

Software Project Management

Week – 14

Today's Lecture

- Project Quality Management
- Project Risk Management
- Project Procurement Management
- Project Human Resource Management
- Project Communication Management

Slides derived from Ian Somerville, PMP Prep and B Boehm

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Software Project Quality Management

- SQE covered
 - ISO 9001:2008
 - CMMI
- We leave this as already covered

Today's Lecture

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- Project Human Resource Management

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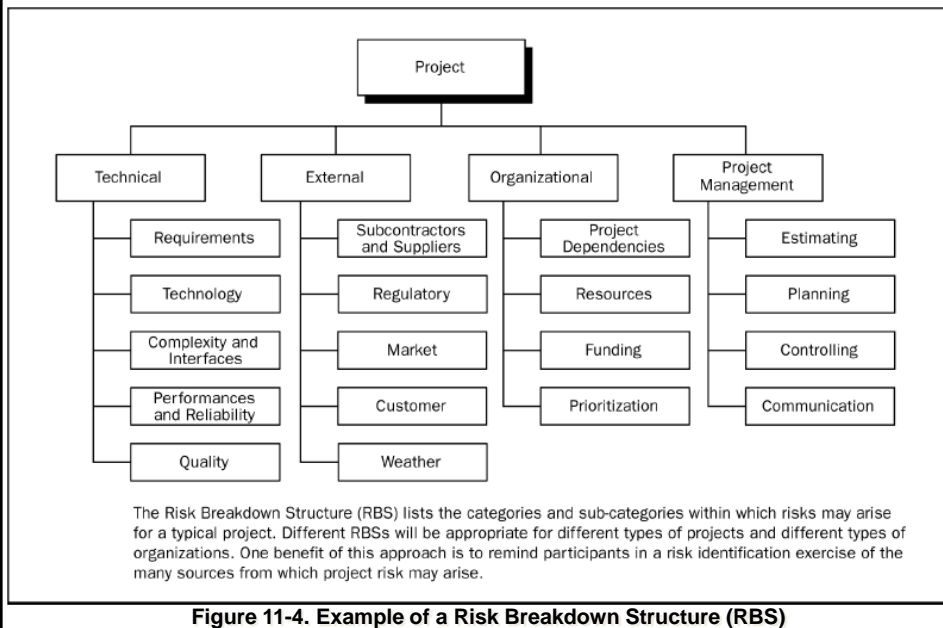
Project Risk Management

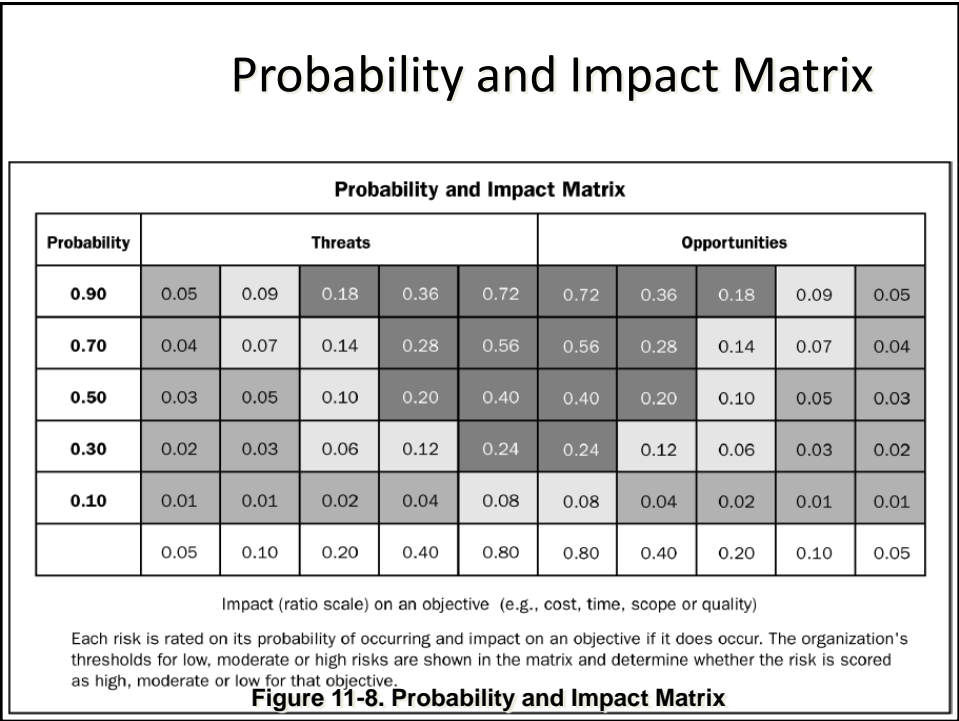
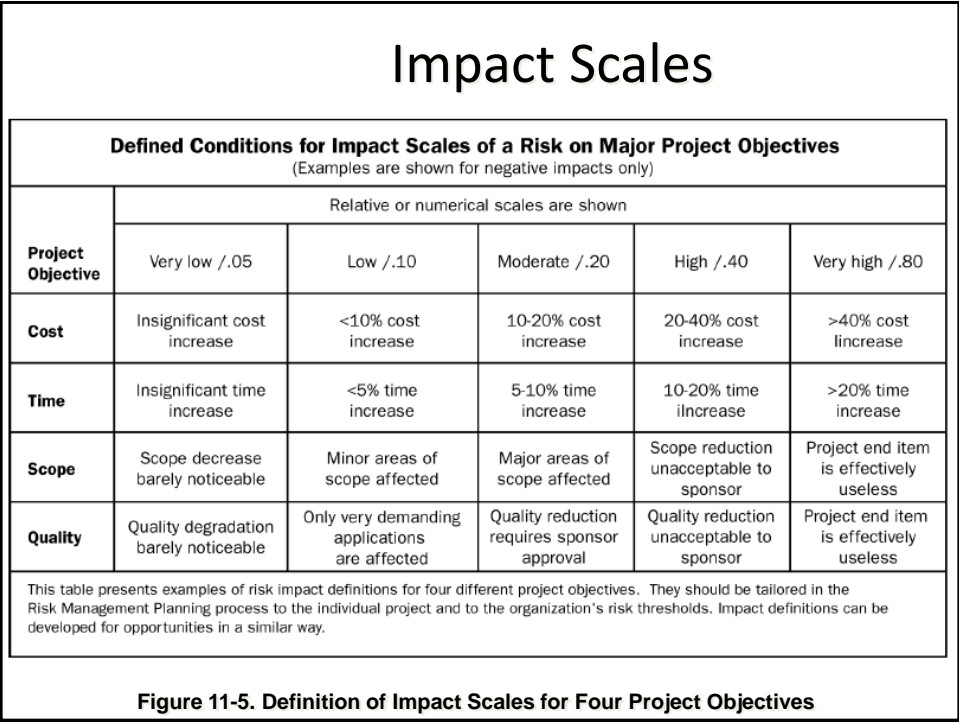
- Project Risk Management includes the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project; most of these processes are updated throughout the project.
- The objectives of Project Risk Management are to increase the probability and impact of positive events, and decrease the probability and impact of events adverse to the project.

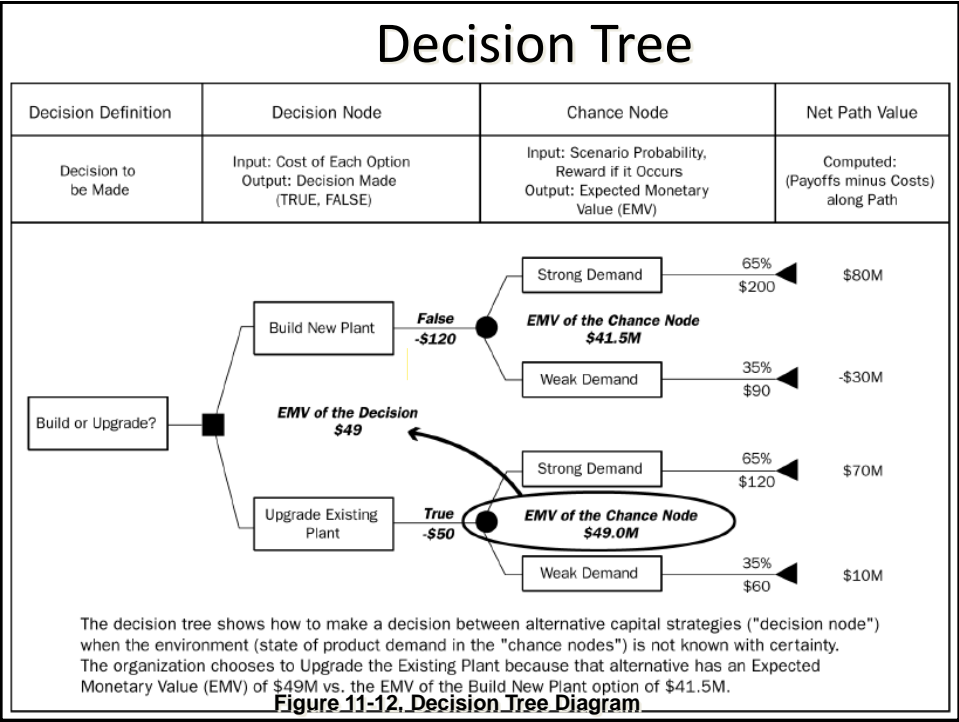
Project Risk Management Processes

- **11.1 Risk Management Planning** – deciding how to approach, plan, and execute the risk management activities for a project.
- **11.2 Risk Identification** – determining which risks might affect the project and documenting their characteristics.
- **11.3 Qualitative Risk Analysis** – prioritizing risks for subsequent further analysis or action by assessing and combining their probability of occurrence and impact.
- **11.4 Quantitative Risk Analysis** – numerically analyzing the effect on overall project objectives of identified risks.
- **11.5 Risk Response Planning** – developing options and actions to enhance opportunities, and to reduce threats to project objectives.
- **11.6 Risk Monitoring and Control** – tracking identified risks, monitoring residual risks, identifying new risks, executing risk response plans, and evaluating their effectiveness throughout the project life cycle.

Risk Breakdown Structure







Response Strategies for Positive Risks

- Risk exploitation
- Risk sharing
- Risk enhancement
- Risk acceptance

Monitoring/Controlling Process Group:

Controlling Risks

- Responding to risk events and ensuring that risk awareness is an ongoing activity
 - **Workarounds**
- Main outputs of risk control are:
 - Work performance information
 - change requests
 - updates to the project management plan, other project documents, and organizational process assets

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Results of Good Project Risk Management

- Unlike crisis management, good project risk management often goes unnoticed
- Well-run projects appear to be almost effortless, but a lot of work goes into running a project well
- Project managers should strive to make their jobs look easy to reflect the results of well-run projects

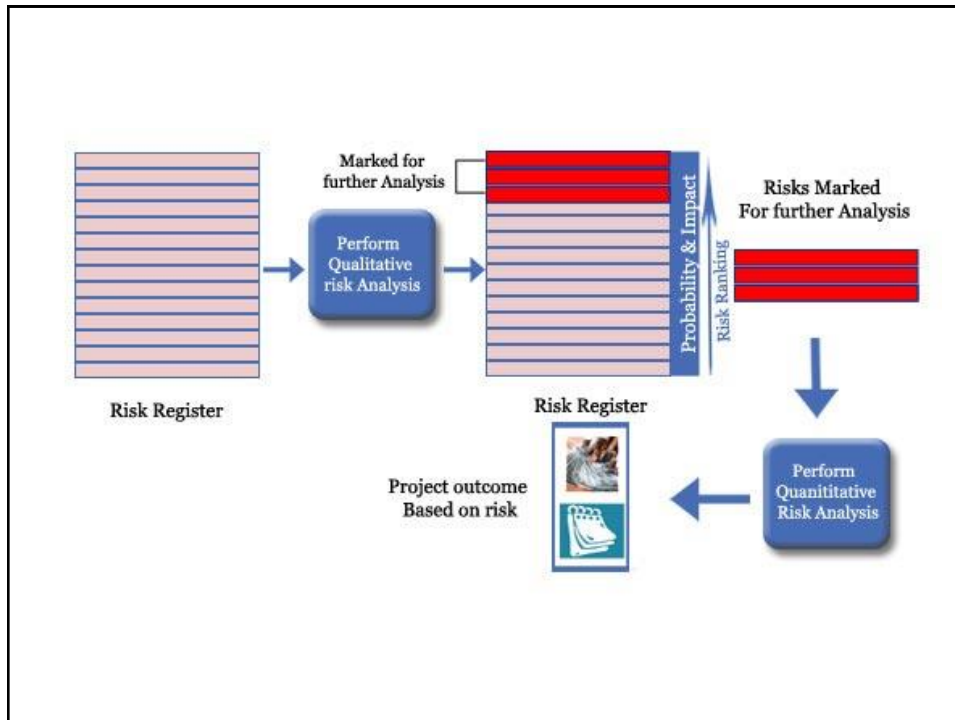
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Risk Analysis - Factors

- Risk Exposure
- Confidence of the risk assessment
- Compound Risks
- The number of Risks
- Cost of Action
 - Risk Reduction Leverage – Cost Benefit

$$RRL = \frac{RE_{before} - RE_{after}}{risk\ reduction\ cost}$$

SOFTWARE RISK MANAGEMENT



What is Risk?

- We are in the process of integration
 - and we found out that modules A and B just can't talk to each other (They were off-the-shelf COTS)
- We've got too much tied into A and B to change
- Our best solution is to build wrappers around A and B to get them to talk via CORBA
- This will take additional 3 months and \$300K
- It will also delay integration and delivery by at least 3 months
- **Question – Is this a risk?**
 - No, it is a problem
 - Being dealt with reactively
 - Risks involve uncertainties
 - And can be dealt with pro-actively
 - Earlier, this problem was a risk

Earlier, This Problem Was A Risk

- A and B are our strongest COTS choices
 - But there is **some chance** that they can't talk to each other
 - **Probability of loss P(L) or occurrence**
- If we commit to using A and B
 - And we find out in integration that they can't talk to each other
 - We'll add more cost and delay delivery by at least 3 months
 - **Size of loss S(L)**
- **We have a risk exposure of**

$$RE = P(L) * S(L)$$

How Can Risk Management Help You Deal With Risks?

- Risk avoidance
 - This technique usually involves **developing an alternative strategy** that is more likely to succeed, but is usually linked to a higher cost.
 - A very common risk elimination technique is to use proven and existing technologies rather than adopting new technologies, although they could lead to better performance or lower costs.
 - A project team can choose a supplier with a proven track record instead of a new supplier that offers significant price incentives; this, in order to avoid the risk of working with a new supplier that is not known whether it is reliable or not.
 - **Eliminating a risk is definitely the best technique you can use.** If the project manager can avoid it, surely he will not have negative impacts derived from it on the project.

How Can Risk Management Help You Deal With Risks?

- Risk transfer
 - The most common example of risk transfer is insurance.
 - When an individual or entity purchases insurance, they are insuring against financial risks.
 - For example, an individual who purchases car insurance is acquiring financial protection against physical damage or bodily harm that can result from traffic incidents.

How Can Risk Management Help You Deal With Risks?

- Risk reduction
 - **Risk reduction** represents an investment in order to **reduce the risk on a project.**
 - On international projects, for example, companies will often buy a guaranteed exchange rate in order to reduce the risk associated with exchange rate fluctuations.
 - A project manager can hire an expert to review technical plans or cost estimates on a project in order to increase confidence in that plan.
 - Assigning high-risk management activities to highly qualified project personnel is another risk reduction method.
 - Experts who run a high-risk business can often anticipate problems and find solution.

How Can Risk Management Help You Deal With Risks?

- **Risk acceptance**
 - This technique involves **accepting the risk** and collaborating with others in order to share responsibility for risky activities.
 - Many organizations working on international projects will reduce the political, legal, and employment risks associated with international projects by developing a joint venture with a company based in a particular country, for example.
 - Partnering with another company to share the risk associated with a part of the project is advantageous when the other company has experience that the project team does not have. If a risk event occurs, **the partner company absorbs all or part of the negative impact of the event.**

Risk Management Strategies: Buying Information

- Let's spend \$30K and 2 weeks prototyping the integration of A and B
- This will buy information on the magnitude of $P(L)$ and $S(L)$
- Risk Exposure = $RE = P(L) * S(L)$
- If $RE = P(L) * S(L)$ is small, we'll accept and monitor the risk
- If RE is large, we'll use one/some of the other strategies

Is Risk Management Fundamentally Negative?

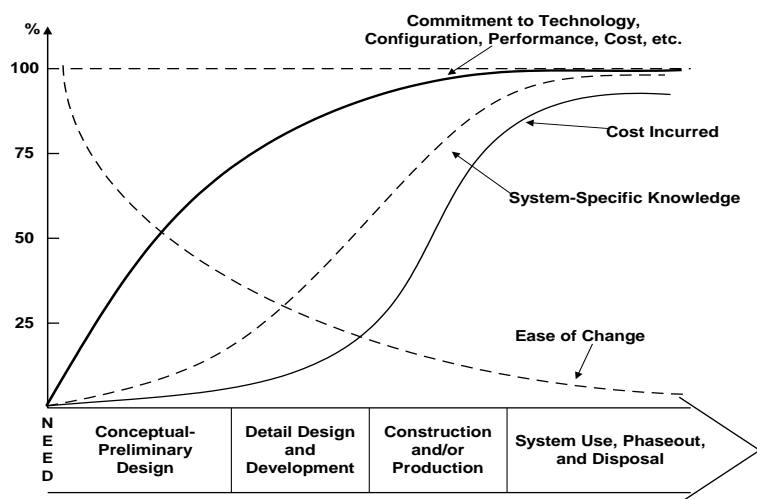
- It usually is, but it shouldn't be
- As illustrated in the Risk Acceptance strategy, it is equivalent to Opportunity Management

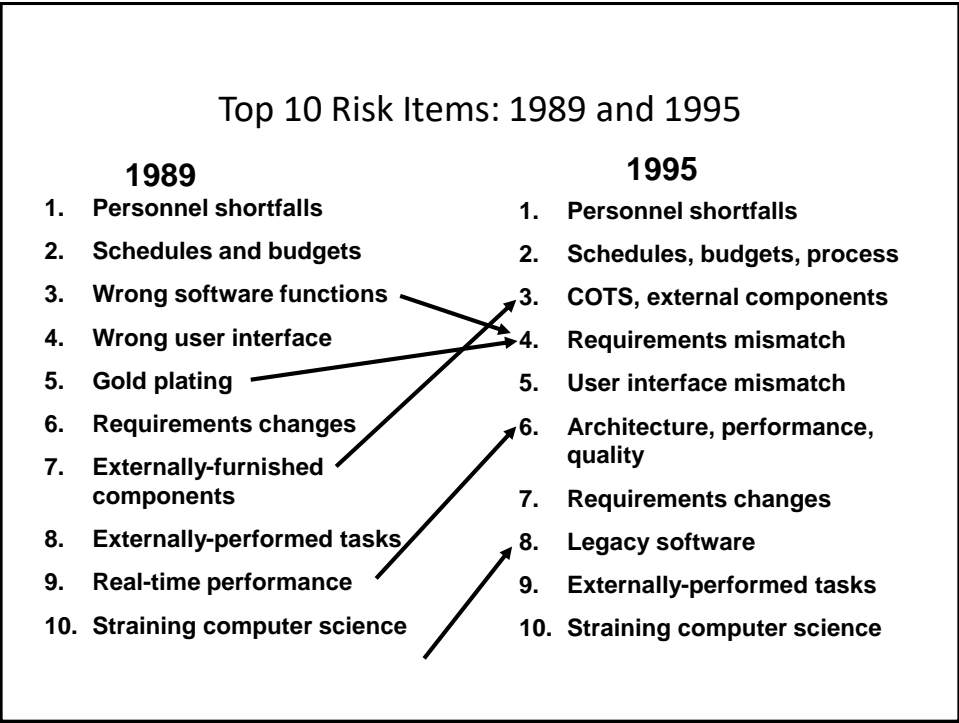
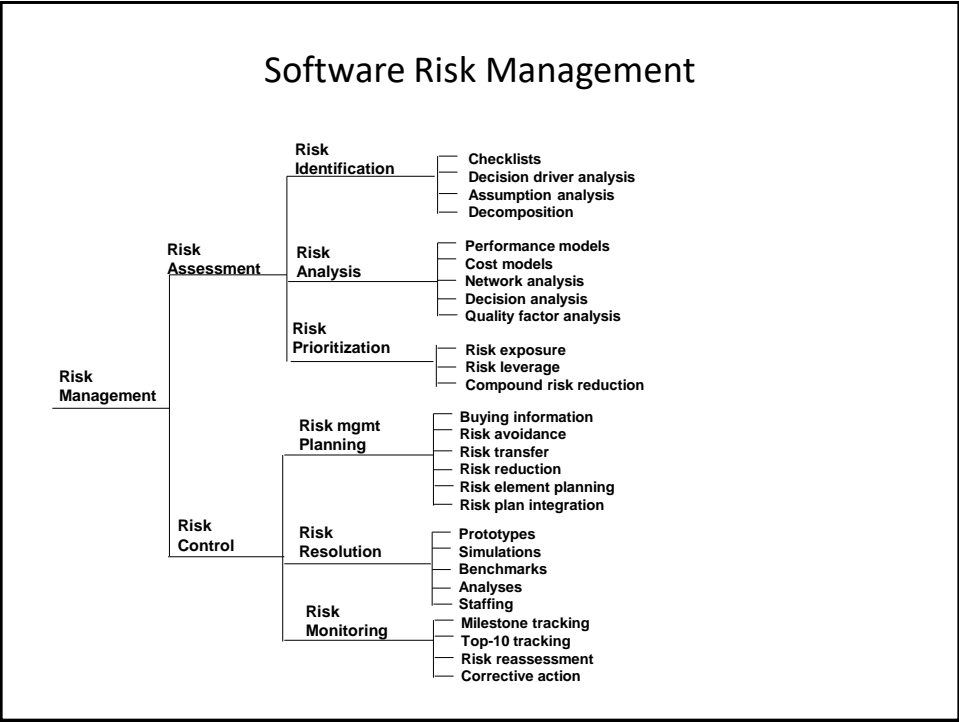
$$\text{Opportunity Exposure OE} = P(\text{Gain}) * S(\text{Gain})$$

$$= \text{Expected Value}$$
- Buying information and the other Risk Strategies have their Opportunity counterparts
 - P(Gain): Are we likely to get there before the competition?
 - S(Gain): How big is the market for the solution?

Risk of Delaying Risk Management: Systems

—Blanchard- Fabrycky, 1998





Risk Exposure Example

Risk Exposure, RE
Risk Exposure calculates the effective current cost of a risk, and can be used to prioritize risks that require countermeasures.

$Risk\ Exposure, RE = Probability\ of\ risk\ occurring \times Total\ loss\ if\ risk\ occurs$

$RE = 2\% \times 80K = \frac{2}{100} \times 80000 = 1600$

Risk	Probability of occurring	Total loss if it occurs	Risk Exposure
Product recall situation	2%	80K	1600
Significant product rejection	0.1%	1000K	1000
Competitive strike	10%	25K	2500

Highest Risk Exposure indicates most serious risk

Risk Reduction Leverage Example

Risk Reduction Leverage calculates a value for the 'return on investment' for a countermeasure and can thus be used to prioritize possible countermeasures.

$Risk\ Reduction\ Leverage\ of\ a\ countermeasure, RRL = \frac{Reduction\ in\ Risk\ Exposure}{Cost\ of\ the\ countermeasure}$

$RRL = \frac{2500 - 150}{40000} = 0.059$

Risk		Probability of occurring	Total loss if it occurs	Risk Exposure	
Competitive strike		10%	25K	2500	
Countermeasure	Total cost	New risk probability	New total loss	New RE	RRL
Advertising campaign	40K	3%	5K	150	0.059
Price promotions	30K	5%	10K	500	0.067
Simultaneous launch	10K	8%	15K	1200	0.13

Highest RRL indicates most cost-effective countermeasure

Risk Management Plans

For Each Risk Item, Answer the Following Questions:

1. Why?
Risk Item Importance, Relation to Project Objectives
2. What, When?
Risk Resolution Deliverables, Milestones, Activity Nets
3. Who, Where?
Responsibilities, Organization
4. How?
Approach (Prototypes, Surveys, Models, ...)
5. How Much?
Resources (Budget, Schedule, Key Personnel)

Today's Lecture

- Project Quality Management
- Project Risk Management
- Project Procurement Management
- Project Human Resource Management

Project Procurement Management

- **Procurement** means acquiring goods and/or services from an outside source
- Other terms include purchasing and outsourcing
- Experts predict that global spending on computer software and services will continue to grow
- People continue to debate whether offshore outsourcing helps their own country or not

Contracting in terms of Software Industry

- Company A intends to get a software
- Companies X, Y and Z are interested in offering development/COTS
- We do
- **OUTSOURCING**

Debates on Outsourcing

- Some companies, such as Wal-Mart, prefer to do no outsourcing at all, while others do a lot of outsourcing
- Most organizations do some form of outsourcing to meet their IT needs and spend most money within their own country
- The U.S. temporary workforce continues to grow as people work for temporary job agencies so they can more easily move from company to company

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Why Outsource?

- To reduce both fixed and recurrent costs
- To allow the client organization to focus on its core business
- To access skills and technologies
- To provide flexibility
- To increase accountability

Contracts

- A **contract** is a mutually binding agreement that obligates the seller to provide the specified products or services and obligates the buyer to pay for them
- Contracts can clarify responsibilities and sharpen focus on key deliverables of a project
- Because contracts are legally binding, there is more accountability for delivering the work as stated in the contract
- A recent trend in outsourcing is the increasing size of contracts

What Went Wrong?

- Companies often change their minds about procurement; for example, JPMorgan Chase announced a seven-year, \$5 billion deal to outsource much of its data processing to IBM, but they revoked the contract less than two years into its existence because the procurement plan no longer fit their business strategy
- The Australian Computer Society says sending work offshore may lower the number of students entering IT courses, deplete the number of skilled IT professionals, and diminish the nation's strategic technology capability
- Procurement can also cause security problems, including the protection of intellectual property, integrity of data, and the reliability of infrastructure in offshore locations

Project Procurement Management Processes

- **Project procurement management:** acquiring goods and services for a project from outside the performing organization
- Processes include:
 - **Planning purchases and acquisitions:** determining what to procure, when, and how
 - **Planning contracting:** describing requirements for the products or services desired from the procurement and identifying potential sources or **sellers** (contractors, suppliers, or providers who provide goods and services to other organizations)

Project Procurement Management Processes

- **Requesting seller responses:** obtaining information, quotes, bids, offers, or proposals from sellers, as appropriate
- **Selecting sellers:** choosing from among potential suppliers through a process of evaluating potential sellers and negotiating the contract
- **Administering the contract:** managing the relationship with the selected seller
- **Closing the contract:** completing and settling each contract, including resolving any open items

What Went Right?

- Several organizations, such as The Boots Company PLC in England, outsource their IT services to save money compared with the cost of running the systems themselves
- Carefully planning procurement can also save millions of dollars, as the U.S. Air Force did by using a unit pricing strategy for a large office automation project

Tools and Techniques for Planning Purchases and Acquisitions

- **Make-or-buy analysis:** general management technique used to determine whether an organization should make or perform a particular product or service inside the organization or buy from someone else
- Often involves financial analysis
- Experts, both internal and external, can provide valuable inputs in procurement decisions

Make-or-Buy Example

- Assume you can lease an item you need for a project for \$800/day; to purchase the item, the cost is \$12,000 plus a daily operational cost of \$400/day
- How long will it take for the purchase cost to be the same as the lease cost?

Make-or Buy Solution

- Set up an equation so both options, purchase and lease, are equal
- In this example, use the following equation; let d be the number of days to use the item:

$$\$12,000 + \$400d = \$800d$$

Subtracting $\$400d$ from both sides, you get:

$$\$12,000 = \$400d$$

Dividing both sides by $\$400$, you get:

$$d = 30$$
- If you need the item for more than 30 days, it is more economical to purchase it

Types of Contracts – In General

- Different types of contracts can be used in different situations
 - **Fixed price or lump sum** contracts: involve a fixed total price for a well-defined product or service
 - **Cost reimbursable** contracts: involve payment to the seller for direct and indirect costs
 - **Time and material** contracts: hybrid of both fixed price and cost reimbursable contracts, often used by consultants
 - **Unit price** contracts: require the buyer to pay the seller a predetermined amount per unit of service
- A single contract can actually include all four of these categories, if it makes sense for that particular procurement
- **Software Industry specific?**

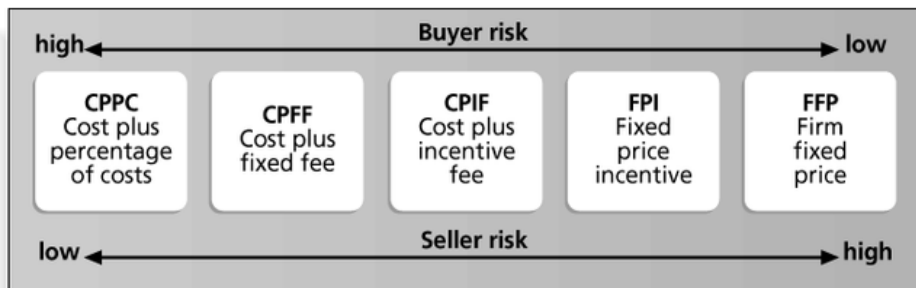
Point of Total Assumption

- The **Point of Total Assumption (PTA)** is the cost at which the contractor assumes total responsibility for each additional dollar of contract cost
- Contractors do not want to reach the point of total assumption because it hurts them financially, so they have an incentive to prevent cost overruns

Cost Reimbursable Contracts

- **Cost plus incentive fee (CPIF):** the buyer pays the supplier for allowable performance costs plus a predetermined fee and an incentive bonus
- **Cost plus fixed fee (CPFF):** the buyer pays the supplier for allowable performance costs plus a fixed fee payment usually based on a percentage of estimated costs
- **Cost plus percentage of costs (CPPC):** the buyer pays the supplier for allowable performance costs plus a predetermined percentage based on total costs

Figure 12-2: Contract Types Versus Risk



Contract Clauses

- Contracts should include specific clauses to take into account issues unique to the project
- Can require various educational or work experience for different pay rights
- A **termination clause** is a contract clause that allows the buyer or supplier to end the contract

Procurement Management Plan

- Describes how the procurement processes will be managed, from developing documentation for making outside purchases or acquisitions to contract closure
- Content varies based on project needs

Contract Statement of Work (SOW)

- A **statement of work** is a description of the work required for the procurement
- If a SOW is used as part of a contract to describe only the work required for that particular contract, it is called a **contract statement of work**
- A SOW is a type of scope statement
- A good SOW gives bidders a better understanding of the buyer's expectations

Statement of Work (SOW) Template

- I. **Scope of Work:** Describe the work to be done to detail. Specify the hardware and software involved and the exact nature of the work.
- II. **Location of Work:** Describe where the work must be performed. Specify the location of hardware and software and where the people must perform the work
- III. **Period of Performance:** Specify when the work is expected to start and end, working hours, number of hours that can be billed per week, where the work must be performed, and related schedule information.
- IV. **Deliverables Schedule:** List specific deliverables, describe them in detail, and specify when they are due.
- V. **Applicable Standards:** Specify any company or industry-specific standards that are relevant to performing the work.
- VI. **Acceptance Criteria:** Describe how the buyer organization will determine if the work is acceptable.
- VII. **Special Requirements:** Specify any special requirements such as hardware or software certifications, minimum degree or experience level of personnel, travel requirements, and so on.

Request for Proposal (RFP) Template

- I. Purpose of RFP
- II. Organization's Background
- III. Basic Requirements
- IV. Hardware and Software Environment
- V. Description of RFP Process
- VI. Statement of Work and Schedule Information
- VII. Possible Appendices
 - A. Current System Overview
 - B. System Requirements
 - C. Volume and Size Data
 - D. Required Contents of Vendor's Response to RFP
 - E. Sample Contract

Evaluation Criteria

- It's important to prepare some form of evaluation criteria, preferably before issuing a formal RFP or RFQ
- Beware of proposals that look good on paper; be sure to evaluate factors, such as past performance and management approach
- Can require a technical presentation as part of a proposal

Requesting Seller Responses

- Deciding whom to ask to do the work, sending appropriate documentation to potential sellers, and obtaining proposals or bids
- Organizations can advertise to procure goods and services in several ways
 - Approaching the preferred vendor
 - Approaching several potential vendors
 - Advertising to anyone interested
- A bidders' conference can help clarify the buyer's expectations

Selecting Sellers

- Also called source selection
- Involves:
 - Evaluating proposals or bids from sellers
 - Choosing the best one
 - Negotiating the contract
 - Awarding the contract

Figure 12-5: Sample Proposal Evaluation Sheet

		Proposal 1		Proposal 2		Proposal 3	
Criteria	Weight	Rating	Score	Rating	Score	Rating	Score
Technical Approach	30%						
Management Approach	30%						
Past Performance	20%						
Price	20%						
Total Score	100%						

Tools to Assist in Contract Closure

- Procurement audits identify lessons learned in the procurement process
- A records management system provides the ability to easily organize, find, and archive procurement-related documents

Using Software to assist in Project Procurement Management

- Word-processing software helps write proposals and contracts, spreadsheets help evaluate suppliers, databases help track suppliers, and presentation software helps present procurement-related information
- E-procurement software does many procurement functions electronically
- Organizations also use other Internet tools to find information on suppliers or auction goods and services

Summary

- Project procurement management involves acquiring goods and services for a project from outside the performing organization
- Processes include:
 - Planning purchases and acquisitions
 - Planning contracting
 - Requesting seller responses
 - Selecting sellers
 - Administering contracts
 - Closing contracts

Software Project Management

Lecture 12 – (1)

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Today's Lecture

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ORGANIZATIONAL STRUCTURES

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Organizational Influences

- Projects are typically part of an organization that is larger than the project.
- Even when the project is external (joint ventures, partnering), the project will still be influenced by the organization or organizations that initiated it.
- The maturity of the organization with respect to its project management system, culture, style, organizational structure and project management office can also influence the project.

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Organizational Systems

- Project-based organizations are those whose operations consist primarily of projects. These organizations fall into two categories:
 - Organizations that derive their revenue primarily from performing projects for others under contract.
 - Organizations that have adopted management by projects
- Non-project-based organizations lack management systems designed to support project needs efficiently and effectively.
- The absence of project-oriented systems usually makes project management more difficult.
- Departments or subunits may operate as project-based organizations with systems to support them.

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Organizational Cultures & Styles

- Most organizations have developed unique and describable cultures reflected in numerous factors like:
 - Shared values, norms, beliefs, and expectations
 - Policies and procedures
 - View of authority relationships
 - Work ethic and work hours.

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Organizational Cultures & Styles

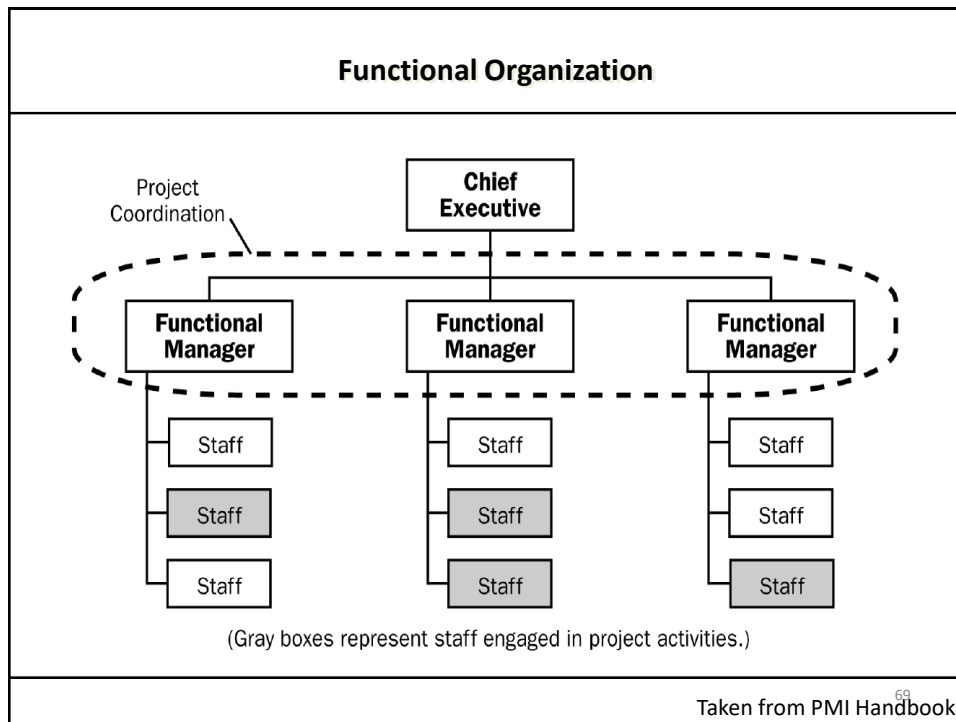
- Organizational cultures often have a direct influence on the project.
 - A team proposing an unusual or high-risk approach is more likely to secure approval in an aggressive or entrepreneurial organization
 - A project manager with a highly participative style is apt to encounter problems in a rigidly hierarchical organization, while a project manager with an authoritarian style will be equally challenged in a participative organization.

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Figure 2-6. Organizational Structure Influences on Projects

<div>Organization Structure</div> <div>Project Characteristics</div>	Functional	Matrix			Projectized
		Weak Matrix	Balanced Matrix	Strong Matrix	
Project Manager's Authority	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Resource Availability	Little or None	Limited	Low to Moderate	Moderate to High	High to Almost Total
Who controls the project budget	Functional Manager	Functional Manager	Mixed	Project Manager	Project Manager
Project Manager's Role	Part-time	Part-time	Full-time	Full-time	Full-time
Project Management Administrative Staff	Part-time	Part-time	Part-time	Full-time	Full-time

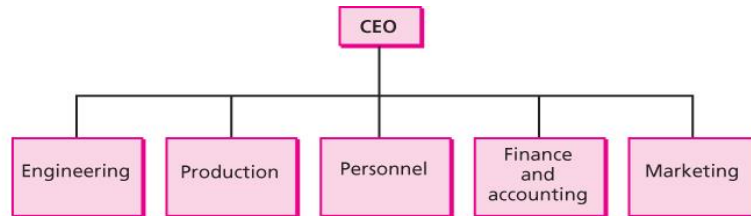
Taken from PMI Handbook



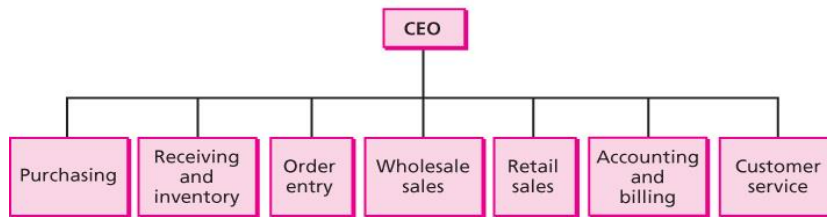
Functional Organizational Structure

- A **functional organizational structure** is one on which the tasks, people, and technologies necessary to do the work of the business are divided into separate “functional” groups (such as marketing, operations, and finance)
- Such organizations have increasingly formal procedures for coordinating and integrating their activities to provide the business’s products and services

Example: Functional Organization Structures



A process-oriented functional structure (an electronics distributor):



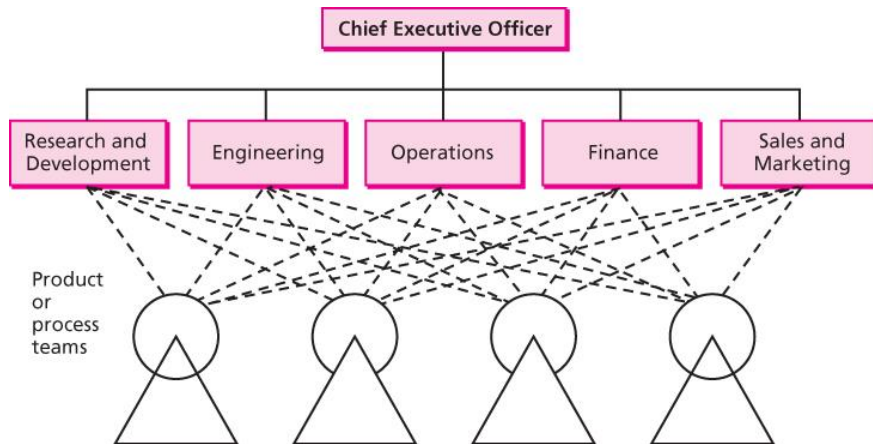
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Specialization: Product-Team Structure

- The **product-team structure** seeks to simplify and amplify the focus of resources on a narrow but strategically important product, project, market, customer, or innovation
- The product-team structure assigns functional managers and specialists to a new product, project, or process team that is empowered to make major decisions about their product

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The Product-Team Structure



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Projectized Structure

- Team members are collocated
- Project manager has independence and authority
- Organizational units are departments where
 - Either groups report directly to PM
 - Or provide support and services
- Each PM can have staff with same skillset
- Example could be
 - Bahria University where each HOD has
 - Staff who can teach software project management
 - Support Staff
 - i.e., overlapping of same skills possible

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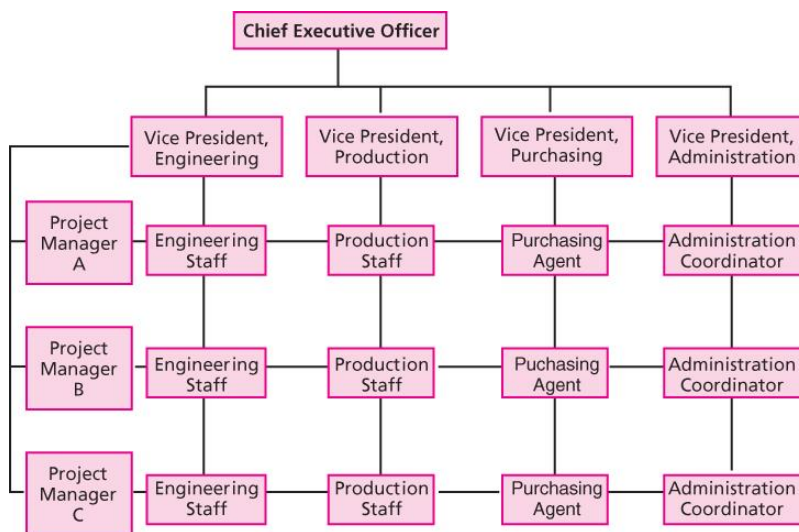
Matrix Organizational Structure



- The **matrix organizational structure** is one in which
 - functional and staff personnel are assigned to both a basic functional area and to a project or product manager
 - This means two reporting officers per functional or staff personnel
- The matrix form is intended to make the best use of talented people within a firm
- by combining the advantages of functional specialization and product-project specialization

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Matrix Organizational Structure



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From Weak to Strong Matrix

- Weak matrix
 - maintains characteristics of functional organizations
 - PM plays role of a coordinator than manager
- Strong matrix
 - maintains characteristics of projectized organizations
 - PM has considerable authority

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Other Organizational Structures

- Comparative view
- Structures
 - Simple organizations
 - Divisional organizations
 - Holding Company

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Simple Organizational Structure

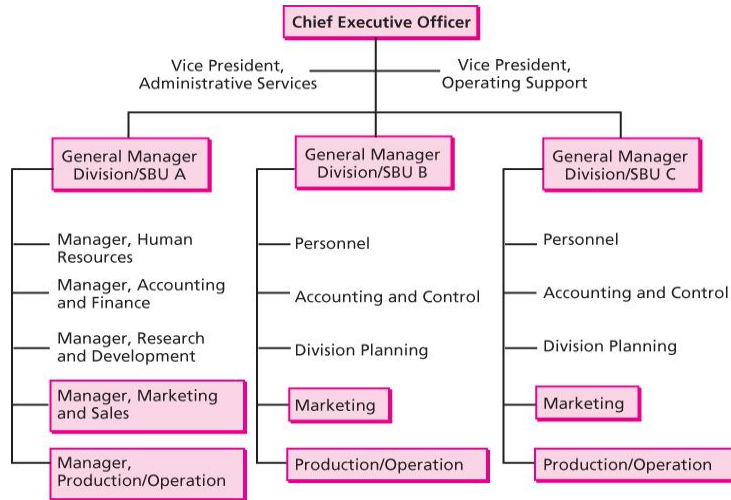
- A **simple organizational structure** is one where there is an owner and a few employees and where the arrangement of tasks, responsibilities, and communication is highly informal and accomplished through direct supervision
- This type of structure can be very demanding on the owner-manager
- Most businesses in this country and around the world are of this type

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Divisional Structure

- A **divisional organizational structure** is one in which a set of relatively autonomous units, or divisions, are governed by a central corporate office but where each operating division has its own functional specialists who provide products or services different from those of other divisions
- This expedites decision making in response to varied competitive environments
- The division usually is given profit responsibility

Divisional Organization Structure



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Strategic Business Unit

- The **strategic business unit (SBU)** is an adaptation of the divisional structure whereby various divisions or parts of divisions are grouped together based on some common strategic elements, usually linked to distinct product/market differences
- The advantages and disadvantages of the SBU form are very similar to those identified for divisional structures

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Outsourcing—Creating a Modular Organization

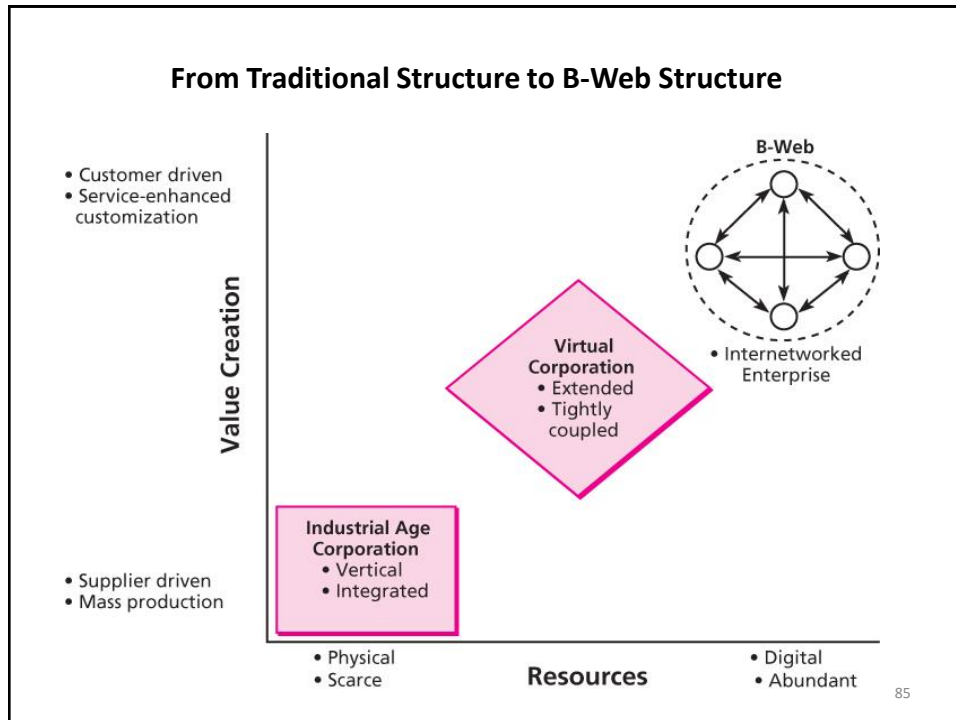
- **Outsourcing** is simply obtaining work previously done by employees inside the companies from sources outside the company
- A **modular organization** provides products or services using different, self-contained specialists or companies brought together—outsourced—to contribute their primary or support activity to result in a successful outcome
- **Business process outsourcing (BPO)** is the most rapidly growing segment of the outsourcing services industry worldwide

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Types of Boundaries

- **Horizontal boundaries**—between different departments or functions in a firm.
- **Vertical boundaries**—between operations and management, and levels of management, between “corporate” and “division”
- **Geographic boundaries**—between different physical locations; between different countries or regions of the world and between cultures
- **External interface boundaries**—between a company and its customers, suppliers, partners, regulators, and competitors

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Examples

- Hot desks
- Virtual offices
- Virtual presence (you place an order in Pakistan through call center and get delivery from Germany)
- ELance, Rent-a-coder, OLX, ...

Organizational structure suitable to software industry

- We studied
 - Simple organizations
 - Divisional organizations
 - Holding Company
 - Functional Organization
 - Projectized Organization
 - Weak Matrix Organization
 - Balanced Matrix Organization
 - Strong Matrix Organization
 - Composite Organization
- For a software house, what is the best suited org. structure?

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