6. Each WBS item must be documented to ensure accurate understanding of the scope of work included and not included in that item.

3.5. Scope Verification and Scope Change Control



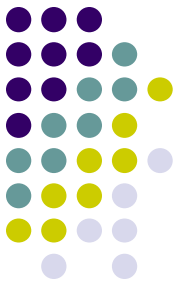
- It is very difficult to create a good scope statement and WBS for a project
- It is even more difficult to verify project scope and minimize scope changes
- Many IT projects suffer from scope creep and poor scope verification

* Using Software to Assist in Project Scope Management



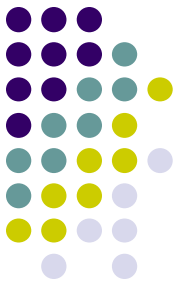
- Word-processing software helps create several scope-related documents
- Spreadsheets help to perform financial calculations, create weighted scoring models, and develop charts and graphs
- Communication software like e-mail and the Web help clarify and communicate scope information
- Project management software helps in creating a WBS, the basis for tasks on a Gantt chart
- Specialized software is available for applying the managing requirements, and so on

Questions

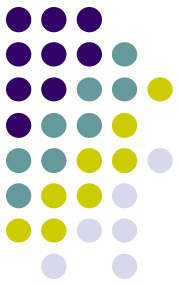


- 1) What is project scope management?
- 2) Project initiation:
 - Strategic planning
 - Method for selecting projects
- 3) Scope definition and WBS
 - Approaches to Developing WBSs
 - Basic Principles for Creating WBSs

លំហាត់



ឧបមាគេត្រូវការទិញម៉ាស៊ីនមួយគ្រឿងក្នុងតម្លៃ \$55,000 ដើម្បី
យកមកអនុវត្តគម្រោងមួយ។ តម្លៃនៃម៉ាស៊ីននេះ គេត្រូវបង់រំលូស
ជាបន្តបន្ទាប់ក្នុងរយៈពេលបួនឆ្នាំ។ ក្នុងរយៈពេលបួនឆ្នាំនេះ
ម៉ាស៊ីននឹងផលិតបានជាផលិតផល និងផ្តល់បានជាប្រាក់ចំណូល
ត្រឡប់មកវិញជាបន្តបន្ទាប់ដែរ។ ក្នុងតារាងខាងក្រោមនេះ ជា
ជម្រើសពីរក្នុងការបង់រំលូស និងប្រាក់ចំណូលបានត្រឡប់មកវិញ។
ចូរធ្វើការសម្រេចចិត្ត ថាតើគួរជ្រើសរើសយក ជម្រើស A ឬជម្រើស
B តាមរបៀប NPV? (ចូរមើលតារាងខាងក្រោម)



<i>Discount Rate 10%</i>				
Year	1	2	3	4
<i>Option A</i>				
Cost	\$25,000	\$15,000	\$10,000	\$5,000
Benefit	\$20,000	\$25,000	\$25,000	\$30,000
<i>Option B</i>				
Cost	\$20,000	\$15,000	\$10,000	\$10,000
Benefit	\$15,000	\$25,000	\$30,000	\$30,000