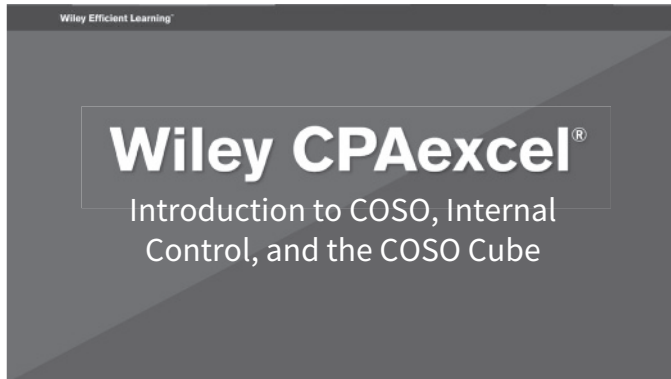
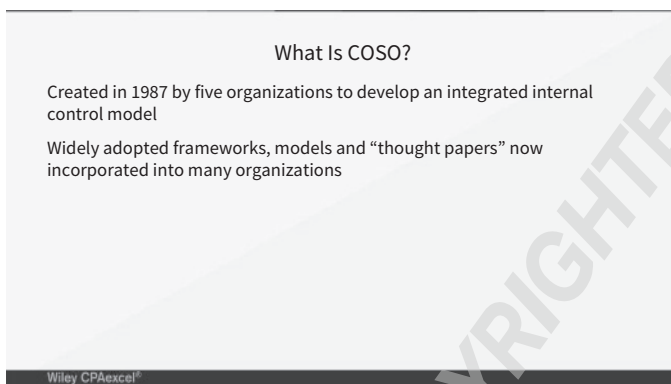


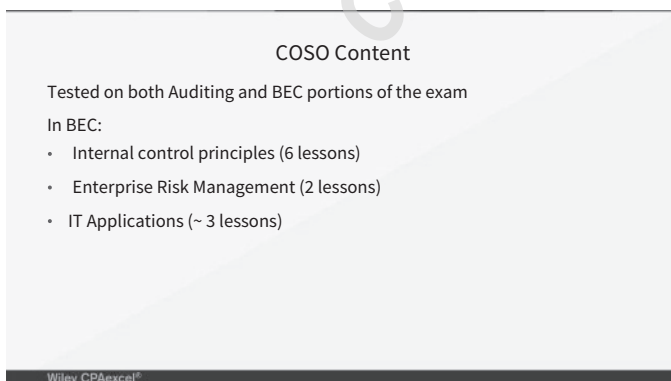
Corporate Governance

Internal Control Frameworks

Introduction to COSO, Internal Control, and the COSO Cube







COSO Integrated Framework for Internal Control Model

Internal control

- What is it?
- Why do we have it?
- Where do we have it?

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Original (1992) COSO “Cube”

Three dimensions

- **What** is it? Vertical: five components of control system
- **Why** do we have it? Horizontal: three control objectives
- **Where** do we have it? Depth: units and activities to control



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Why Do We Have Internal Control? Three Control Objectives

From Types and Principles of Accounting Control lesson:

1. Effectiveness and efficiency of operations
2. Reliability of financial reporting
3. Compliance with laws and regulations

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Why Do We Have Internal Control?

Four Types of Reporting

- Financial/Nonfinancial
- Internal/External

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Why Do We Have Internal Control? Reporting: Four Types

	Financial	Nonfinancial	Characteristics
External	External Financial Reporting Annual Financial Statements Interim Financial Statements Earning Release	External Nonfinancial Reporting Internal Control Report Sustainability Report Supply Chain/ Custody of Assets	Used to meet external stakeholder and regulatory requirements Prepared in accordance with external standards May be required by regulators, contracts, agreements
Internal	Internal Financial Reporting Divisional Financial Reporting Cash Flow/Budget Bank Covenant Calculations	Internal Nonfinancial Reporting Staff/Asset Utilization Customer Satisfaction Surveys Key Risk Indicator Dashboards Board Reporting	Used in managing the business and decision making Established by management and board

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What Do We Control?

Units and Activities to Control → Vague in COSO integrated framework

Clarified in the ERM model (in upcoming Wiley CPAexcel® lessons)

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Lesson Quiz: Understanding



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Quiz: Understanding

Define, according to the COSO internal control framework, "control environment."

- One of five components of internal control.
- Includes management's philosophy toward controls, organizational structure, system of authority and responsibility, personnel practices, and policies and procedures.
- The core or foundation of any system of internal control.

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Quiz: Understanding

Define, according to the COSO internal control framework - "risk assessment."

- One of five components of internal control.
- Process of identifying, analyzing, and managing risks.

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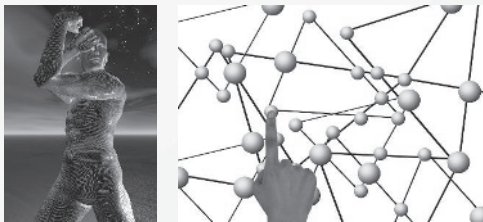
Quiz: Understanding

Define, according to the COSO internal control framework- "monitoring."

- One of five components of internal control.
- Ensures ongoing reliability of information and control processes by monitoring and testing the control system.

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Lesson Quiz: Application



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Application: Quiz

Mee and Bobbee McGee Eetravel Co. calculates a number of financial ratios to be sure that they are in compliance with their loan contract. This is an example of:

- A. External financial reporting
- B. External nonfinancial reporting
- C. Internal financial reporting
- D. Internal nonfinancial reporting

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Application: Quiz

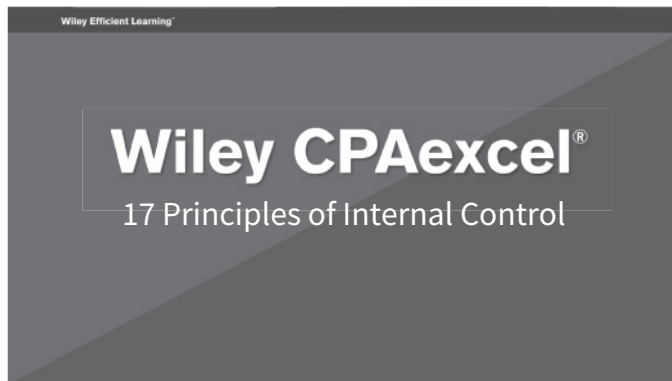
- A. External financial reporting
 - This answer is incorrect. This is an internal report, financial report.
- B. External nonfinancial reporting
 - This answer is incorrect. This is an internal report, financial report.
- C. Internal financial reporting
 - This answer is correct. This is an internal report, financial report.
- D. Internal nonfinancial reporting
 - This answer is incorrect. This is an internal report, financial report.

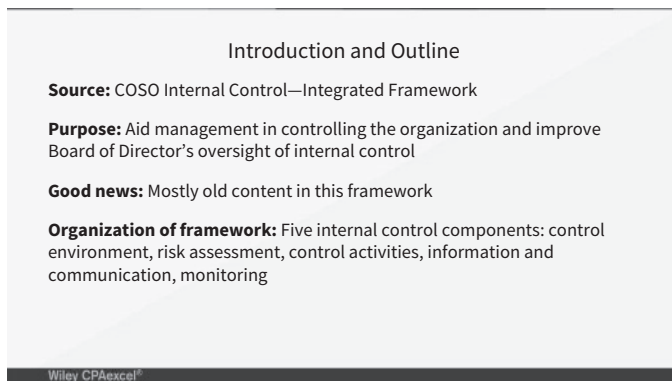
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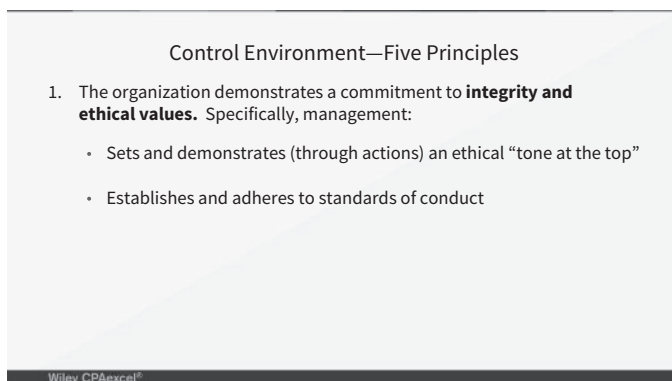
The lessons about COSO standards, frameworks, and thought papers are based on documents from the Committee of Sponsoring Organizations of the Treadway Commission (COSO)
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17 Principles of Internal Control







Control Environment—Five Principles

2. The **Board of Directors** demonstrates independence of management, and oversees the development and monitoring of internal control including:
 - Clear Board of Directors oversight responsibilities and independence
 - Evidence and application of relevant expertise

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Control Environment—Five Principles

3. **Management** establishes, with board oversight, structures, reporting lines, and appropriate authorities and responsibilities to achieve objectives.

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Control Environment—Five Principles

4. **Competence.** The organization demonstrates commitment to attract, develop, and retain competent individuals including:
 - Establishing policies and procedures to attract, develop, and retain competent individuals
 - Assessing competencies, creating development plans to achieve needed skills and competencies, and addressing deficiencies in skills and competencies through training, hiring or outsourcing
 - Planning and preparing for turnover and succession

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Control Environment—Five Principles

5. **Accountability.** The organization holds individuals accountable for their internal control responsibilities including:
- Enforcement of accountability through structures, authorities, and responsibilities
 - Establishing and evaluating performance measures, incentives, rewards and disciplinary actions for individuals

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Control Environment—Five Principles

Monitoring and considering the potential for excessive performance pressures, including unrealistic performance (e.g., earnings) targets, and an excessive concern with short-term (e.g., quarterly earnings) targets

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Risk Assessment—Four Principles

1. **Objectives.** Organization objectives have sufficient clarity to enable the identification and assessment of risks that threaten achievement of objectives including consideration of:
- Precision of risk tolerance levels; e.g., can we quantify the risk? to within what range?
 - Materiality in relation to risk assessment. How big of a risk threatens objectives (a loss of \$10,000? \$100,000? \$1,000,000?)

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Risk Assessment—Four Principles

Risks: organization's ability to comply with standards, frameworks, laws and regulations.

Risks related to operational and financial performance goals.

Risks: committing resources (e.g., new projects, new technologies).

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Risk Assessment—Four Principles

2. **Assessment.** The organization identifies risks to achievement of objectives and analyzes risks to guide risk management strategy including:

- Engage appropriate management in risk assessment.
- Consider and include entity, subsidiary, division, operating unit, and functional levels.
- Analyze internal and external factors.
- Estimate risk importance.
- Develop risk responses.

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Risk Assessment—Four Principles

3. **Fraud.** The organization considers potential fraud in assessing risks to achieving objectives including:

- Consider fraud risk factors and threats.
- Assess potential fraud influence of incentives and pressures.
- Assess fraud opportunities.
- Assess attitudes and potential rationalizations that might justify fraud.

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Risk Assessment—Four Principles

4. **Change Management.** The organization identifies and assesses changes in external environment, business model and organizational leadership that could impact system of internal control.

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Control Activities—Three Principles

1. **Risk Reduction.** Control activities reduce the risks to the achievement of objectives to acceptable levels including:
- Integrate control with risk assessment.
 - Risk reduction analyses determine business processes to target control.
 - Consider influence of environment, complexity, and nature and scope of operations, on risk reduction and control.

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Control Activities—Three Principles

Evaluate the mix of control activity types, including manual and automated, and, preventive and detective controls.

Segregate incompatible activities and implement alternative controls to compensate when segregation is impossible.

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Control Activities—Three Principles

2. **Technology Controls.** The organization selects and implements general controls over technology which support the achievement of its objectives including:
- Management understands dependencies of business processes, automated controls, and technology general controls.
 - Management establishes controls to ensure completeness, accuracy, and availability of technology and processing.

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Control Activities—Three Principles

Restricting technology access rights to authorized users.

Establishing relevant security management process controls.

Establishing relevant technology acquisition, development, and maintenance process controls.

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Control Activities—Three Principles

3. **Policies.** The organization's control activities inform policies that establish stakeholder expectations. Established procedures ensure the implementation of these policies. These activities include:
- Establishing policies and procedures that support the achievement of management's directives.
 - Establishing responsibility and accountability for executing policies and procedures.

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Control Activities—Three Principles

Competent personnel perform control activities in a timely manner, and, take corrective action to investigate and act on control problems and issues.

Management periodically reassessing and revising policies and procedures to address changing conditions.

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Information and Communication—Three Principles

1. **Quality.** Relevant, high-quality information supports internal control processes including organizational processes that:
 - Identify information required to support internal control processes.
 - Capture internal and external courses of data.
 - Transform data into information.

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Information and Communication—Three Principles

Produce information that is relevant, timely, current, accurate, verifiable, protected, and retained.

Consider the costs and benefits of information in relation to organizational objectives.

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Information and Communication—Three Principles

2. **Internal.** Internal communication supports internal control processes. This includes:

- Organizational processes communicate required information to enable all personnel to understand and execute their internal control responsibilities.
- Communication between management and the Board of Directors supports the achievement of organizational objectives.

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Information and Communication—Three Principles

Separate communication lines, e.g., whistleblower hotline, enable anonymous, confidential communication.

Internal communication methods are sensitive to timing, audience, and nature of the communication.

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Information and Communication—Three Principles

3. **External.** Communication with outsiders supports internal control processes including:

- Board of Directors receive relevant information from assessments conducted by external parties (e.g., reviews of internal control).
- External communication methods are sensitive to the timing, audience, and nature of the communication and to legal, regulatory and fiduciary requirements.

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Information and Communication—Three Principles

Enable inbound communications that support the receipt of information from customers, suppliers, external auditors, regulators, financial analysts and others.

Separate communication lines, such as a whistle-blower hotline, as a fail-safe mechanism to enable anonymous, confidential communication.

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Monitoring—Two Principles

1. **Both ongoing and periodic** monitoring evaluates internal control including:

- Benchmarking and providing feedback
- Consideration of environmental and business changes, knowledge of evaluation personnel, and, risk assessments.

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Monitoring—Two Principles

2. **Address Deficiencies.** Parties charged with taking corrective action, including senior management and the Board of Directors, receive timely communication of internal control deficiencies including:

- Management and Board of Directors assessments of evaluations.
- Communication of deficiencies to management at least one level above the identified problem.
- Management tracking of the correction (or lack thereof) of deficiencies.

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Principles of Internal Control

	Control Environment	Risk Assessment	Control Activities	Information and Communication	Monitoring
1	Integrity and ethical values	Objectives	Risk reduction	Quality	Both ongoing and periodic
2	Board of directors	Assessment	Technology controls	Internal	Address deficiencies
3	Management	Fraud	Policies	External	
4	Competence	Change management			
5	Accountability				

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Lesson Quiz: Understanding



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Quiz: Understanding

In the context of designing internal control, ...

Define "competence"

- Commitment to attract, develop, and retain highly qualified individuals consistent with achieving organizational objectives.
- Includes establishing policies, assessing competencies, and planning for turnover and succession.

Define "accountability"

- Individuals must answer for their internal control responsibilities

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Quiz: Understanding

In the context of designing internal control, ...

Define "risk assessment precision."

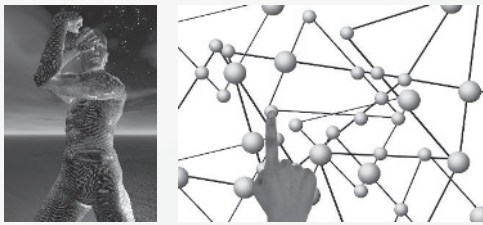
- Whether, and the extent to which, risk can be quantified

Define "risk assessment materiality."

- The determination of how large of a risk poses a threat to objectives

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Lesson Quiz: Application



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Quiz: Application

For each activity, identify the internal control principle(s) to which it relates.

Board of Directors meets to review plan for, and risks of, cloud computing

Best: **2. Exercises oversight responsibility.**

Also relevant:

9. Change Management. The organization identifies and assesses changes in external environment, business model and organizational leadership that could impact system of internal control.

11. Technology Controls. The organization selects and implements general controls over technology which support the achievement of its objectives

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Quiz: Application

For each activity, identify the internal control principle(s) to which it relates.

The CFO is caught embezzling money from the Big Brothers / Big Sisters Program

- 1. Demonstrates commitment to integrity and ethical values

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Quiz: Application

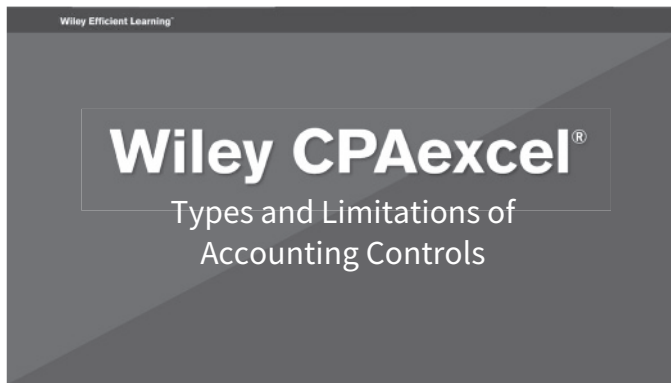
For each activity, identify the internal control principle(s) to which it relates.

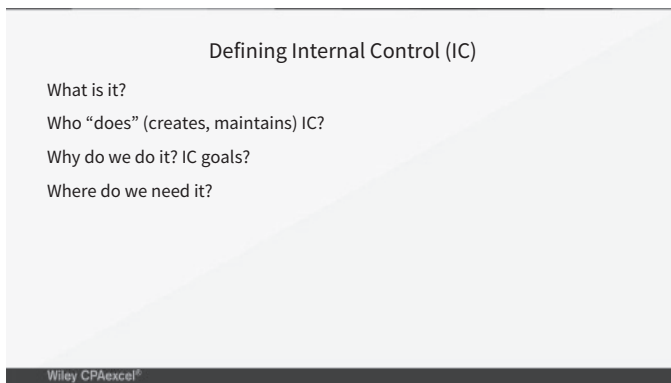
The CFO establishes skills and required training for all positions that include internal control responsibilities.

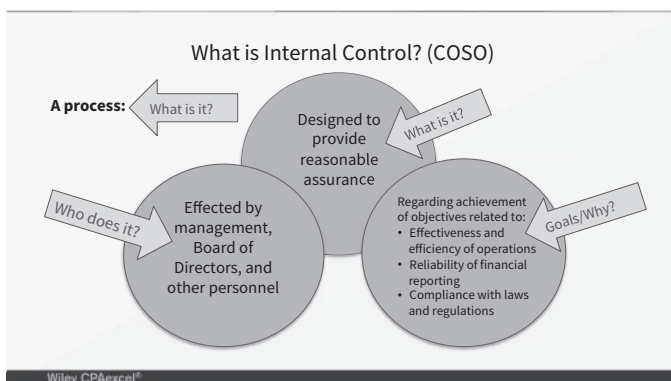
- 4. Demonstrates commitment to competence

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Types and Limitations of Accounting Controls







Limitations of Internal Control

- Management may set (inappropriate) objectives
- People screw up
- Management may over-ride controls
- Collusion happens
- Doo doo happens
- Internal control systems provide reasonable (cost-effective) not absolute assurance

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Control Deficiencies

Control deficiency = shortcoming that reduces likelihood of entity achieving its objectives. Management must assess the severity of deficiency.

Types of deficiencies (SEC)

- *Control deficiency*: defined above. The least serious of the three types of control deficiencies.
- *Significant deficiency*: More serious than a control deficiency but less severe than a material weakness.
- *Material weakness*: Creates a reasonable possibility of a material misstatement of the entity's financial statements.

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Types of Controls

Three classifications:

1. Preventive, detective, and corrective controls
2. Feedback and feed-forward controls
3. General and application controls

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Types of Controls: Preventive, Detective, and Corrective

The diagram consists of three gray parallelogram boxes arranged horizontally. The first box on the left is labeled 'Preventive "before" controls'. The middle box is labeled 'Detective "after" controls'. The third box on the right is labeled 'Corrective "reversing" controls'.

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Types of Controls: Preventive, Detective, and Corrective

Preventive “before” controls

- Prevent **an error or irregularity**
- Examples (primarily preventive): building locks, user names and passwords, and segregation of duties

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Types of Controls: Preventive, Detective, and Corrective

Detective “after” controls

Detect error **after occurrence**

- Examples: data entry edits (checks for missing data), reconcile accounting records to physical assets (inventory counts)

But often also have secondary **preventive benefits**

- Example: surveillance cameras (primary: detective; secondary: preventive)

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Types of Controls: Preventive, Detective, and Corrective

Corrective “reversing” controls

Reverse effects of error

Always with detective

- Examples: backup files, disaster recovery plans, insurance

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Types of Controls: General and Application

General (holistic):

Apply broadly, e.g., to most computerized functions

- Examples: restricting access to computer facility, backup file systems, and background checks of personnel

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Types of Controls: General and Application

Application (specific) controls:

Focus on accounting applications that include data entry, update and reporting.

- Examples: data checks (e.g., dates, dollar amounts)

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Feedback and Feed-Forward Controls

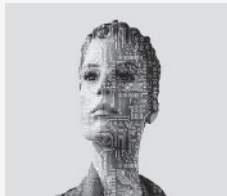
Closely related to preventive, detective, and corrective controls.

Feedback controls evaluate and respond to the results of a process.

Feed-forward controls project future results and alter inputs in response.

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Lesson Quiz: Understanding



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Quiz: Understanding

Define "feed-forward controls."

- Process in which future results are projected based on current and past information.
- If the future results are undesirable, inputs are changed to avoid the projected outcome.
- E.g., Many inventory ordering systems.

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Quiz: Understanding

Define "general controls."

- Controls over the environment as a whole
- Apply to all functions

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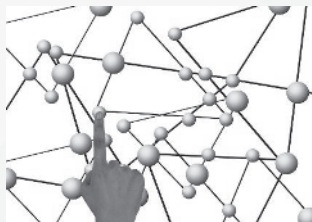
Quiz: Understanding

Define "application controls."

- Controls over specific data input, data processing, and data output activities.
- Designed to ensure the accuracy, completeness, and validity of transaction processing. As such, application controls have a relatively narrow focus on those accounting applications that are involved with data entry, update, and reporting.

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Lesson Quiz: Application



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Quiz: Application

An internal auditor at Eastern Waxwing University asks the CFO each of the following questions. Classify the relevant control to which the question relates as:

1. General or application
2. Preventive, detective, or corrective

Question: Are Database Management Systems (DBMS) security features used to protect data against unauthorized access or manipulation?

Answer: general, preventive

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Quiz: Application

Question: Are data transmission errors reported to management for problem analysis and action?

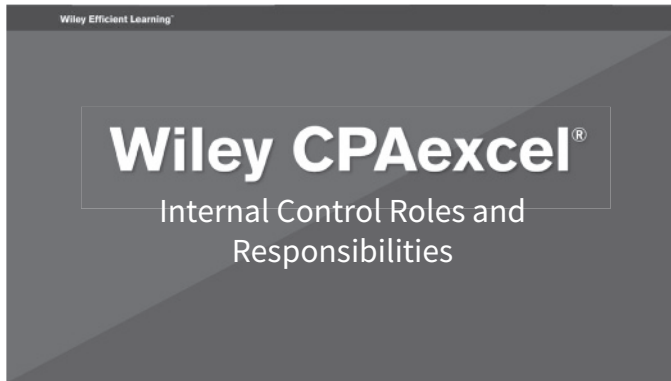
Answer: general, detective (i.e., analysis), corrective (i.e., action)

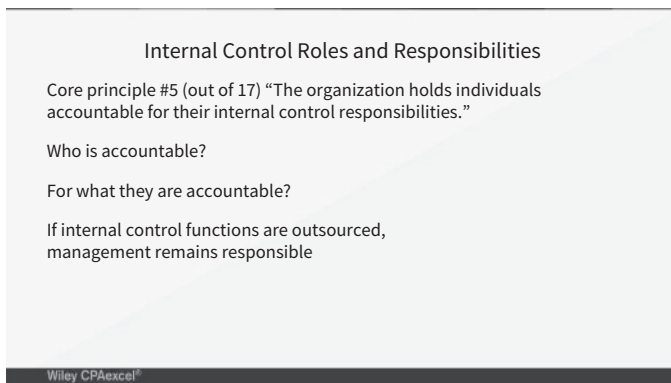
Question: Are source documents designed to facilitate the initial recording of data in a uniform, complete, and accurate format?

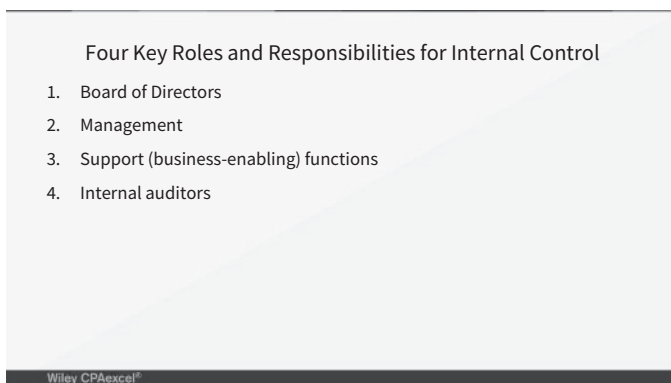
Answer: application, preventive

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Internal Control Roles and Responsibilities







Four Key Roles: Board of Directors

Responsibilities:

- Oversight of key internal control activities and enterprise-wide risk management .
- Create expectations about integrity and ethical values, transparency
- Accountable for performance of internal control responsibilities.

Competence and Communication:

- Must have a working knowledge of entity's activities and environment .
- Commit to governance responsibilities.
- Must be objective, capable, and inquisitive.
- Maintain open and unrestricted communications channels.

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Four Key Roles: Management

Senior Management

Ownership of internal control

Sets the organizational ethical “tone at the top”

Accountable to Board of Directors

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Four Key Roles: Management Responsibilities

1. “First line of defense” in internal control.
2. Oversight and control over controls and risks.
3. Compensation often based on achieving objectives (e.g., earnings targets).
4. Guide and develop control activities at the entity level.
5. Delegate the design, implementation, conduct, and assessment of internal control.
6. Communicate expectations and information requirements.
7. Evaluate control deficiencies and their impact.

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Four Key Roles: Support (Business-enabling) Functions

“Second line of defense”

E.g., legal, compliance, finance, human resources, IT (not internal audit)

1. Identify known or emerging risks.
2. Help management respond, communicate, and educate others about risks.
3. Clarify internal control requirements.
4. Evaluate effectiveness of control and risk assessment processes.
5. Evaluate control-related compliance (Legal and compliance functions).
 - Compensation should not be tied to organizational objectives

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Four Key Roles: Internal Auditors

“Third line of defense” (independent of functions)

1. Evaluate adequacy and effectiveness of controls
2. Often monitor internal controls
 - Compensation should be unrelated to the business areas that they review and assess

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Roles and Responsibilities: All Employees

Internal control is the responsibility of everyone in organization; Internal control objectives are, to differing extents, requirements of all employees

Almost all employees produce information that is relevant to the internal control systems. Responsible for communicating problems related to operations, code of conduct, or other policy violations or illegal actions.



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Roles and Responsibilities: External Parties

E.g., external auditors, customers, legislators and regulators, and financial analysts

Relevant to achievement of entity's objectives

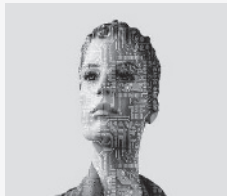
- E.g., external auditors independently and objectively audit financial statements (and often system of internal control)

Provide information that aids management and Board of Directors in improving internal controls.

Not responsible for, nor a part of the, internal control system.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

What is the "Board of directors"

- Individuals elected as representatives of stockholders.
- Establish corporate management related policies.
- Make decisions on major company issues.

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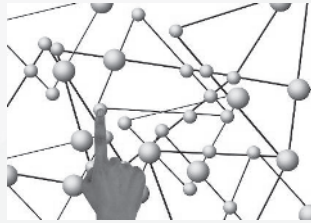
Lesson Quiz: Understanding

Support (business-enabling) Function

- Also called the “second line of defense” include legal, compliance, finance, human resources, IT and others.
- Clarify internal control requirements and evaluate control-related compliance with set standards.

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Lesson Quiz: Application



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Lesson Quiz: Application

Binx Bolling is CEO of Moviegoer Productions, a film production and distribution company. Mr. Bolling is considering outsourcing the evaluation of many of the controls at Moviegoer Productions to outside experts. What factors should Mr. Bolling consider in making the decision to outsource aspects of internal control?

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Lesson Quiz: Application

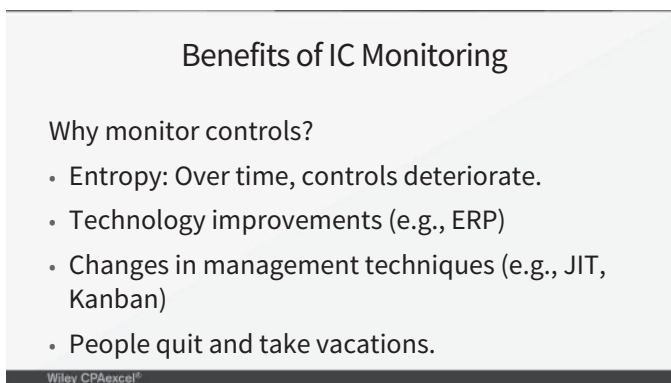
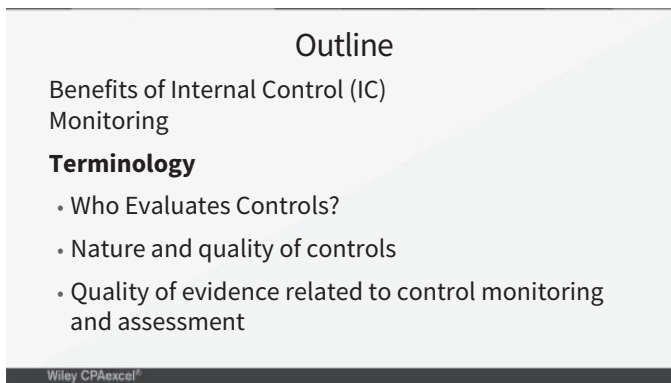
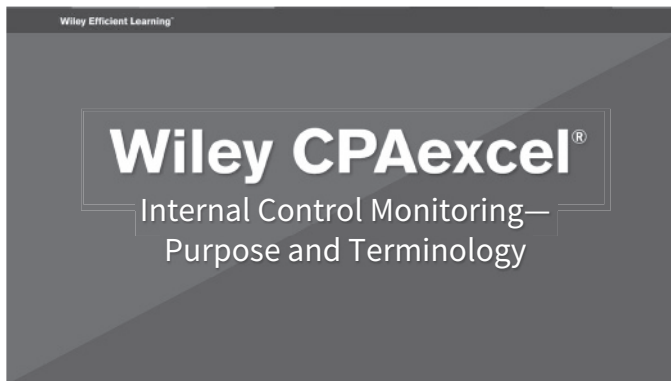
Controls and control evaluations can be outsourced but they remain management's responsibility.

Considerations:

- Importance of controls and risks of their failure
- Need for external auditors to rely on the control
- Overall need for in-house control expertise
- Capabilities, and limitations, of the organization's internal audit staff
- Role and functions of the business-support staff in relation to these functions

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Internal Control Monitoring—Purpose and Terminology



Benefits of IC Monitoring

Benefits of control monitoring:

- Lessen the negative effects of entropy.
- Identify IC problems before they become crises.
- More timely, accurate and reliable: information, financial statements, certifications of internal control, e.g., SOX 404.
- Maximize efficiency, reduce costs.

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Terms: Who Evaluates Controls?

Evaluators

- Monitor internal control. Must have skills, knowledge, and authority to enable them to (1) understand the risks that can materially affect organization's objectives, (2) identify critical controls related to managing or mitigating those risks, and (3) conduct and/or oversee the monitoring of appropriately persuasive information about the effectiveness of IC system. Two primary attributes are **competence** and **objectivity**.

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Terms: Who Evaluates Controls?

Competence

- Evaluator's knowledge of controls and related processes, including their operation and what constitutes a control deficiency.

Board monitoring

- Monitoring by board or its committees.
- Includes evaluating management's monitoring process and assessment of risk of management override of controls.

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Terms: Who Evaluates Controls?

Self-assessment (where “self” here is the unit or function)

- Persons responsible for a particular unit or function who determine the effectiveness of controls for their activities.
- Assessment may be by personnel who operate the control (i.e., self-review) or peer or supervisory review within the same unit as the control.

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Terms: Who Evaluates Controls?

Self-review (where “self” here is an individual)

- Review of one’s own work. Least objective type of “self-assessment”. Order of review objectivity (from least to most): self, peer, supervisor, impartial.

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Terms: The Nature or Quality of Controls

Control objectives

- Specific targets against which the effectiveness of IC is evaluated. Typically state the risk that they should manage or mitigate.

Compensating controls

- Accomplish the same objective as another control and can “compensate” for deficiencies in that control.

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Terms: The Nature or Quality of Controls

Deficiency or internal control deficiency

- An IC condition requiring attention.
- Could be a perceived, potential or real shortcoming, or opportunity to strengthen IC to increase likelihood of achieving objective.

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Terms: The Nature or Quality of Controls

Key controls

- Most important to assessing IC system's ability to manage or mitigate meaningful risks. Often:
 - Failure might materially affect the organization's objectives, yet not reasonably be detected in a timely manner by other controls, or
 - Their effective operation might prevent other control failures or detect such failures before they have an opportunity to become material to the organization's objectives.

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Terms: The Nature or Quality of Controls

Key performance indicators

- Metrics that assess critical success factors
- Help measure progress towards goals and objectives

Key risk indicators

- Forward-looking metrics that help identify potential problems

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Terms: Quality of Evidence Related to Control Monitoring

Direct information

- Directly substantiates operation of a control. Must link directly to a judgment regarding the effective operation of control
- Highly persuasive
- Obtained by
 - Observing controls in operation, re-performing them, or otherwise directly evaluating their operation
 - Either ongoing or separate evaluations

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Terms: Quality of Evidence Related to Control Monitoring

Indirect information

- Relevant to assessing whether controls are operating and underlying risk is mitigated
- Does not provide explicit evidence as to whether controls are operating effectively

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Terms: Quality of Evidence Related to Control Monitoring

Persuasiveness of information

- Degree to which information supports relevant conclusions
- Derives from suitability (i.e., its relevance, reliability, and timeliness) and sufficiency

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Terms: Quality of Evidence Related to
Control Monitoring

Relevant information

- Helps in assessing the operation of the underlying controls or control component

Reliable information

- Accurate, verifiable and from an objective source

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Terms: Quality of Evidence Related to
Control Monitoring

Sufficient information

- Obtains when evaluators have gathered enough to form a reasonable conclusion
- To be sufficient, evidence must be suitable

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Terms: Quality of Evidence Related to
Control Monitoring

Suitable information

- Relevant (i.e., fit for its intended purpose), reliable (i.e., accurate, verifiable and from an objective source), and timely (i.e., produced and used in an appropriate time frame).

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Terms: Quality of Evidence Related to Control Monitoring

Timely information

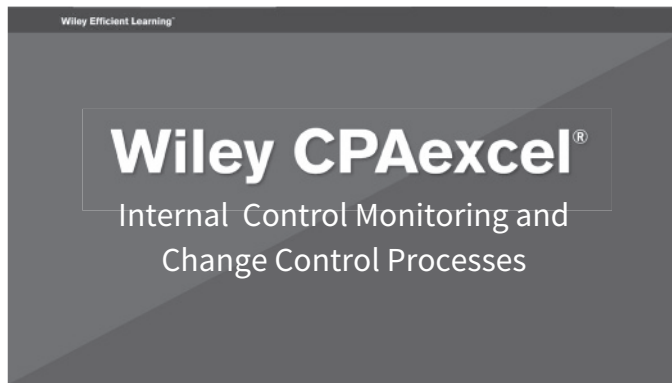
- Produced and used in a time frame that makes it possible to prevent or detect control deficiencies before they become material to an organization

Verifiable or verifiability

- Can be established, confirmed or substantiated as true or accurate

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Internal Control Monitoring and Change Control Processes





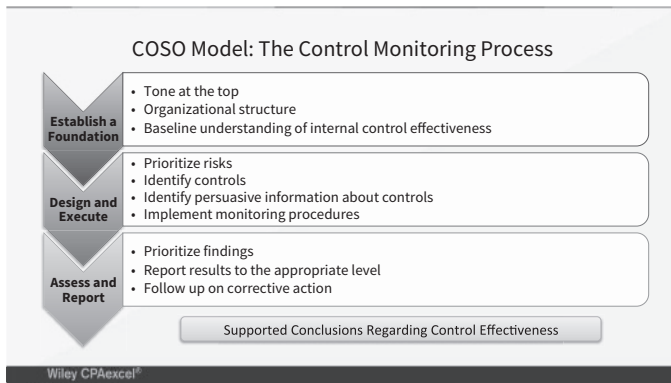
Control Monitoring Process Methods

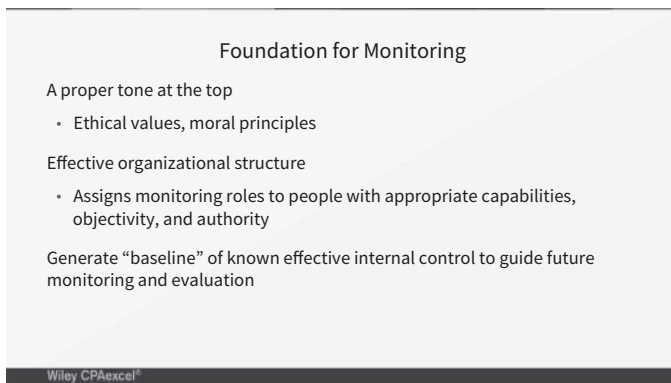
Reviewing process including reviews of flowcharts, and, risk and control documentation

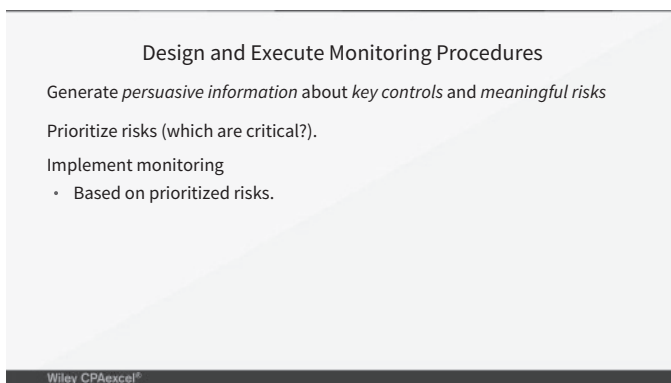
Benchmarking assessments comparing organizational controls and processes with best practices in comparable functions

Questionnaires that assess the extent to which controls are operating as stipulated

Focus groups and interviews to identify concerns and surprises related to changes in the system of internal control







Assess and Report Results

Prioritize findings.

- Determine severity of identified deficiencies.

Report results.

Follow up with corrective action.

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Assessing Changes in Internal Control Effectiveness

Four-stage process called the “monitoring-for-change continuum”:

Establish Control Baseline

- Begin with area where controls are well understood. Provides baseline for enhanced monitoring.

Change Identification

- Identify changes in control operations, design, or related risks. Often includes evaluations to identify and address the potential changes in IC effectiveness.

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Assessing Changes in Internal Control Effectiveness

Control Revalidation

- Periodically (i.e., subsequently) revalidate that controls remain effective, thus maintaining a *continuous* control baseline.

Change Management

- When changes occur, verify that controls remain effective. Establishes a new control baseline for the modified controls.

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Monitoring for Change Continuum

Monitoring starts with understanding of IC system design and whether/how controls are implemented.

Monitoring (initial and ongoing) increases baseline understanding of controls.

Baseline understanding facilitates monitoring for IC and environmental changes.



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Effective Change Control Processes

- A. Internal control processes must anticipate and promptly react to changes.
- B. Control change management must consider costs vs. benefits.
- C. Critical change process processes:
 1. Well-structured documentation.
 2. Appropriate procedures: risk analysis, written change control procedures, change request forms, quality system methodologies to ensure business requirements are met, change review team(s), appropriate segregation of duties, appropriate permissions model, implementation and test teams, and retention of applicable documentation.

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Effective Change Control Processes

- D. Change management is part risk assessment including consideration of:
 1. Changes in operations
 2. Personnel change
 3. Changing technologies and information systems
 4. Rapid, unexpected growth

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Lesson Quiz: Understanding



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Quiz: Understanding

Identify three activities that comprise assessing and reporting on control monitoring.

1. Prioritize findings.
2. Report results as appropriate.
3. Follow up to implement corrective actions.

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Quiz: Understanding

What are the three elements of establishing a foundation for control?

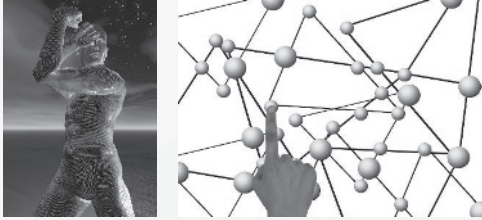
1. The tone at the top
2. Organizational structure
3. Baseline understanding of control effectiveness

Define "ongoing monitoring."

- Activities to monitor the effectiveness of internal control in the ordinary course of operations

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Lesson Quiz: Application



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Quiz: Application

Question: Hungry Games Inc. is a start-up company that makes video games. A previous CFO documented the internal control system when she had the position. Since she left, however, there is no documentation of any changes in their internal control processes or functions. When asked about this, the current CFO says, "Dude, like, who cares about this <stuff>. It ain't gettin' the product out the door." Why is documentation important and relevant to a functioning control system?

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Quiz: Application

Answer notes:

- Effective control requires determining whether the company's change management system is working as intended.
- System is ineffective and unauditible unless all changes are documented
- Must document:
 - Who can request, approve, develop, test, and move changes from production to operation.
 - When, by whom, and why changes occurred.

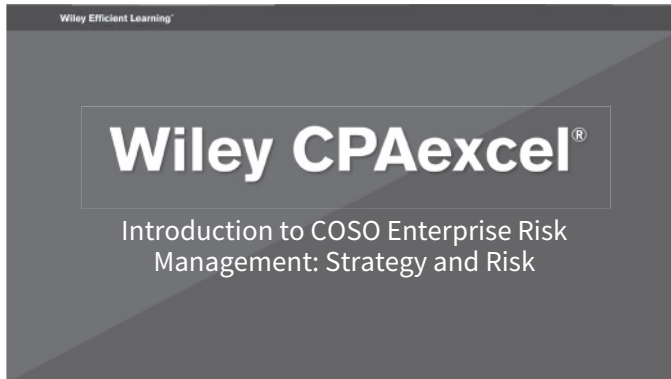
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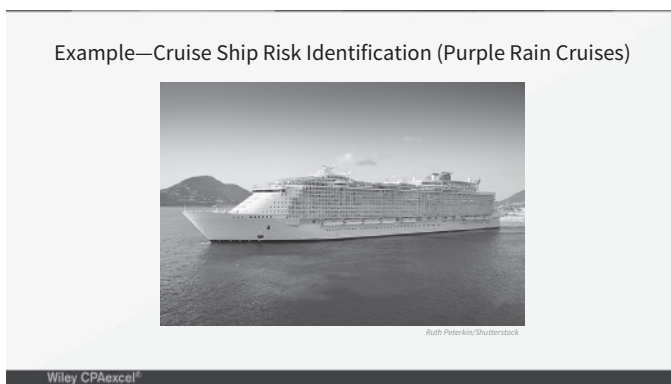
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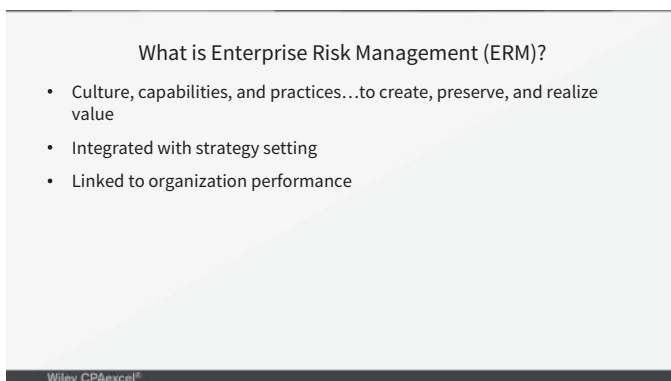
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Enterprise Risk Management Frameworks

Introduction to COSO Enterprise Risk Management: Strategy and Risk







Risk

- An uncertain event will influence whether an organization achieves its strategic business goals.
- Neutral, for example:
 - A **negative risk**—new accounting system fails and you cannot track sales and inventory
 - A **positive risk**—servers fail because demand for your product is so high

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Managing ERM—Focus

- Entity culture
- Developing capabilities
- Adapting and integrating ERM practices
- Integrating with strategy-setting and performance
- Managing risk to strategy and business objectives
- Linking to value through risk appetite

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Correcting Misconceptions of ERM

- Not a listing of risks
- Not just for a big corporation
- Not the same as internal control
- Cannot be an “add-on” activity/must be integrated into and throughout entity

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Why is ERM Important?

- Expanding opportunities
- Identifying and managing **entity-wide** risk
- Increasing positive and reducing negative outcomes
- Reducing performance variability
- Better deploying assets (and human resources)
- Increasing enterprise resilience

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Board of Director's Role in ERM

Work with management on:

- Proposed strategy and risk appetite.
- Aligning strategy and objectives with mission and core values.
- Major business decisions.
- Responding to significant fluctuations in entity performance or risk.

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Board of Director's Role in ERM

Work with management on:

- Responding to deviations from core values.
- Approving management incentives and compensation.
- Managing investor and stakeholder relations.
- Creating and sustaining organization culture.

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Concepts and Terms

Risk Appetite: The types and amount of risk that an organization assumes.

Uncertainty: Not knowing how or if potential events may occur.

Severity: Likelihood and impact of events. May refer to time required to recover from events.

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Concepts and Terms

Organizational Sustainability: The ability of an entity to withstand the impact of large-scale events.

Performance Management: The measurement of efforts to achieve or exceed the strategy and business objectives.

Portfolio View: A composite view of entity's risk.

Risk Profile: A composite view of the risk assumed at a level of the entity.

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Concepts and Terms

Reasonable Expectation: The amount of risk of achieving strategy and business objectives that is appropriate for an entity, recognizing that risk cannot be predicted precisely or perfectly.

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Concepts and Terms

Mission: Why the entity exists.

Vision: The entity's aspirations; what organization wants to be known for.

Core Values: The entity's beliefs about morality.

Strategy: The organizations' plan to achieve its mission and vision.

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Example—A Regional Hospital's Mission, Vision, and Core Values

Mission: Improve health of the people we serve by providing high-quality care, a comprehensive range of services...

Vision: We will be the healthcare provider of choice for physicians and patients, and be known for providing unparalleled quality...

Core Values: Foundation for everything we think, say, and do. Treat physicians, patients, and colleagues with respect, honesty, and compassion...

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Example—A Regional Hospital's Strategy

- Maximize value for our patients by improving quality across a diverse spectrum of services.
- Curtail trends in increasing costs.
- Integrate operating efficiency and cost-management initiatives into operations.
- Leverage clinical program research and innovation.

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Risk in Strategy Selection

Risk #1—Misalignment

- Does our strategy align with our mission, vision, and core values?

Risk #2—Implications

- Do we understand the risk implications of our chosen strategy?

Risk #3—Risks to Success

- Will we achieve our business objectives?

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ERM and Performance

ERM → organizational performance

Performance measures: financial, operating, obligation (or contractual), project, growth, stakeholder

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Emerging Issues and Opportunities in ERM

- Integrating big data into ERM
- Integrating Artificial Intelligence (AI) into ERM
- Managing ERM costs



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Example—Cruise Ship Mitigation (Purple Rain Cruises)

Procedures to minimize spread of germs:

- Hand-sanitizing stations, providing laundry facilities, daily disinfecting of handrails, washrooms, and other public spaces

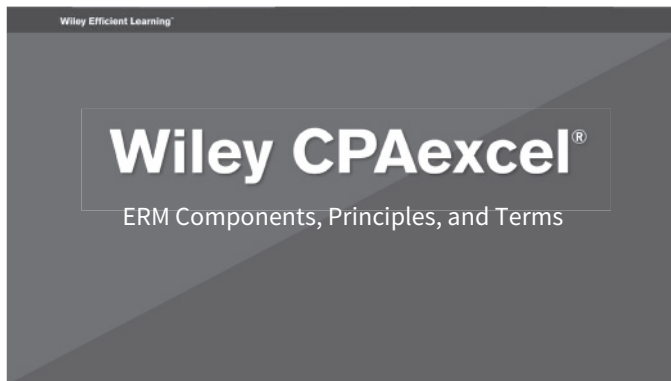
Additional procedures:

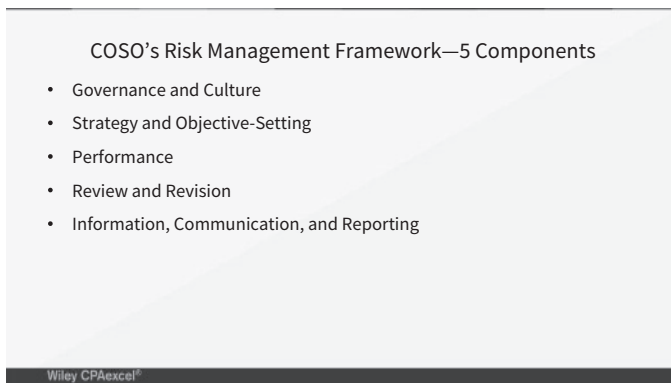
- When in port, all passengers disembark, and trained staffed disinfect ship and test for viruses. If virus found, additional cleaning protocols, and departure delay.

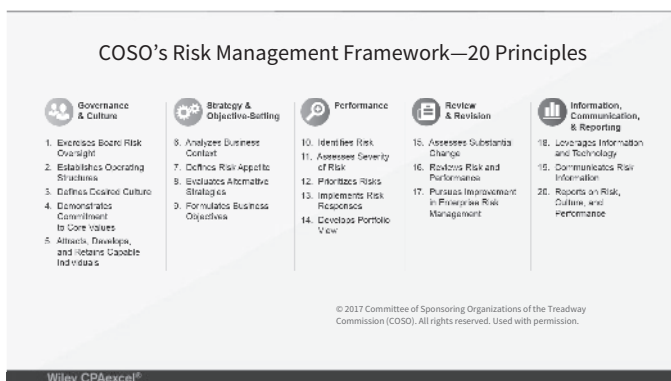
Summary: Strong ERM practices minimizes the inconvenience to passengers while sustaining passenger confidence.

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ERM Components, Principles, and Terms







Governance and Culture

1. Exercise Board Risk Oversight—The board of directors provides oversight of the strategy and carries out governance responsibilities to support management in achieving strategy and business objectives.
2. Establish Operating Structures—The organization establishes operating structures in the pursuit of strategy and business objectives.
3. Define Desired Culture—The organization defines the desired behaviors that characterize the entity's desired culture.

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Governance and Culture

4. Demonstrate Commitment to Core Values—The organization demonstrates a commitment to the entity's core values.
5. Attract, Develop, and Retain Capable Individuals—The organization is committed to building human capital in alignment with the strategy and business objectives.

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Strategy and Objective-Setting

6. Analyze Business Context—The organization considers potential effects of business context on risk profile.
7. Define Risk Appetite—The organization defines risk appetite in the context of creating, preserving, and realizing value.
8. Evaluate Alternative Strategies—The organization evaluates alternative strategies and potential impact on risk profile.
9. Formulate Business Objectives—The organization considers risk while establishing the business objectives at various levels that align and support strategy.

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Risk and Performance

- 10. Identify Risk—The organization identifies risk that impacts the performance of strategy and business objectives.
- 11. Assess Severity of Risk—The organization assesses the severity of risk.
- 12. Prioritize Risks—The organization prioritizes risks as a basis for selecting responses to risks.
- 13. Implement Risk Responses—The organization identifies and selects risk responses.
- 14. Develop Portfolio View—The organization develops and evaluates a portfolio view of risk.

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Review and Revision

- 15. Assess Substantial Change—The organization identifies and assesses changes that may substantially affect strategy and business objectives.
- 16. Review Risk and Performance—The organization reviews entity performance and considers risk.
- 17. Pursue Improvement in Enterprise Risk Management—The organization pursues improvement of enterprise risk management.

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Information, Communicating, and Reporting

- 18. Leverage Information Systems—The organization leverages the entity's information and technology systems to support enterprise risk management.
- 19. Communicate Risk Information—The organization uses communication channels to support enterprise risk management.
- 20. Report on Risk, Culture, and Performance—The organization reports on risk, culture, and performance at multiple levels and across the entity.

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ERM Assessment—Must Assess Capacity to Manage Risk

- Assessment may be voluntary or required
- Assure that (5) components and (20) principles are functioning
- Assure that components and principles are fully integrated
- Assure that controls needed to achieve the principles are functioning

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Terms

Business Context: The trends, events, relationships and other factors that may influence, clarify, or change an entity's current and future strategy and business objectives.

Culture: An entity's core values, including its attitudes, behaviors, and understanding about risk.

Governance: The allocation of roles, authorities, and responsibilities among stakeholders, the board, and management. Some aspects of governance fall outside ERM (e.g., board member recruiting and evaluation; developing the entity's mission, vision, and core values).

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Terms

Practices: The methods and approaches deployed within an entity relating to managing risk.

Risk Capacity: The maximum amount of risk that an entity can absorb in the pursuit of strategy and business objectives.

Risk Ceiling: The maximum level of risk established by an entity.

Risk Floor: The minimum level of risk established by an entity.

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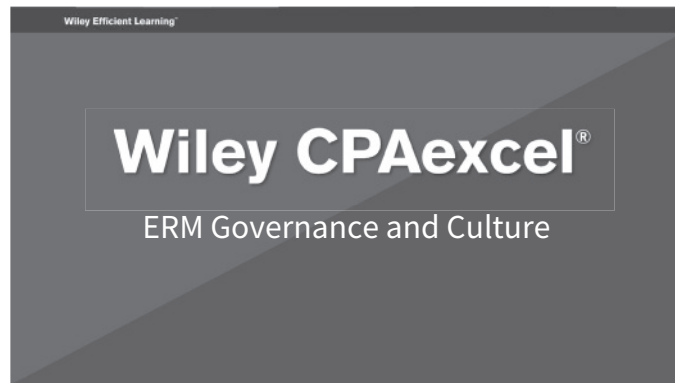
Terms

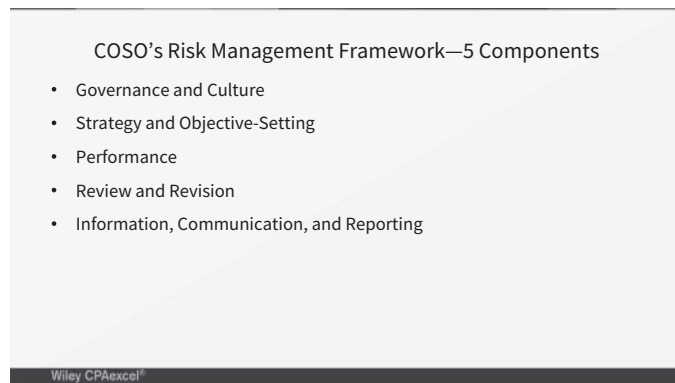
Target Risk: The desired level of risk set by an entity.

Risk Range: The acceptable level of risk (highest to lowest) established by the organization. Like tolerance but tolerance is a measure of performance while risk range is a statement about (or measure of) risk.

Tolerance: The boundaries of acceptable variation in performance related to achieving business objectives. Like risk range but risk range is a statement (or measure) of risk while tolerance is a measure of performance.

ERM Governance and Culture





COSO's Risk Management Framework—5 Components

- Governance and Culture
- Strategy and Objective-Setting
- Performance
- Review and Revision
- Information, Communication, and Reporting



COSO's Risk Management Framework—20 Principles

Governance & Culture	Strategy & Objective-Setting	Performance	Review & Revision	Information, Communication, & Reporting
1. Exercises Board Risk Oversight	8. Analyzes Business Context	10. Identifies Risk	16. Assesses Substantive Change	18. Leverages Information and Technology
2. Establishes Overarching Structures	7. Defines Risk Appetite	11. Assesses Severity of Risk	16. Reviews Risk and Performance	19. Communicates Risk Information
3. Defines Desired Culture	9. Evaluates Alternative Strategies	12. Prioritizes Risks	17. Pursues Improvement in Enterprise Risk Management	20. Reports on Risk, Culture, and Performance
4. Demonstrates Commitment to Core Values	9. Formulates Business Objectives	13. Implements Risk Responses		
5. Attracts, Develops, and Retains Capable Individuals		14. Develops Portfolio View		

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Governance and Culture—Principles 1-5

- 1. Exercise Board Risk Oversight—The board of directors provides oversight of the strategy and carries out governance responsibilities to support management in achieving strategy and business objectives.
- 2. Establish Operating Structures—The organization establishes operating structures in the pursuit of strategy and business objectives.
- 3. Define Desired Culture—The organization defines the desired behaviors that characterize the entity’s desired culture.

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Governance and Culture—Principles 1-5

- 4. Demonstrate Commitment to Core Values—The organization demonstrates a commitment to the entity’s core values.
- 5. Attract, Develop, and Retain Capable Individuals—The organization is committed to building human capital in alignment with the strategy and business objectives.

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#1. Exercise Board Risk Oversight

- Accountability and responsibility
- Independence
- Organizational bias

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#1. Exercise Board Risk Oversight—Board Independence

Potential Impairment:

- Substantial financial interest including substantial donations
- Employment in “executive capacity”
- Advises the board
- Material or contractual business relationship
- Business or personal relationship with key stakeholders
- Membership on a board with potential conflict of interest to this board
- Holding board position for an extended period

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#2. Establish Operating Structures

Influences on operating structure:

- Strategy, business objectives, related risks
- Nature, size, and geographical distribution of the business
- Assignment of authority, accountability, and responsibility
- Reporting lines (direct vs. secondary) and communication channels
- External reporting requirements (e.g., financial, tax, regulatory)

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#2. Establish Operating Structures

ERM structures:

- Many organization have board-appointed risk committees.
- Complex organizations may have multiple risk committees.

Risk committees need statements of authority, membership, frequency of meetings, responsibilities, and operating principles.

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#2. Establish Operating Structures

Authority and responsibility. Entities with:

- One board, management designs and implements practices to achieve strategy and objectives.

Dual-board structures

- A supervisory board focuses on long-term strategy and oversight.
- Management (or executive) board oversees daily operations.

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#2. Establish Operating Structures

Risk management improves when management:

- Delegates responsibility only as required to achieve objectives.
- Identifies transactions that require review and approval.
- Identifies and assesses new and emerging risks.

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#2. Establish Operating Structures

Internal influences on organizational culture:

- Management judgment
- The level of autonomy provided to employees, employee and management interactions (e.g., formal vs. informal)
- Physical layout of the workplace (e.g., decentralized, centralized, or virtual)
- Rewards, recognition, and compensation

External influences include regulatory requirements, and customer and investor expectations.

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#3. Define Desired Culture

Organizational culture exists on a continuum of risk aversion to risk seeking (aggression).

Organizational units may be more risk seeking or risk averse (within overall risk appetite).

- Example: Aggressive sales unit → sales without careful attention to regulatory compliance.
- Example: The risks of cloud storage may cause an organization to proceed cautiously before contracting with cloud service provider.

A risk-aware culture may permit both approaches, where both are within risk tolerance and appetite.

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#3. Define Desired Culture—Two Endpoints on the Risk Continuum

A **risk-averse culture**
(e.g., a nuclear power plant)

- Risk-averse culture in its day-to-day operations
- Prioritize safety and plant reliability
- Unlikely to invest heavily in innovative and unproven technologies for its operations



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#3. Define Desired Culture—Two Endpoints on the Risk Continuum

A **risk-seeking culture**, e.g., a private equity manager who provides financial backing to start-up companies

- Likely to be risk-aggressive, i.e., risk seeking
- High performance expectations = high risks
- Fund must still identify and operate within risk appetite and tolerance

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#3. Define Desired Culture—Example: An Evolving Culture

A technology start-up

- Developing an algorithm to track customer behavior and purchasing.
- In start-up → very aggressive risk culture
- With maturity, more formal partnerships with larger clients + public listing
- Shifted to more risk averse culture, reduced risk appetite, and corresponding changes to ERM practices and capabilities.

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#3. Define Desired Culture

Good judgment = thoughtful, rational decisions from available information.

- Judgment required when little or contradicting information exists about alternatives, or, in periods of disruption to strategy, objective, performance, or risk profiles.
- Bias—Management judgment susceptible to bias when over- or under-confidence exists in the organization's capabilities.

Management teams with more experience, capabilities, and a well-defined risk appetite likely to evidence better judgment.

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#3. Define Desired Culture—Organizational Culture Influences

Identification, Assessment, and Response

Culture and Strategy (e.g., a risk-averse organization (and culture) may decline to mine on suburban land with high environmental risk).

Culture and Risk Assessment. Same event may view as negative or positive risk.

- A risk-averse traditional retail organization (e.g., Sears) may view online sales as a threat to its "brick and mortar" business.
- A risk aggressive traditional retail company (e.g., Walmart) may see online sales as an opportunity to increase sales and market share.

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#3. Define Desired Culture—Organizational Culture Influences

Culture and Resource Allocations

- A risk-averse entity may allocate more resources to achieve objectives.
- A risk-seeking entity may expend fewer resources in pursuit of specific objectives.

Example:

- A risk-averse entity might purchase insurance to help achieve a business objective (e.g., reduced likelihood of losses due to cyber-breaches), whereas;
- A risk-seeking entity may choose to self-insure for these potential losses.

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#3. Define Desired Culture—Aligning Core Values, Decision-Making, and Behaviors

Failure to adhere to core values generally occurs for one of these reasons:

- Inappropriate tone at the top.
- The board fails to provide oversight of management.
- Middle and functional managers are misaligned with mission and core values.
- Risk not integrated into strategy setting and planning.
- Unclear and untimely responses to risk and performance outcomes.
- Excessive risk taking not investigated or addressed.
- Management or employees deliberately act inconsistent with core values.

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#4. Demonstrates Commitment to Core Values

Reflecting Core Values throughout the Organization

The communication of values within an organization = “tone.”

- Consistent tone establishes a collective understanding of core values and desired behaviors.
- Aligning the tone and culture of an organization (e.g., “safety first”) provides confidence that organization acts consistent with its values.

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#4. Demonstrates Commitment to Core Values

Embracing a risk-aware culture includes:

- Strong leadership endorsement of risk awareness and tone.
- Participative management style that encourages risk discussions.
- Aligning risk awareness with behaviors and performance evaluation.
- Encouraging risk awareness across the entity.

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#4. Demonstrates Commitment to Core Values

Keeping Communication Open

- No fear of retribution from management or the board for employees who report on risks
- Managing risk is a responsibility of all employees' responsibility

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#4. Demonstrates Commitment to Core Values

When Deviations from Standards of Conduct Occur

Example: Drug Testing

R&D at a global pharmaceutical company, research and development

- Among the biggest costs
- In testing, many drug side effects identified.
- R&D unit must report side effects to management.
- Failure to do so = serious violation of the culture and code of conduct of company.

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#5. Attract, Develop, and Retain Capable Individuals

Includes:

- Establishing and evaluating competence
- Attracting, developing, and retaining Individuals
- Rewarding performance
 - consider potential ethical risks
 - consider non-monetary rewards
- Address pressure including “excessive” pressure

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#5. Attract, Develop, and Retain Capable Individuals**Performance, Incentives, and Rewards**

Example: Family-owned furniture manufacturer

- Engages workforce to reduce production defect rates
- Aligns performance measures, incentives, and rewards with operating units' production goals and safety and quality expectations
- Result: Evidence of greater accountability and teamwork and reduced product defects.

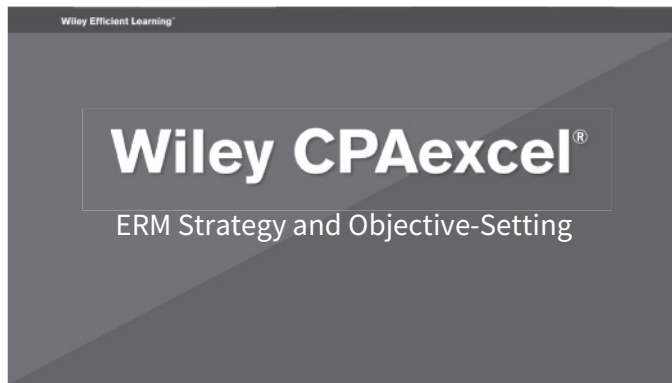
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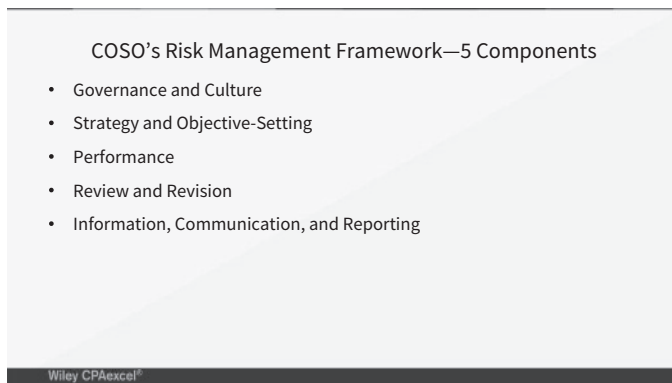
#5. Attract, Develop, and Retain Capable Individuals—Example**Pressure and Investment and Fund Managers**

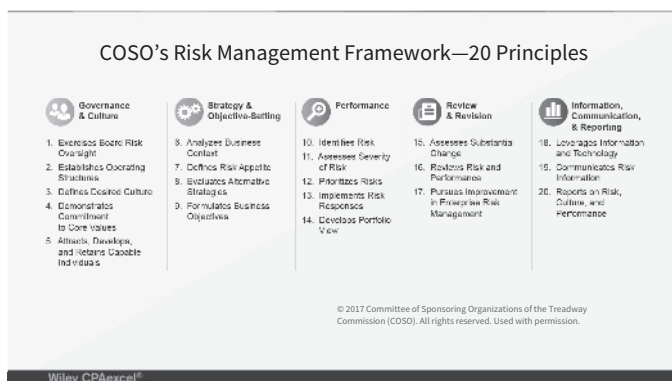
- Compensation and incentives may create pressure for unethical behavior.
- Investment managers → risks for clients with effects on entity's and investment manager's compensation.
- Incentive effects → fixed fee vs. fee-based on short-term fund performance vs. fee-based on long-term fund value.
- Align individual compensation with organization's objectives to reinforce culture.
- Excessive pressure and failure to align → Bernie Madoff

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ERM Strategy and Objective-Setting







Strategy and Objective Setting—Principles 6-9

6. Analyze Business Context—The organization considers potential effects of business context on risk profile.
7. Define Risk Appetite—The organization defines risk appetite in the context of creating, preserving, and realizing value.
8. Evaluate Alternative Strategies—The organization evaluates alternative strategies and potential impact on risk profile.
9. Formulate Business Objectives—The organization considers risk while establishing the business objectives at various levels that align and support strategy.

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#6. Analyze the Business Context

“Business context” = trends, events, relationships and factors that influence, clarify, or change an entity’s strategy and business objectives.

Example: dynamic or static, complex or simple, and predictable or unpredictable

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#6. Analyze the Business Context

External Environment

- Example: regulatory agency, investor

Categorized by acronym: PESTLE (political, economic, social, technological, legal, environmental)

External Environment Categories and Characteristics	
Categories	External Environment Characteristics
Political	The nature and extent of government intervention and influence, including tax policies, labor laws, environmental laws, trade restrictions, tariffs, and political stability
Economic	Interest rates, inflation, foreign exchange rates, availability of credit, GDP growth, etc.
Social	Customer needs or expectations; population demographics, such as age distribution, educational levels, distribution of wealth
Technological	R&D activity, automation, and technology incentives; rate of technological changes or disruption
Legal	Laws (e.g., employment, consumer, health and safety), regulations, and/or industry standards
Environmental	Natural or human-caused catastrophes, ongoing climate change, changes in energy consumption regulations, attitudes toward the environment

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#6. Analyze the Business Context

Internal Environment Categories and Characteristics

Categories	Internal Environment Characteristics
Capital	Assets, including cash, equipment, property, patents
People	Knowledge, skills, attitudes, relationships, values, and culture
Process	Activities, tasks, policies, or procedures; changes in management, operational, and supporting processes
Technology	New, amended, and/or adopted technology

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#6. Analyze the Business Context—Example: A Retail Business Context in Assessing in Framework Components

Management integrates business context with ERM by:

- **Governance and Culture:** Identify governance and associated regulatory trends in industry. Incorporate understanding into ERM oversight.
- **Strategy and Objective-Setting:** Conduct detailed analysis of social trends, retail trends, and consumer confidence. Incorporate findings into strategy.
- **Performance:** Assess environmental trends and evaluates their impact on risks relating to the objective of reducing packing by 50% (a core value).

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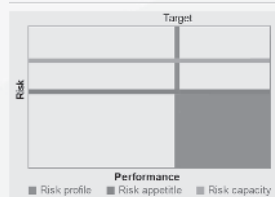
#7. Define Risk Appetite—Risk Appetite and Risk Profile

Many organizations co-develop strategy and risk appetite

- Some organizations quantify risk appetite (i.e., in numbers), others state risk appetite in words

Set risk capacity > risk appetite except in unusual cases (e.g., bankruptcy)

Risk Profile Showing Risk Appetite and Risk Capacity



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#7. Define Risk Appetite

Multiple approaches to determining and expressing risk appetite

- In words: “low” or “high” appetite
- In numbers: (e.g., in financial results or beta measure, i.e., volatility of stock compared to the stock market)

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#7. Define Risk Appetite

Considerations:

- Risk profile, i.e., a composite assessment of risks, including types, severity, and interdependence.
- Risk capability, i.e., the risk maximum
- ERM capability and maturity. More mature and capable ERM = greater insight into risk appetite.

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#7. Define Risk Appetite—Example**Risk Appetite Expressions in Different Organization**

Target Risk: Credit union = loan loss target of 0.50% (i.e., 1/2 of 1%) of the overall loan portfolio.

Risk Range: A medical supply company operates within a low overall risk range.

- Lowest risk appetite relates to safety and compliance objectives.
- Higher risk appetite for its strategic, reporting, and operations objectives.

Risk Ceiling (Maximum): University accepts moderate risk appetite to expand offerings; no programs that present severe risk to university mission.

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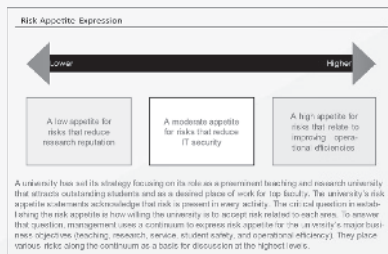
#7. Define Risk Appetite—Articulating (Stating) Risk Appetite

Articulate relative to strategy and business objectives, business objective categories, or performance targets.

- Example: University's articulation of its risk appetite

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#7. Define Risk Appetite—Articulating (Stating) Risk Appetite



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#7. Define Risk Appetite—Articulating Risk Appetite



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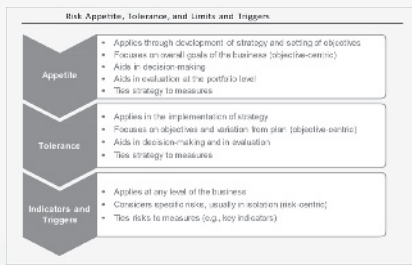
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#7. Define Risk Appetite—Use Risk Appetite

- Guides resource allocations
- Example: Allocate more resources to business objectives with lower risk appetite and fewer resources to business objectives with higher risk appetite
- Must align and articulate with risk tolerance (i.e., the acceptable boundaries of performance), and risk indicators or triggers (see Figure)

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#7. Define Risk Appetite



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#8. Evaluate Alternative Strategies and Potential Impact on Risk Profile

- Strategy must align with mission, vision, and core values, and, risk appetite
- Must understand implications of and assumptions underlying strategy.
- Popular approaches to evaluating strategy include a SWOT analysis (strengths, weaknesses, opportunities, threats)

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#8. Evaluate Alternative Strategies and Their Potential Impact on Risk Profile

Guiding Principles for Risk	
• Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time. • Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time. • Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time.	• Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time. • Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time. • Risk is a function of the magnitude of the adverse event and the likelihood of its occurrence. Risk is not a static concept and can change over time.
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#8. Evaluate Alternative Strategies

Must be periodically re-evaluated and assessed.

Change strategy if business context results in exceeding risk capacity, or, requires more resources than available

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#8. Evaluate Alternative Strategies

Example: Changing a strategy at an all film global camera manufacturer ©

- Digital cameras reduced sales
- Company develops and sells digital cameras
- Change in strategy supported by aligned changes to business objectives and performance targets

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#9. Formulate Business Objectives—Consider Risk While Establishing Business Objectives

Example: Implications of a chosen business objective

- An agricultural producer considers cultivating organic produce
- Analyzes cost of transitioning to organic environment and too expensive! Threatens financial performance goals!
- Abandons business objective of selling organic produce

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#9. Formulate Business Objectives

Set and monitor performance targets and match to business objectives.

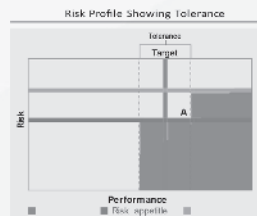
Business Objectives	Business Objective	Performance Measures and Targets
Business objectives (entity)	• Continue to develop innovative products that attract and excite consumers • Expand retail presence in the high-foot-traffic sector	• 5 products in R&D at all times • 5% growth year over year
Business objectives for North America (division)	• Increase shelfspace in leading stores that share our core values • Continue to source products in local markets	• 7% increase in shelf space • 92% local source rate
Business objectives for Quick-Discovery (operating unit)	• Develop high-quality and safe snack products that exceed consumer expectations	• 4.8 out of 5 in customer satisfaction survey
Business objectives for Human Resources (function)	• Maintain favorable annual turnover of employees • Recruit and train product sales managers in the coming year	• Turnover less than 10% • Recruit 450 sales managers • 95% training rate for sales staff

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#9. Formulate Business Objectives—Understanding and Using Tolerance

- Tolerance = acceptance range of performance variation
- Risk appetite is broad, tolerance is tactical (operational) and focused.
 - Tolerance is measured (in numbers)
 - Risk appetite may be stated in numbers (quantitatively) or in words (qualitatively, e.g., "low" or "high")



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#9. Formulate Business Objectives—Understanding and Using Tolerance

- Variations in performance, can exceed or trail targeted performance.
- Exceeding variation = positive
- Trailing variation = negative
- Tolerance may be set at different distances from target performance

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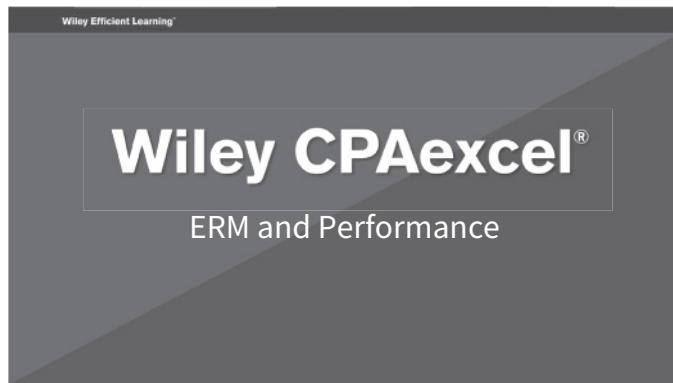
#9. Formulate Business Objectives—Understanding and Using Tolerance

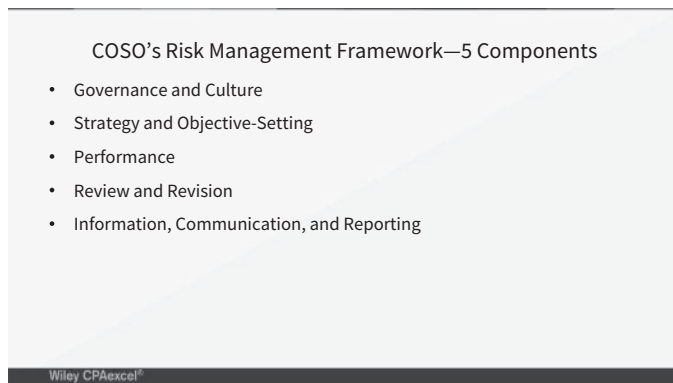
Example: Target Variation at a large beverage bottler

- Target = < five lost-time incidents in a year
- Tolerance = 0 to 7 incidents
- Exceeding variation (5 to 7) = potential lost time and safety claims (negative result)
- Trailing variation (< 5) = benefit

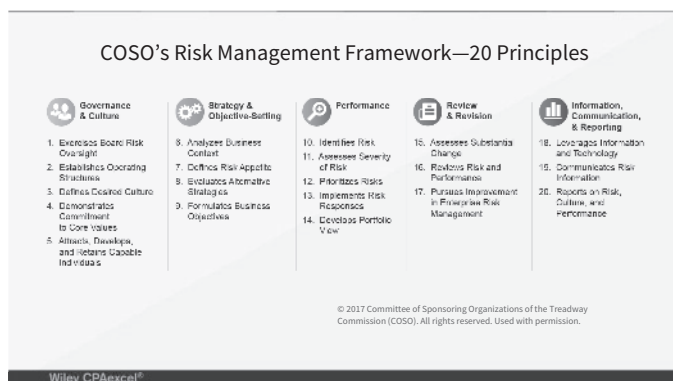
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ERM and Performance





- Governance and Culture
- Strategy and Objective-Setting
- Performance
- Review and Revision
- Information, Communication, and Reporting



Governance & Culture	Strategy & Objective-Setting	Performance	Review & Revision	Information, Communication, & Reporting
1. Exercises Board Risk Oversight	8. Analyzes Business Context	10. Identifies Risk	16. Assesses Substantive Change	18. Leverages Information and Technology
2. Establishes Operating Structures	7. Defines Risk Appetite	11. Assesses Severity of Risk	16. Reviews Risk and Performance	19. Communicates Risk Information
3. Defines Desired Culture	9. Evaluates Alternative Strategies	12. Prioritizes Risks	17. Pursues Improvement in Enterprise Risk Management	20. Reports on Risk, Culture, and Performance
4. Demonstrates Commitment to Core Values	10. Formulates Business Objectives	13. Implements Risk Responses		
5. Attracts, Develops, and Retains Capable Individuals		14. Develops Portfolio View		

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ERM Performance—Principles 10-14

10. Identify Risk—The organization identifies risk that impacts the performance of strategy and business objectives.
11. Assess Severity of Risk—The organization assesses the severity of risk.
12. Prioritize Risks—The organization prioritizes risks as a basis for selecting responses to risks.
13. Implement Risk Responses—The organization identifies and selects risk responses.
14. Develop Portfolio View—The organization develops and evaluates a portfolio view of risk.

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#10. Identify Risk—Risk Inventory and Impact

Uses operating structures to identify new and emerging risks to enable timely responses

Risks may arise from:

- Changing business objectives, business context
- Customer preferences
- Regulation
- Discoveries
- Cascading effects from previous changes

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#10. Identify Risk—Impacting Strategy and Business Objectives

Disruptive (substantial) effects potentially include:

- Emerging technologies
- Depleting natural resources
- Virtual entities
- Mobile workforces, labor shortages
- Shifts in lifestyle, healthcare, and demographics

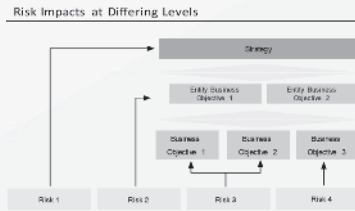
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#10. Identify Risk—Impacting Strategy and Business Objectives

Risk Inventory = listing of risks

More useful when categorized

Risk Impact



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#10. Identify Risk—Methods of Identifying Risk

- Multiple, acceptable approaches
- Many approaches are technology-based (e.g., data analytics and AI).
- Larger, complex organizations = multiple risk identification methods
- May be integrated into:
 - Ongoing processes (e.g., budgeting, planning and performance reviews)
 - Targeted activities (e.g., questionnaires, workshops, interviews)

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#10. Identify Risk—Methods of Identifying Risk

Methods include:

- Cognitive computing
- Data tracking and external sources
- Interviews, surveys
- Key risk indicators (KRIs) (help identify risk changes)
- Process analysis
- Workshops
- Surfacing Assumptions

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#10. Identify Risk—Risk Statements

Precise, well-formed risk statements preferred to vague statements

Describing Risk with Precision		
Clear Context and a Potential root causes	Business/Risk Description	Reduced Risk Description
	• Lack of training increases the risk that processing errors and accidents occur. • Low and mixed contribution to the risk that loss occurs from loss of data.	• The risk that processing errors impact the quality of manufacturing. • The risk of losing any employee and having to replace staff.
Potential impacts associated with a risk occurring	• Risk present: if loss occurs, but then planned, production capacity is reduced to support with increased orders, result in higher delivery times, a negative customer experience, effects on the company's reputation. • The risk of data loss affects the company's IT systems, but results in reduced customer risk, increased production, loss of customers, and negative news.	• The risk that customer orders production targets impact customer service. • The risk of data loss affects the company's IT systems, but results in reduced customer risk, increased production, loss of customers, and negative news.
Potential effects of poorly implemented risk responses	• The risk that loss occurs, but then planned, production capacity is reduced to support with increased orders, result in higher delivery times, a negative customer experience, effects on the company's reputation. • The risk that loss occurs, but then planned, production capacity is reduced to support with increased orders, result in higher delivery times, a negative customer experience, effects on the company's reputation.	• The risk of increased payments to customers impacting the company's financial results. • The risk of product defects impacting the company's reputation.

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#10. Identify Risk—Framing and Prospect Theory

Prospect theory

- Losses more consequential than gains
- Framing (i.e., gain vs. loss) influences assessment

Example: risk framed as gain (i.e., getting a sure thing vs. likelihood of getting \$), pick the sure thing (risk-averse choice)

Risk is framed as loss (i.e., losing something vs. likelihood of losing \$) pick risky alternative (a risk-seeking choice)

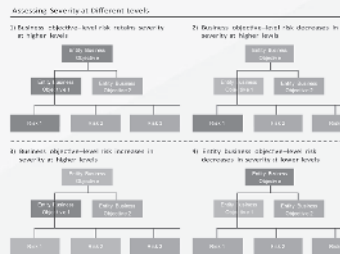
- The point: the way a risk is presented (gain or loss) influences assessments of it.

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#11. Assess Severity of Risk

At multiple organizational levels.

Risks at higher levels more likely to influence overall reputation and brand.



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#11. Assess Severity of Risk—Selecting Severity Measures

Impact: result or effect of risk, may be stated as range of impacts, may be positive or negative.

Likelihood: the possibility of a risk occurring expressed as a probability (in words or numbers), or, as a frequency. Examples:

- Words: “The possibility of a major fire ... within the next 12 months is remote.”
- Numbers: “The possibility of a major fire within the next 12 months is 5%.”
- Frequency: “A major fire in a manufacturing plant ... is likely once every 25 years.”

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#11. Assess Severity of Risk—Severity Measures

Assessed on same time horizon as strategy and business objectives.

Risk assessments may:

- Be in words or numbers.
- Use a variety of approaches, e.g., interviews, workshops, benchmarking, modeling, decision trees, Monte Carlo simulations.

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#11. Assess Severity of Risk—Example

Risk Type	Business Objective	Identified Risk	Target and Indicator	Severity Measures
Revenue	Revenue	The possibility that the organization's sales will decline due to a decrease in demand for its products.	Target: Increase sales by 10% over the next 12 months. Indicator: Sales volume.	From the organization's financial statements.
Revenue	Revenue	The possibility that the organization's sales will decline due to a decrease in demand for its products.	Target: Increase sales by 10% over the next 12 months. Indicator: Sales volume.	From the organization's financial statements.
Revenue	Revenue	The possibility that the organization's sales will decline due to a decrease in demand for its products.	Target: Increase sales by 10% over the next 12 months. Indicator: Sales volume.	From the organization's financial statements.

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#11. Assess Severity of Risk

Risk assessment should consider

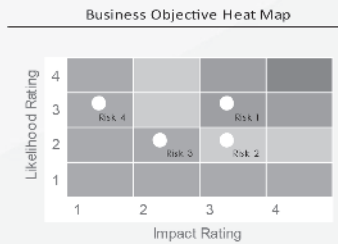
- Inherent risk (i.e., risk absent efforts to address).
- Target residual risk (i.e., desired risk after addressing).
- Actual residual risk (i.e., realized risk after addressing).

Actual residual risk $\leq$ target residual risk. Otherwise, must reduce risk.

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#11. Assess Severity of Risk—Heat Map

Displaying risk assessment results



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#11. Assess Severity of Risk

Risk-aware organization identifies triggers that prompt reassessment of risk severity.

- Triggers often changes in business context or risk appetite.
- Examples: increase in customer complaints, downturn in a critical economic index, sales decrease, spike in employee turnover or accidents.
- Triggers may also come from a competitor, e.g., recall of competitor's product, or, new competing product.

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#11. Assess Severity of Risk

Bias (e.g., through framing)... risk can be over- or under-estimated.
Careful presentation of risks (remember Prospect Theory) can reduce biases.

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#12. Prioritize Risks—for Risk Responses

Prioritization assesses risk severity compared to risk appetite.
Greater priority (importance) often given to risks that are likely to approach or exceed risk appetite.

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#12. Prioritize Risks—for Risk Responses

The criteria for prioritizing risks may include:

- Adaptability
- Complexity
- Velocity
- Persistence
- Recovery

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#12. Prioritize Risks—for Risk Responses

Risks with similar severity may receive differing priorities.

Example: Two similar severity risks

- One receives higher priority because it has greater velocity and persistence.

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#12. Prioritize Risks

Example: Prioritizing risk at large restaurant chain

- Risk that customer complaints remain unresolved > higher priority than risk of protracted contract negotiations with vendors.
- Both risks = severe.
- Speed and scope of online scrutiny has more likely and severe impacts on reputation, necessitating a quicker response.
- Hires social media experts to monitor, harvest and respond quickly to online customer complaints.

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#12. Prioritize Risks

Risk prioritization occurs at all levels.

Different risk priorities may be assigned at different levels.

Example: High-priority risks at operating level may be low-level risks at entity level.

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#13. Implement Risk Responses—Identify and Select Risk Responses

Acceptable risk response categories:

- Accept
- Avoid
- Pursue
- Reduce
- Share

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#13. Implement Risk Responses—Identify and Select Risk Responses

Acceptable risk response categories:

- May need to revisit business objectives and strategy to respond to a severe risk (e.g., threat of bankruptcy).
- Influences on risk responses include business context, costs and benefits, obligations and expectations, risk priority, risk appetite, and risk severity.
- Often easier to measure costs of risk responses than benefits

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#13. Implement Risk Responses

Example: Relationship of risk profile to risk appetite

- An insurance company implements risk responses
 - to address new regulatory requirements of record confidentiality and customer privacy
 - Response requires investment in technology infrastructure, changes in work processes
 - new staff required to implement objectives related to regulatory compliance

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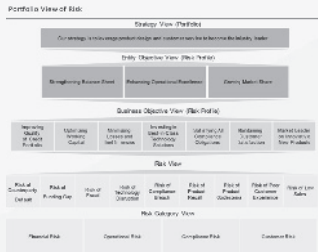
#14. Develop Portfolio View of Risk

Enables identification of severe risks at entity level. Assess: does residual risk profile align with risk appetite?

Multiple, acceptable methods for creating portfolio view of risk.

Example: begin with major risk categories and metrics, e.g., “capital at risk” (i.e., a loss to investors’ principal investment).

#14. Develop Portfolio View of Risk



#14. Develop Portfolio View of Risk

May represent differing levels of integration.

Four levels of integration:

- Minimal integration—the risk view
- Limited integration—risk category view
- Partial integration—risk profile view
- Full integration—portfolio view

#14. Develop Portfolio View of Risk—Analyzing

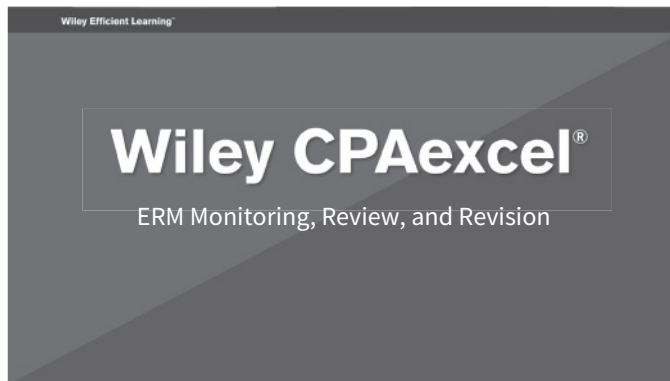
- Requires both quantitative (numeric) and qualitative (in words) risk assessment methods

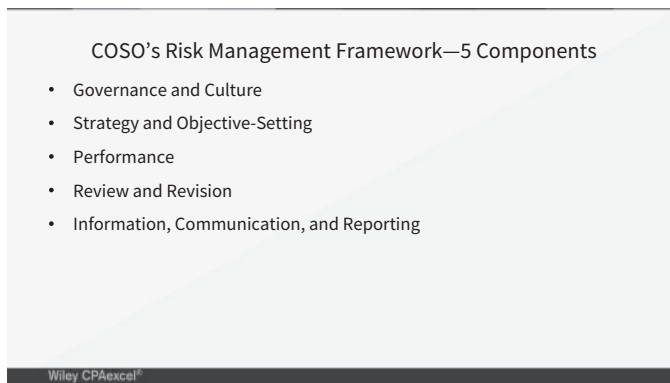
Need to “stress test” risk portfolio, to assess the effect of hypothetical changes in the business context (e.g., “what if sales drop by 10%?”).

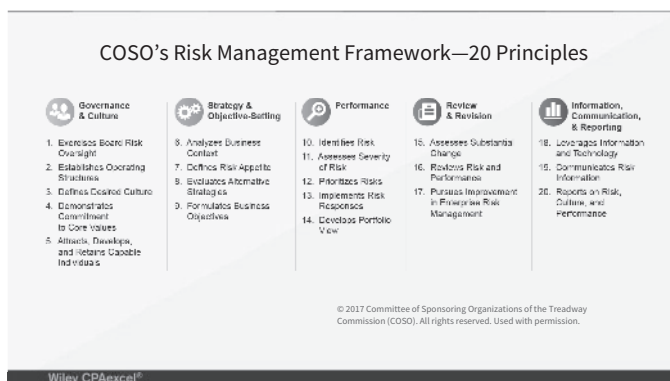
- To reveal new and emerging risks
- Clarify adequacy of planned risk responses

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ERM Monitoring, Review, and Revision







Monitoring, Review, and Revisions—Principles 15-17

- #15. Assess Substantial Change—The organization identifies and assesses changes that may substantially affect strategy and business objectives.
- #16. Review Risk and Performance—The organization reviews entity performance and considers risk.
- #17. Pursue Improvement in Enterprise Risk Management—The organization pursues improvement of enterprise risk management

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#15. Assess Substantial Change

- Changes bring new or altered risks
- Identify and integrate into risk portfolio
 - Identifying substantial changes
 - Post-event reviews, following substantial changes, can help determine lessons

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#15. Assess Substantial Change—Examples

In internal environment:

- Rapid growth
- Innovation
- Major changes in leadership or personnel

In external environment:

- Changing regulatory or economic environment can increase pressures

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#16. Review Risk and Performance

Periodically review ERM capabilities and practices.

Ask: **How has the entity performed?**

Example: Entity committed to opening five new office locations every year

- Can achieve strategy with three offices per year.
- Exceed risk appetite if open seven or more offices.
- Need to revisit strategy?

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#16. Review Risk and Performance

Review performance and related risks

Ask: **What risks influence performance?**

Actual risk > tolerance?

- Example: Risk of delays due permit requirements occurred and < new offices. Performance still acceptable?

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#16. Review Risk and Performance

Ask: **Is entity taking sufficient risk to attain target?**

Ask: **Is failure to achieve performance due to insufficient risk taking?**

Example: Open three offices.

- Assuming *too little* risk despite resources and plan to assume more?

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#16. Review Risk and Performance

Ask: **Were risk estimates accurate?**

Example: Entity opens five offices

- Observes that the estimated risk was < actual risks

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#16. Review Risk and Performance

If performance outside of tolerance, or risk profile unexpected

- Review business objectives, strategy, culture, target performance, severity of risk analysis, risk prioritization, risk responses or risk appetite
- Revising risk appetite requires review and approval by the board or other risk oversight body (e.g., a risk committee)

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#16. Review Risk and Performance

Example: Review and revision at a small retailer

- Purchases most inventory locally
- Weekly review of financial results
 - Result: locally produced goods insufficient to meet financial goals.
- Revises business objective of sourcing locally
 - Begins importing higher margin goods to improve financial performance.
- Change may influence other risks, including logistics (e.g., shipping), currency fluctuations, and lag times to acquiring inventory

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#16. Review Risk and Performance

Example: Performance at Local Colorado Government and Tourism

- Economy = mostly tourism
- City officials understand minimum, targeted, and maximum tourism to support financial objectives.
 - Occupancy rate = 50% (target) = sufficient revenue
 - Occupancy rate > 85% > risks
- Tracks patterns and data about tourism
 - Times marketing campaigns to attract tourists

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#17. Pursue ERM Improvement

May embed continual ERM evaluation in ongoing business processes and practices

Separate, periodic evaluations also useful

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#17. Pursue ERM Improvement

Opportunities:

- New technology (e.g., emerging data mining and automated content methods).
- Historical shortcomings (e.g., auto parts manufacturer + currency fluctuation risk).
- To support changing risks or governance structures (e.g. restructure to better align strategy with ERM).

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#17. Pursue ERM Improvement

- Risk appetite. Performance reviews enable refinement of risk appetite (e.g., monitoring = new product < volatile than expected).
- Risk categories. Revision and addition (e.g., new cyber risk threat).
- Communications. Identify outdated or inadequate communication processes (e.g., employees not reading emails. Highlight relevance and change media).

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#17. Pursue ERM Improvement

Peer comparison (benchmarking). Reviewing industry peer data may provide insight into industry performance tolerance (i.e., the range of acceptable outcomes).

- Example: A global shipping organization discovers → Asia underperforming. Revises strategy and objectives.

Business Context— Rate of change

- Example: mobile app software company vs. metal wholesaling business.

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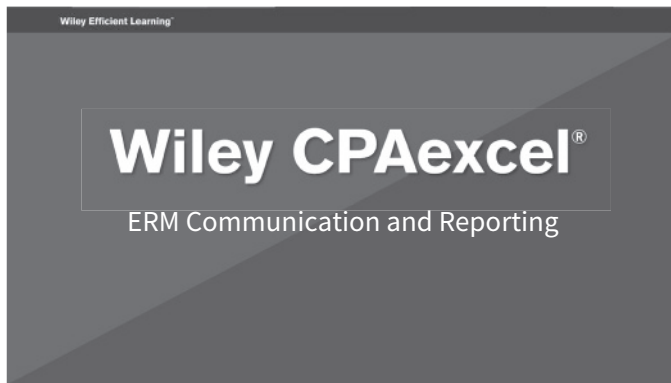
#17. Pursue ERM Improvement—Example

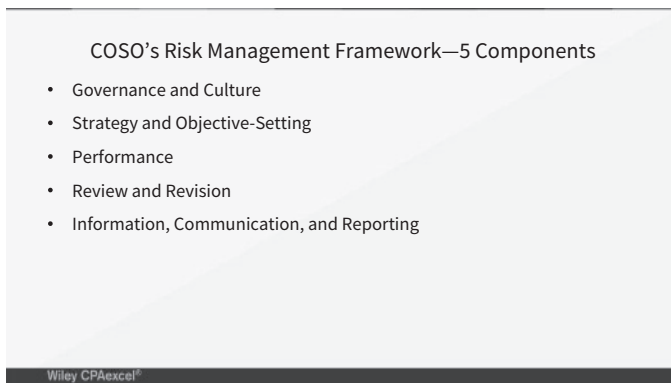
Continuous Improvement

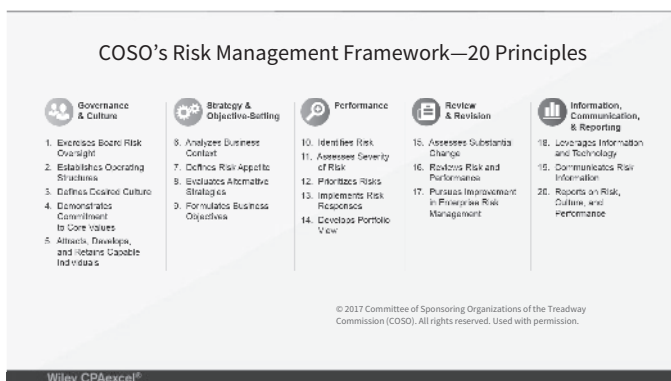
- Self-assessment indicates a government agency strong governance and culture
- Weak communication processes

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ERM Communication and Reporting







Information, Communicating, and Reporting

18. Leverage Information Systems—The organization leverages the entity's information and technology systems to support enterprise risk management.

19. Communicate Risk Information—The organization uses communication channels to support enterprise risk management.

20. Report on Risk, Culture, and Performance—The organization reports on risk, culture, and performance at multiple levels and across the entity.

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#18. Leverage Information Systems—to Support ERM

- For governance and culture: assess standards and related performance
 - Example: Professional service firms + standards independence with clients
 - Annual staff training reinforces standards
 - Management gathers information by testing the staff's knowledge + levels of compliance
- For strategy and objective-setting: stakeholder expectations of risk appetite
 - Example: Investor and customer expectations of risk appetite

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#18. Leverage Information Systems—to Support ERM

- For performance-related practices: assess competitors to understand risk changes
 - Example: A large residential real estate company assesses risk of losing market share to smaller boutique firms
 - Review competitors' commission pricing models & on-line marketing
- For review and revision: emerging ERM trends
 - Example: ERM conferences, industry-specific blogs and consortiums

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#18. Leverage Information Systems—Information/Data

Information can be:

- Structured (organized and searchable)
- Unstructured (unstructured and disorganized)
 - Increasing → big data (e.g., emails, text files, web pages)

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#18. Leverage Information Systems

Internal Data Sources:

Source	Examples of Data	Structured	Unstructured
Board and management meetings	Meeting minutes and notes		X
Documents and materials	Financial reports, policy documents, and other internal documents	X	X
Due diligence activities	Due diligence reports and documents	X	
Email	Internal email messages and attachments		X
Financial reports and disclosures	Financial statements and related disclosures	X	
Investor relations	Investor presentations and analyst reports		X
Marketing reports from internal marketing teams	Marketing reports and materials	X	
Website	Website content and analytics	X	X
Public relations	Press releases and media coverage		X
Social media and blogs	Social media posts and blog entries	X	X

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#18. Leverage Information Systems

Example: Drug testing—compliance requirements

- Pharmaceutical company strategy: develop targeted medications
 - Requires creating and reporting testing results and conclusions
 - Data from internal patient physiology and experience
 - Conclusions include demographics of tested sample, side effects, durations, and proposed applications

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#18. Leverage Information Systems

Effective data management includes:

- *Data and information governance*: processes for identifying data and risk owners and accountability
- *Processes and controls* to create and sustain reliable data
 - Example: processes to identify low- and high-quality data relative to requirements and standards

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#18. Leverage Information Systems

Effective data management includes:

- *Data management architecture*: design of technology and related data including models, policies, rules, or standards
 - Standards and rules for structuring information to enable harvesting, indexing, retrieving, and sharing

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#18. Leverage Information Systems

Example: wearable technologies reduce risk

A healthcare organization's objective → reduce elderly patients missing prescription doses.

- Risk: Missing dosages reduces benefits of medications and increases patient health risk.
- Risk response: Distribute wearable technology to patients.
- Identify cases of missed doses and track patient health.
- Result: Helps manage risk and informs patient-physician consultations.

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#19. Communicate Risk Information—to Support ERM

Important internal communications from management include:

- Entity's strategy, business objectives and performance expectations
- Desired behaviors and core values of culture
- The value and importance of ERM
- Entity's risk appetite and tolerance
- Expectations in ERM weakness, degradation, or failure

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#19. Communicate Risk Information—Board and Management Communication

Methods of communicating risk information may include:

- Electronic messages
- External, third-party materials
- Informal and verbal communications
- Public events
- Training and seminars
- Written internal displays
- Additional methods as required (e.g., whistleblower hotline)

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#19. Communicate Risk Information—Board and Management Communication

Example: a telecommunications company improved risk communication by revising its governance structure

- Removed board committee related to risk and, elevated its chief risk officer (CRO) position
- Goal: Improve risk discussion at board
- Result: Better risk discussion by full board

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#20. Report on Risk, Culture, and Performance

Report on risk, culture, and performance at multiple levels and across the entity

Risk report users may include:

- management
- board of directors
- risk owners
- assurance providers (e.g., internal and external auditors)
- external stakeholders (including regulators, rating agencies, community groups and others)

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#20. Report on Risk, Culture, and Performance—Types of Reporting

Portfolio view of risk

Profile view of risk

Analysis of **root causes** (asking “why”)

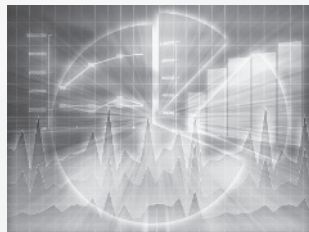
Sensitivity analysis (e.g., using Monte Carlo simulation)

Analyses of **new, emerging, and changing risks**

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#20. Report on Risk, Culture, and Performance—Types of Reporting

- Key performance indicators (KPIs)
- Key risk indicators (KRIs)
- Trends (i.e., over time)
- Incidents, breaches, and losses
- Track ERM plans and initiatives



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#20. Report on Risk, Culture, and Performance—Reporting Risk to Board

Includes formal and informal sharing

- Examples:
 - Informal discussions about the implications and risks of alternative strategies.
 - Regular, formal reporting about board's ERM oversight of management
- Focus on link between strategy, business objectives, risk and performance
 - Include the entity's portfolio view of risk

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#20. Report on Risk, Culture, and Performance—Culture Reporting

Measuring and reporting on culture is challenging

Reports about culture may include:

- Analytics of cultural trends (e.g., reports to whistleblower hotline)
- Benchmarking within an industry or to standards
- "Lessons learned"
- Trend reviews
- Surveys: risk attitudes and awareness

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#20. Report on Risk, Culture, and Performance—KRIs vs. KPIs

Key risk indicators (KRIs) measure emerging risks.

- Usually quantitative (e.g., expected number of security incidents per quarter), but sometimes qualitative (e.g., likelihood of major fire at a manufacturing plant)

Often reported with key performance indicators (KPIs)

- Key performance indicators (KPIs) provide high-level measures of organizational performance

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#20. Report on Risk, Culture, and Performance—KRIs vs. KPIs— Example

Accounting receivable (source: Beasley, Branson, & Hancock, 2010)

- KPI for customer credit = data about customer delinquencies and write-offs
- KRI = anticipate customer collection issues
 - Make credit function more proactive in addressing customer payment trends
- Example KRI: financial results of top 25 largest customers
 - Identify emerging trends that signal collection challenges

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#20. Report on Risk, Culture, and Performance—KRIs vs. KPIs— Example

Using Key Risk Indicators

- Government agency → retaining competent staff
- Business objective → annual turnover rate < 5%
- KRI = % of personnel eligible to retire within five years
 - If > 5% eligible to retire, higher risk to the target
- KPI = actual turnover rate
 - Based on historical performance

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Terms

Assumption: An assertion (belief) about the future that underlies ERM plan.

Bot: A software application that runs automated (usually simple) tasks (scripts) on the internet.

KPI: High-level measures of historical performance

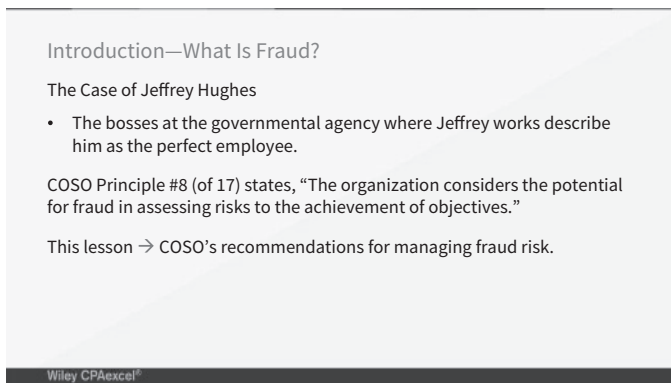
KRI: Leading (predictive) indicators of emerging risks

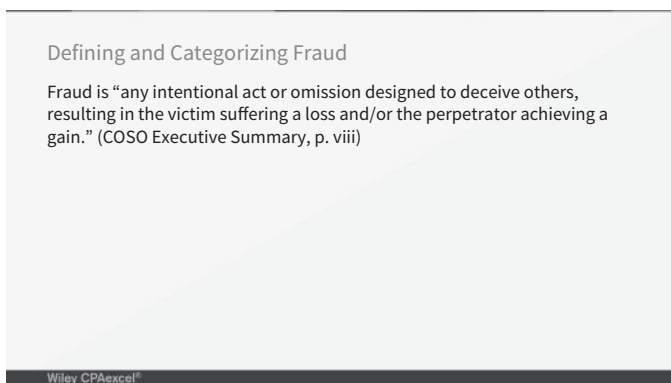
Risk Owners: Managers or employees who are accountable managing identified risks

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Fraud Risk Management







COSO's Four Categories of Fraud

- Reporting fraud: financial
- Reporting fraud: nonfinancial
- Misappropriation of assets
- Other illegal acts and corruption

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Reporting Fraud: Financial

- An intentional misstatement of accounting information
- Often includes a goal of improving financial results by overstating income or assets, understating losses or expenses, or misleading disclosures.
- Alternatively, may misstate to evade or avoid taxes or smooth earnings
- Examples:
 - Improper revenue recognition through backdating agreements (recognizing unshipped goods as sales)
 - Channel stuffing (shipping excess products to retailers)

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Reporting Fraud: Nonfinancial

- Manipulating nonfinancial reports, including environmental, health, safety, production, quality, or customer reports
- Falsifications of nonfinancial reports often result from management setting unrealistic performance targets
- Examples:
 - Volkswagen's software to falsify pollution emission data
 - Falsifying employee credentials to improve the company's reputation

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Misappropriation of Assets

Theft or misuse of tangible or intangible assets by employees, customers, vendors, hackers, or criminal organizations

Examples:

- Vendors submitting inflated or fictitious invoices
- Customers making false claims for damaged or returned goods
- Employees stealing tangible or intangible assets

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Other Illegal Acts and Corruption

Violations of laws or regulations that may have a material impact on the financial statements

Examples—bribes, kickbacks, “gratuities” (i.e., gifts to purchasing agents)

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IT and Fraud

- IT can both facilitate fraud and help prevent and detect fraud.
- The accounting system...and fraud risk
 - Bad design = increased fraud risk
 - Good design = decreased fraud risk

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IT Fraud Risk Examples

Reporting fraud: financial

- Hackers or employees gain unauthorized access to accounting applications.
- System controls may include fail-safe mechanisms that can be overridden in some circumstances. These fail-safe mechanisms can, in some situations, facilitate inappropriate access to systems.

Reporting fraud: nonfinancial

- E.g., Volkswagen, employees may override controls to falsify non-financial reports.

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IT Fraud Risk Examples

Misappropriation of assets

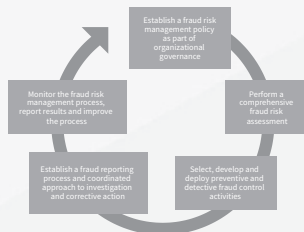
- Access to both accounting records and assets creates many opportunities for theft (e.g., creating fictitious vendors and “paying” falsified invoices).

Other illegal acts and corruption

- Data theft and abuse is an increasing problem (e.g., theft of Netflix episodes, North Korean theft and hack of Sony).

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COSO's Five Fraud Risk Management Principles



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COSO's Fraud Risk Management Principles

Link to COSO's five components of internal control (i.e., the rows in the cube below).



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Principle 1—Control Environment

Establish and communicate a fraud risk management program that demonstrates:

- Expectations of board of directors and senior management.
- Commitment to high integrity and ethical values in managing fraud risk.



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Principle 1—Control Environment (continued)

Focal points:

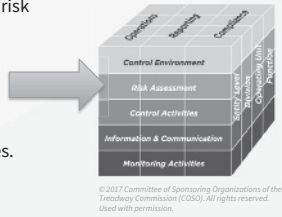
- Map fraud risk management program to organization's goals and risks.
- Establish fraud risk governance roles and responsibilities throughout the organization.
- Document the program and communicate throughout the organization.

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Principle 2—Risk Assessment

Implement a comprehensive fraud risk assessment that

- Identifies fraud risks.
- Assesses their likelihood and significance.
- Evaluates fraud control activities.
- Implements actions to mitigate residual fraud risks.



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Principle 2—Risk Assessment (continued)

Focal points—Managing the risk assessment process:

- Involve appropriate management including all organizational management levels and functions.
- Data analytics to assess risks and evaluate responses.
- Periodically reassess fraud risk.
- Document risk assessment.

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Principle 2—Risk Assessment (continued)

Focal points—Risk assessments:

- Analyze internal (e.g., activities) and external (e.g., customers, vendors, environment) risks.
- Consider distinct types of fraud (see earlier four categories of fraud).
- Consider the risk of management override of controls.
- Estimate the likelihood and significance of identified risks.
- Assess personnel and departments → fraud triangle (opportunity, incentives and pressure, attitudes or rationalizations).

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Principle 2—Risk Assessment (continued)

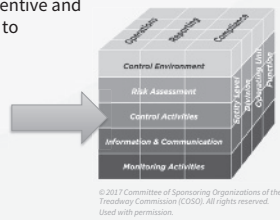
Focal points—Fraud controls and responses:

- Identify existing fraud controls and their effectiveness.
- Determine risk responses.

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Principle 3—Control Activities (continued)

Select, develop, and deploy preventive and detective fraud control activities to reduce risk of fraud events occurring or not being detected in a timely manner.



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Principle 3—Control Activities (continued)

Focal points:

- Promote fraud deterrence through preventive and detective controls.

Consider:

- Organization- and industry-specific risks and activities.
- Controls at differing organizational levels.
- Risk of management override of controls.
- Integration with fraud risk assessments.

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Principle 3—Control Activities (continued)

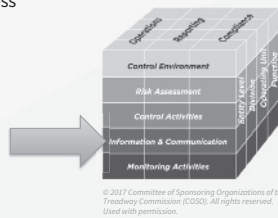
Consider:

- Multiple, synergistic fraud control activities (e.g., a defense-in-depth strategy).
- Proactive data analytics (see examples later in lesson).
- Control through policies and procedures.

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Principle 4—Information and Communication

- Establish communication process to obtain information about potential fraud.
- Address fraud through coordinated approach to investigation and corrective action.



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Principle 4—Information and Communication (continued)

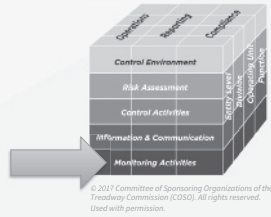
Focal points:

- Create fraud investigation and response protocols.
- Conduct and document investigations.
- Communicate investigation results.
- Implement corrective actions.
- Evaluate investigation performance.

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Principle 5—Monitoring Activities

- Select, develop, and perform ongoing evaluations to ascertain functioning of five principles of fraud risk management.
- Communicate fraud risk management program deficiencies in a timely manner to responsible parties for corrective action (may include senior management and board of directors).



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Principle 5—Monitoring Activities (continued)

Focal points:

- Ongoing and separate evaluation.
- Influences on scope and frequency of monitoring (e.g., changing fraud risks, personnel changes).
- Known and emerging fraud cases.
- Establish appropriate management criteria.
- Evaluate, communicate, and remediate deficiencies identified through monitoring.

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Fraud Risk Management Process

Example—Revenue recognition fraud—relevant questions:

- Sources and drivers of company revenue
- Product Mix—many homogeneous products or a few heterogeneous products
- Revenue transactions automated or manual
- Industry-specific fraud risks
- Revenue recognition
 - Incentives or pressures
 - Data used by external stakeholders

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Fraud Risk Management Process (continued)

Example—HR procedures for fraud management:

- Background, credit, and criminal checks
- Fraud risk management training
- Evaluating performance and compensation programs
- Annual employee surveys
- Exit interviews
- Implement a whistleblower system
- Old news (segregation of duties, transaction-level controls)

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Fraud Risk Management Process (continued)

Use of data analytics to address fraud triangle:

- Incentive and pressure – Data analytics to identify management practices and business processes that encourage risks of misbehavior
- Opportunity – Data analytics through monitoring (i.e., confirmation of) key controls
- Attitudes and rationalization – Data analytics by changing attitudes (less fraud because of known monitoring)

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Data Analytics Plan to Support Fraud Risk Management

- Analytics design – Map risks to data sources and data availability. Create work plan, timeline, and deliverables.
- Data collection – Map data to planned analytics tests, validate data.
- Data organization and calculation – Execute work plan, adapt analytics to available data, use advanced methods.
- Data analysis – Evaluate analytics results. Develop scoring models for risks. Adapt and tune model.
- Findings, observations, and remediation – Request supporting documents to assist in directing action. Determine triage and escalation procedures to determine report levels. Develop remediation plan for issues.

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Data Analytic Tools for Fraud Risk Management (continued)

- Data stratification – Sorting or categorizing data
- Risk scoring – Weighting, aggregating and comparing fraud risks
- Data visualization – Detecting changes and trends, e.g., heat map, fraud dashboard
- Trend analysis – Data over time and across locations, e.g., ratio analysis over time or across locations

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Data Analytic Tools for Fraud Risk Management (continued)

- Fluctuation analysis – Detect anomalies (e.g., unusual transactions, missing but expected transactions)
- Statistical analysis and predictive modeling – Often used in continuous auditing and monitoring systems
- Integrating external data sources – e.g., emerging fraud risks, industry trends, regulatory actions, economic indicators

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Lesson Quiz (Application)

Black Earth Construction of Baton Rouge does road construction for the state of Louisiana (LA). Most LA road construction contracts are awarded in a “competitive bidding” process. Louisiana is ranked (on several lists) as the “most corrupt” U.S. state. The bidding process for road construction in Louisiana has a reputation for “under the table” payments to those awarding the contract.

The new CEO of Black Earth (B. Eartha Noir) has asked you to consult with her about how to manage the issue of fraud in the business. Write an initial memo about issues that you will discuss with her in this meeting.

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Black Earth Mini-Case

To clarify: This is a consulting, not an audit, engagement (BEC, not auditing).

Type of fraud: Concerned with all but corruption is first concern.

Required:

- Knowledge of LA contracting law and governmental bidding process
- Forensic accounting exercise

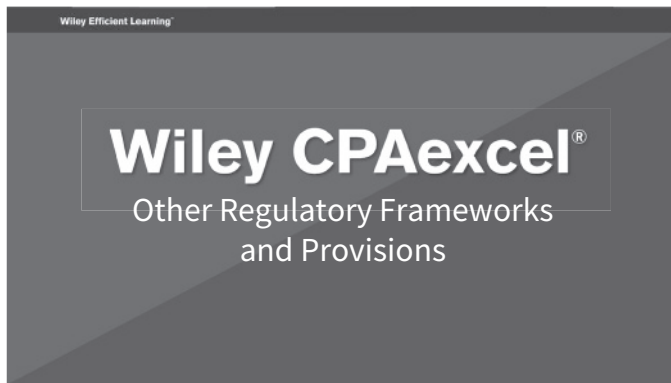
Initial concern: kickbacks (payments) to public officials

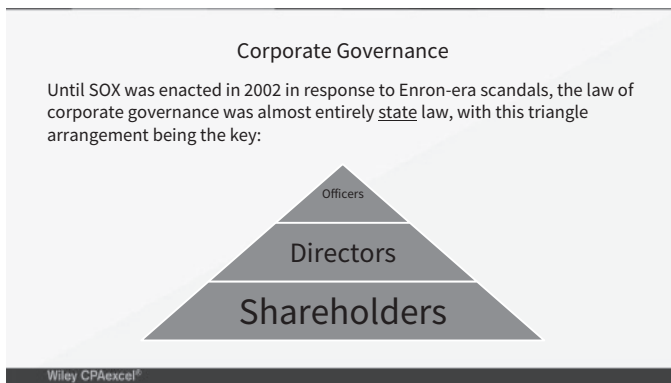
- Ask for her understanding of how the kickback payments process.

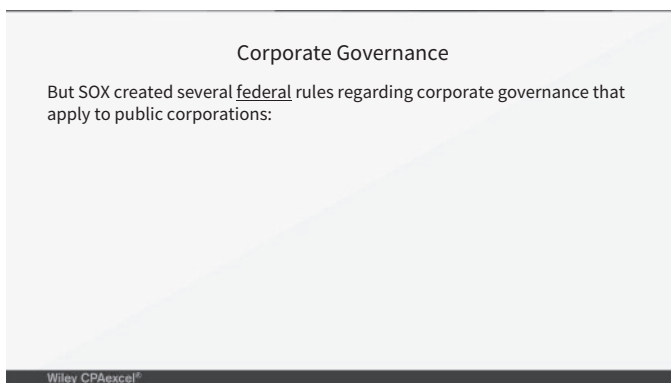
Outline goals and five steps of fraud management process for her.

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Other Regulatory Frameworks and Provisions







Corporate Responsibility

Audit Committees:

- Hire, supervise, compensate, and fire outside auditors
- All members must be independent and at least one must be a “financial expert”
- Must set up procedures for handling tips from whistleblowers and preserving confidentiality

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Corporate Responsibility

CEOs and CFOs must certify:

- That they have reviewed the quarterly and annual reports that their companies must file with the SEC
- That to their knowledge the reports do not contain any materially untrue statements or half-truths
- That based on their knowledge the financial information is fairly presented

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Corporate Responsibility

CEOs and CFOs must also certify that:

- They are responsible for establishing and maintaining their company's *internal financial controls*
- They have designed such controls to ensure the relevant material information is made known to them
- They have recently (within 90 days) evaluated the effectiveness of the internal controls
- They have presented in the report their conclusions about the controls' effectiveness.

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Corporate Responsibility

And they must certify:

That they have reported to the auditors and the audit committee regarding:

- All significant deficiencies and material weaknesses in the controls
- Any fraud, whether or not material, that involves management or other employees playing a significant role in the internal controls

And they must indicate whether or not there have been any significant post-evaluation changes in the controls that could significantly affect the controls.

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Corporate Responsibility

Misleading Auditors. It is a crime “to fraudulently influence, coerce, manipulate, or mislead” an auditor for the purpose of rendering financial statements misleading.

Clawbacks. If an issuer must materially restate its financial statements as a result of “misconduct,” which apparently need not be intentional, the CEO and CFO shall reimburse the company for bonuses received due to the misstatement and for any profits they realized from sale of the company’s stock during that period.

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Enhanced Financial Disclosures

Financial Statement Shenanigans

- **Off-balance sheet transactions.** SOX requires F/S filed with the SEC disclose all material off-balance sheet transactions that might have a material impact on the financial statement. Transactions motivated not by economics but by accounting and reporting concerns are discouraged.
- **Pro forma financial statements.** When issuing pro forma F/S, companies must include the most directly comparable GAAP financial measures and a reconciliation of the two.

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Enhanced Financial Disclosures

Improper Loans

SOX prohibits public companies from making personal loans to their top officers and directors. Such loans are now permitted only if they are made:

- On market terms
- In the ordinary course of business
- Also made available to the public

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Enhanced Financial Disclosures

Auditing Internal Financial Controls

SOX 404 requires outside auditors of public companies to audit both:

1. The F/S
2. The internal financial reporting process that create them

CFO Code of Ethics

Public companies must disclose whether or not they have adopted a code of ethics for senior financial officers and, if not, the reasons why.

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Enhanced Financial Disclosures

What are the attributes of an Audit Committee "Financial Expert"?

They have:

- An understanding of GAAP and F/S
- An ability to assess the general application of these principles in connection with accounting for estimates, accruals, and reserves
- Experience preparing, auditing, analyzing or evaluating F/S that present a breadth and level of complexity comparable to those presented by the issuer's F/S, or experience actively supervising persons engaged in such activities
- An understanding of internal controls and procedures for financial reporting
- An understanding of audit committee functions

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Enhanced Financial Disclosures

How does one attain these “financial expert” attributes?

- Education and experience as a principal financial officer, principal accounting officer, controller, public accountant or auditor or experience in one or more positions that involve the performance of similar functions
- Experience actively supervising such a person
- Other relevant experience

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Corporate and Criminal Fraud Accountability

Destruction, alteration, or falsification of records in federal investigations and bankruptcy. SOX punishes anyone who “knowingly alters, destroys, mutilates, conceals, covers up, falsifies, or makes a false entry in any record, document, or tangible object with the intent to impede, obstruct, or influence the investigation or proper administration of *any* matter within the jurisdiction of any agency or department of the United States” or in any bankruptcy case filed under Ch. 11.

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Corporate and Criminal Fraud Accountability

Destruction of corporate audit documents. SOX also requires “any accountant” who audits a public company to “maintain all audit or review workpapers” for five years after the conclusion of the audit. Willful violation is a crime.

--Note: Sec. 103 requires working papers be kept for 7 years.

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Corporate and Criminal Fraud Accountability

SOX provides a civil damages action for public company whistleblowers who are retaliated against for providing information involving federal securities law violations *or other frauds* that might damage shareholders.

The provision covers investigations conducted by federal agencies, members of Congress or their staffs, or persons with supervisory authority over the employee.

Whistleblowers are protected if their belief that legal violations have occurred is *reasonable*, even if mistaken.

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White-collar Crime Penalty Enhancements

SOX imposes criminal punishments upon those officers who intentionally certify SEC filings containing inaccurate financial statements.

Other provisions increase punishments for:

- Conspiracy to commit securities fraud
- Committing mail and wire fraud
- Criminally violating ERISA

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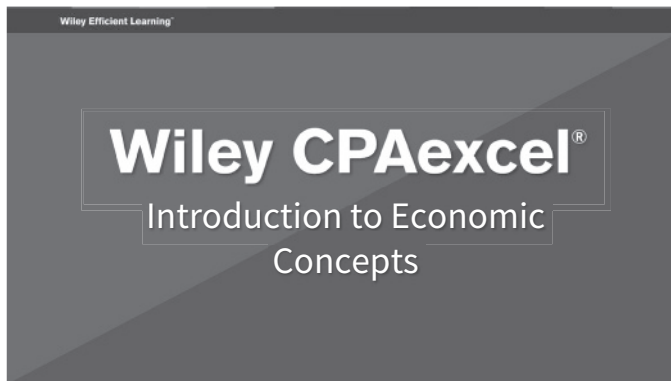
Corporate Fraud Accountability

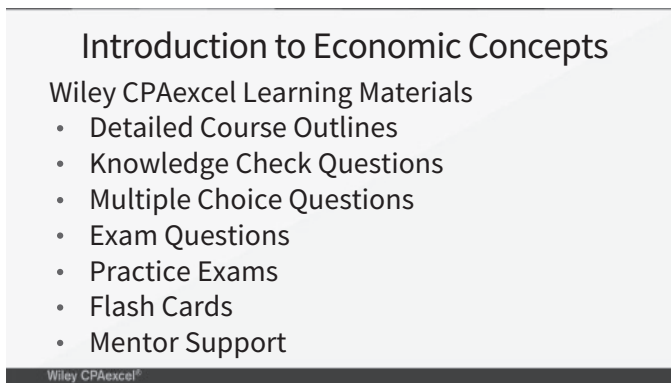
SOX makes it a crime to retaliate against an informant providing truthful information relating to the commission of *any* federal crime to law enforcement officers.

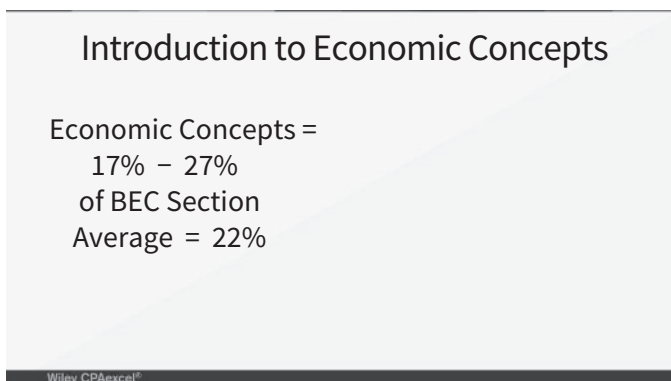
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Economic Concepts and Analysis

Introduction to Economic Concepts







Economic Concepts

Economics: Is concerned with the allocation of scarce resources among alternative uses.
For business and for the CPA Exam the focus is on the:

- Production
- Distribution, and
- Consumption of goods and services

The usual objective is to maximize or optimize desired outcomes.

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Major Subsections

There are three major areas of economics:

1. **Microeconomics:** Concerned with economic activity at the level of the individual decision-making units.
2. **Macroeconomics:** Concerned with economic activity at the national level.
3. **International Economics:** Concerned with economic activity across national boundaries.

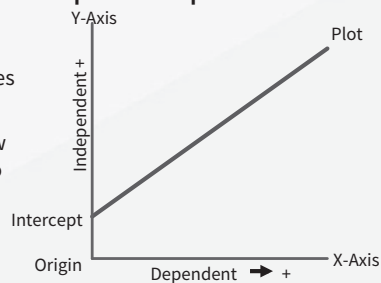
Our material will follow this breakdown.

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Graphs and Graph Components

Graph: Diagram that shows the relationship between two sets of values (or variables).

Economics: Used to show relationship between two variables (e.g., price and quantity).

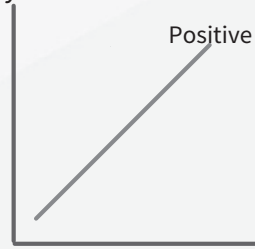


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Graphs and Positive Relationships

The plotted line slope may be:

- **Positive:** Indicating the two variables move in the same direction

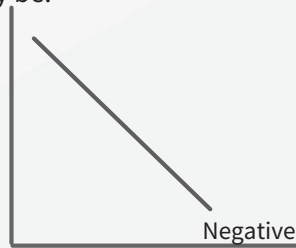


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Graphs and Negative Relationships

The plotted line slope may be:

- **Negative:** Indicating the two variables move in opposite directions

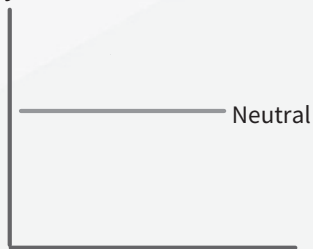


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Graphs and Neutral Relationships

The plotted line slope may be:

- **Neutral:** Indicating that one variable does not change with changes in the other variable

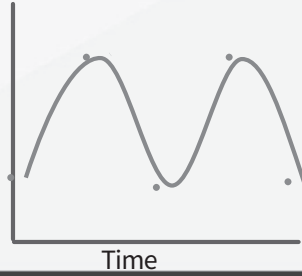


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Graphs and Time Relationships

The plotted line slope may be:

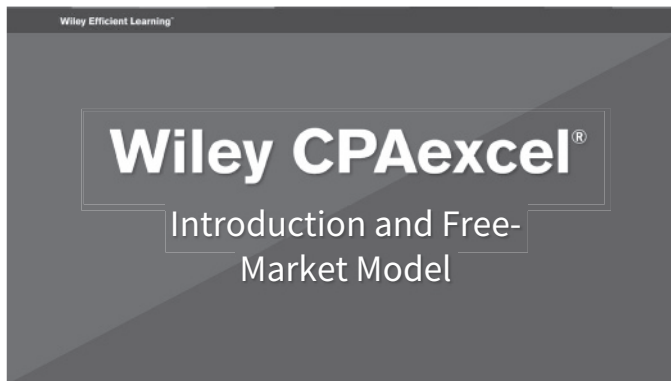
- **Time series graph:**
Shows the change in a variable over time (the x-axis)
- The horizontal axis measures time.



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Microeconomics

Introduction and Free-Market Model



Microeconomics

Microeconomics: Study of how individuals, households, firms and other single entities make economic decisions to allocate their limited resources.

- Focus is on individual decision-making units.

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Economic Systems

Economic activity takes place within an economic system.

- **Command Economic System:** Government determines the production, distribution and consumption of goods and services.
- **Market Economic System:** Individuals, businesses, and other distinct entities determine the production, distribution, and consumption of goods and services.

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Demand



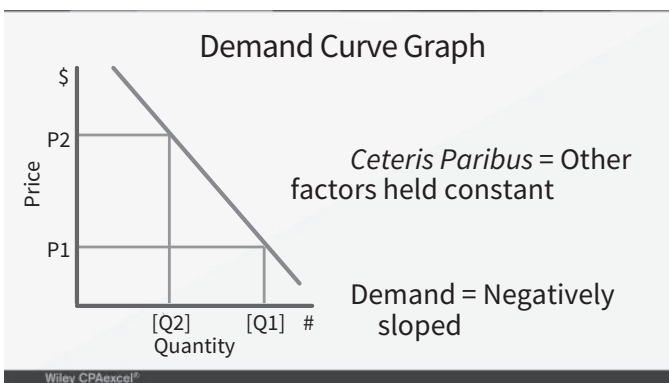
Demand Defined

Demand: Desire, willingness and ability to acquire a commodity.

A demand schedule shows the quantity of a good or service that will be demanded at various prices.

The quantity demanded and price are inversely related:

- More of a good or service will be demanded at a lower price than at a higher price.



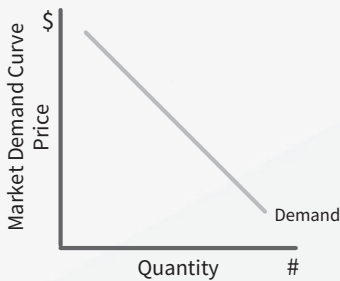
Demand Curve Relationships

Two factors cause the negatively sloped demand curve:

- Income effect—Individuals can purchase more units at a lower price than at a higher price.
- Substitution effect—Lower-priced items will be purchased as substitutes for higher-priced items; as the price for Product A goes up, consumers will switch to its substitute Product B.

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Market Demand



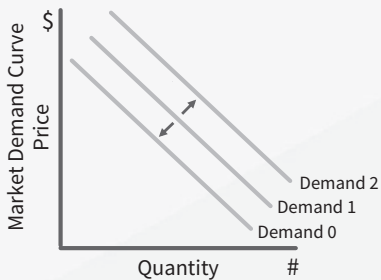
Sum of individual demand curves =
Market demand curve

Along a given demand curve, only
price changes; other factors are
unchanged

Movement along
Demand Curve =
Change in
Quantity Demanded

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Changes in Demand



Change in demand =
Shift in demand curve

Factors other than price
change:

- Size of market
- Wealth of buyers
- Price of other goods
- Buyer preferences
- Etc.

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Changes in Demand

Many factors can influence a change in demand.

Two factors of note that influence changes in demand are:

- A change in the price of a substitute commodity
 - A substitute commodity satisfies the same basic purpose as the commodity of concern.
 - The price of the substitute commodity and demand for commodity of concern move in same direction.

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Changes in Demand

The two factors of note that influence changes in demand:

- Change in the price of a complementary commodity
 - A complementary commodity is used jointly with the commodity of concern.
 - The price of the complementary commodity and demand for commodity of concern move in opposite directions.

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Change in Quantity Demanded vs. Change in Demand

Change in quantity demanded is movement along a given demand curve as a result of a change in price only.

- All other factors are assumed unchanged.

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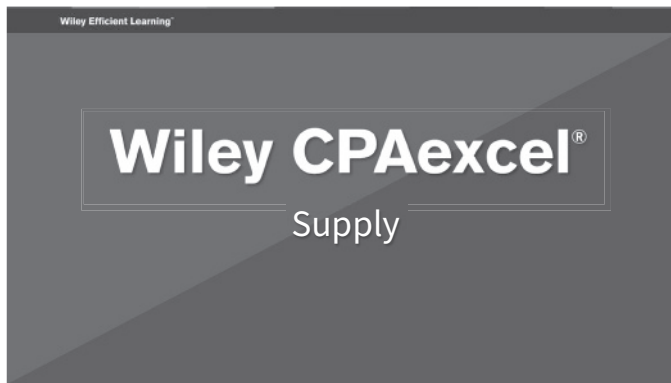
Change in Quantity Demanded vs. Change in Demand

Change in demand causes a shift in the demand curve.

- Shift results from factors other than price:
 - Demand decreases = curve shifts left and down.
 - Demand increases = curve shifts right and up.

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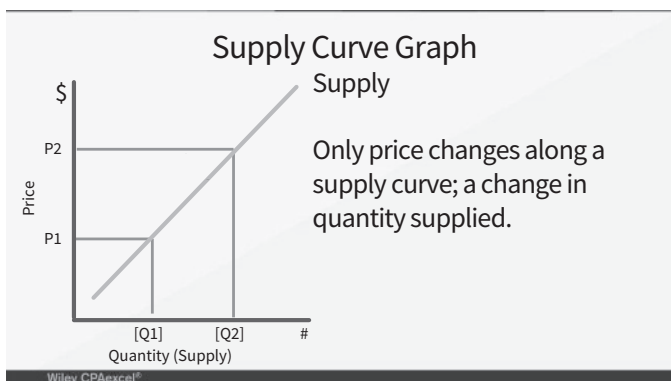
Supply

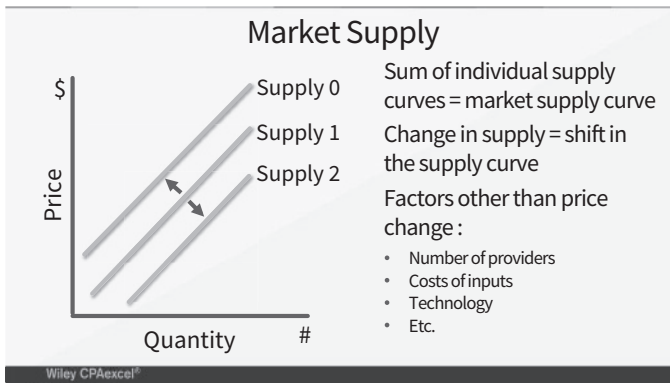


Supply Defined

Supply is the quantity of a good or services that will be provided at different prices.
Because increasing output normally results in higher per unit cost, more goods will be provided only at higher sales prices. Consequently, the supply curve has a positive slope. The law of diminishing returns accounts for the higher per unit cost.

- We cover law of diminishing returns later.





Change in Quantity Supplied vs. Change in Supply

A change in quantity supplied is movement along a given supply curve as a result of a change in price only.

- All other factors are assumed unchanged.

A change in supply causes a shift in the supply curve.

- Shift results from factors other than price:
 - Supply decreases = Curve shifts left and up
 - Supply increases = Curve shifts right and down

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Market Equilibrium



Market Equilibrium

Market equilibrium occurs where market demand intersects market supply.

That intersection establishes equilibrium quantity and price.

At market equilibrium:

- Demand in the market just takes the supply provided, and
- Supply in the market just meets demand

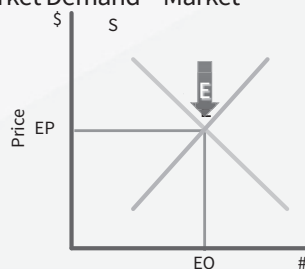
Market Equilibrium Graph

Market Equilibrium: Market Demand = Market Supply

At equilibrium price there is neither a shortage nor a surplus.

What would cause a shortage or surplus?

D



Market Shortages and Market Surpluses

Market shortages occur when the actual price charged is less than equilibrium price.

- Lower actual price means demand will exceed supply.
- Example: rent controls

Market Surpluses occur when the actual price charged is more than equilibrium price.

- Higher actual price means supply will exceed demand.
- Example: minimum wage

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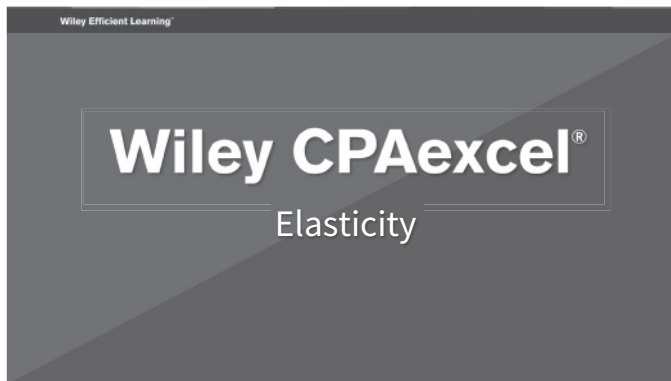
Changes in Market Demand and/or Changes in Market Supply

Causes of a change in market equilibrium:

- If **demand only changes**—equilibrium quantity and price will change in the same direction as demand.
- If **supply only changes**—equilibrium quantity will change in the same direction as supply, but equilibrium price will change in opposite direction.
- If **both demand and supply change**—the new equilibrium quantity and price will depend on direction and magnitude of each change.

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Elasticity



Elasticity of Demand Formula

Elasticity of Demand = $\frac{\% \text{ Change in Quantity}}{\% \text{ Change in Price}}$

Example Facts:

	PRICE	QUANTITY
Pre-change	\$1.50	1,500 Units
Post change	<u>2.00</u>	<u>1,200</u> Units
Change	\$.50	300 Units
Percentage change:	\$.50/\$1.50	300/1,500
	= .333	= .20
Elasticity of Demand =	.20/.333 = .60 (Inelastic)	

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Elasticity of Demand Outcomes

Elasticity of Demand = $\frac{\% \text{ Change in Quantity}}{\% \text{ Change in Price}}$

Calculated Outcome	Elasticity Called	Meaning In % Change
> 1	Elastic	Q Demand > Price
= 1	Unitary	Q Demand = Price
< 1	Inelastic	Q Demand < Price

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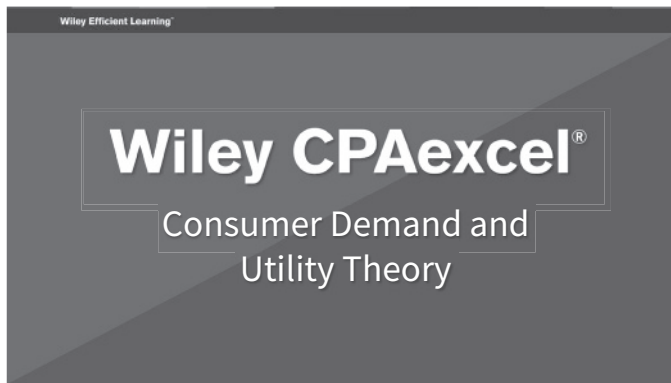
Elasticity of Demand and Total Revenue

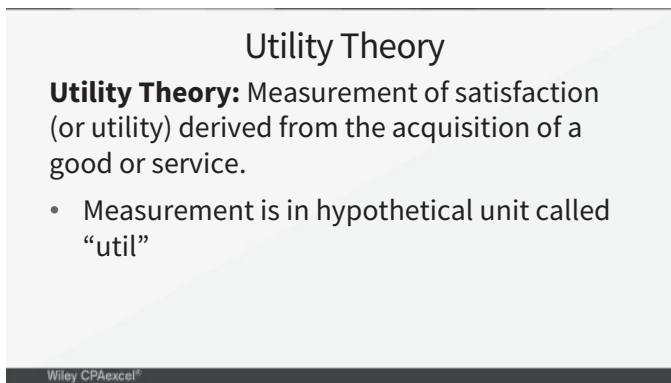
Elasticity of demand outcome directly determines the impact of a change in price on Total Revenues (TR):

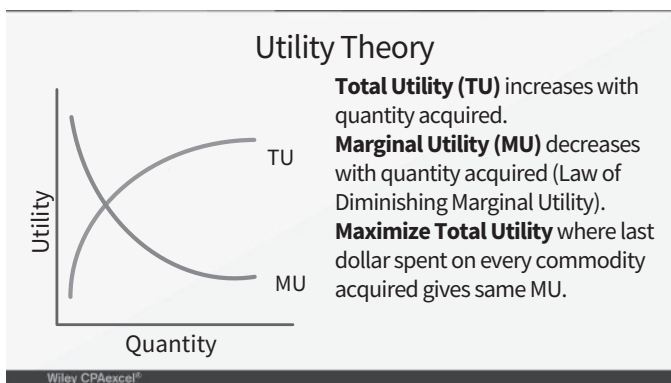
Elasticity Outcome	Price Increase	Price Decrease
>1	TR Decrease	TR Increase
$=1$	TR No Change	TR No Change
<1	TR Increase	TR Decrease

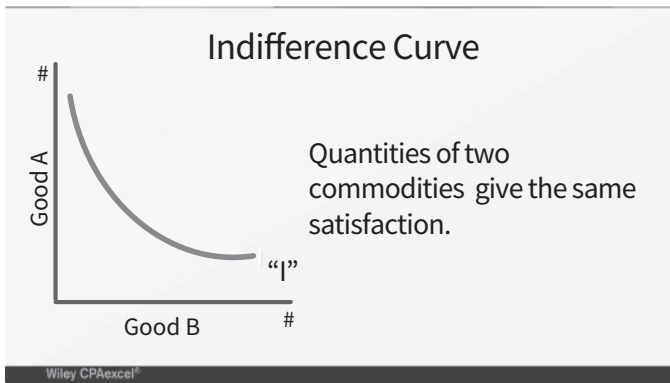
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Consumer Demand and Utility Theory

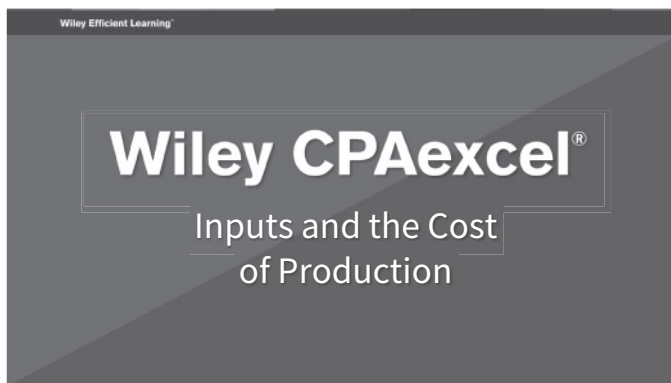








Inputs and the Cost of Production



Periods of Analysis

Short-Run Analysis: Period during which at least one input to the production process cannot be varied.

- Example: size/capacity of a production line

Long-Run Analysis: Period during which all inputs to the production process can be varied.

- Example: size/number of plants can be changed

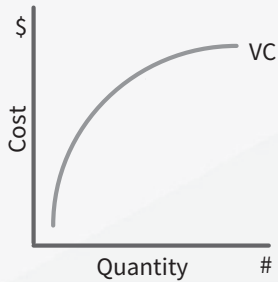
Short-Run Cost Concepts

The graph shows a coordinate system with "Cost" on the vertical axis (labeled with a dollar sign \$) and "Quantity" on the horizontal axis (labeled with a hash #). A horizontal line is drawn across the graph, labeled "FC" at its right end, representing Total Fixed Cost.

Total Fixed Cost (FC): Does not change with changes in the level of output.

- Examples: real property taxes, insurance, contracted rent, etc.

Short-Run Cost Concepts



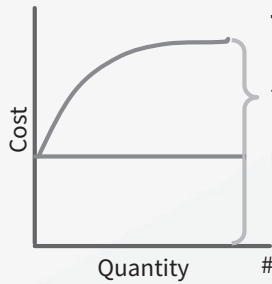
Total Variable Cost (VC):

Varies directly with changes in the level of output.

- Examples: raw materials, direct labor, electricity, etc.

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Short-Run Cost Concepts



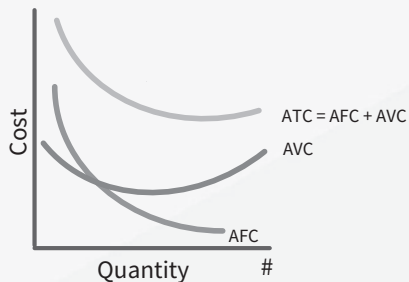
Total Cost (TC): Total fixed cost (FC) + Total variable cost (VC)

$$TC = VC + FC$$

FC

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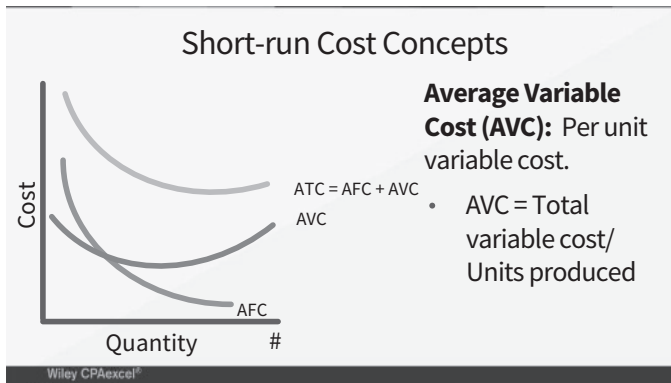
Short-Run Cost Concepts

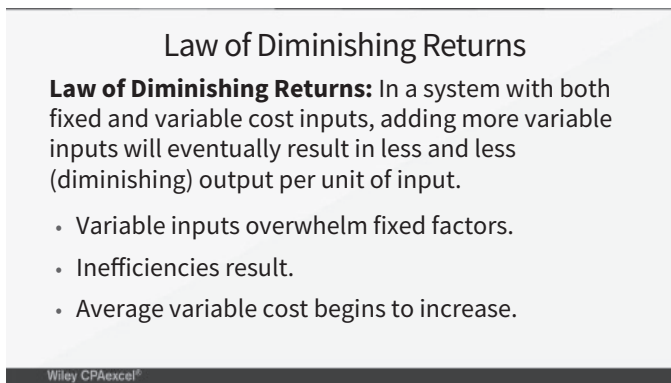


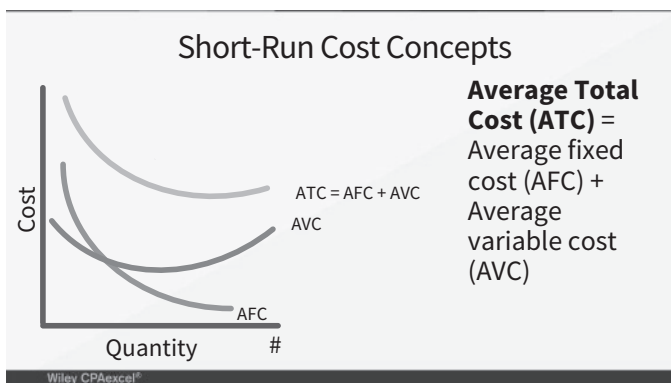
Average Fixed Cost (AFC): Per unit fixed cost.

- $AFC = \text{Total fixed cost} / \text{Units produced}$

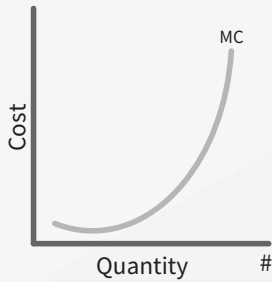
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Short-Run Cost Concepts



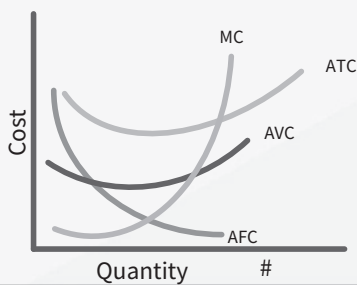
Marginal Cost (MC): Cost of last acquired unit of input.

Computed as:

- Change in successive variable costs, or
- Change in successive total costs

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Average Cost and Marginal Cost



A graph of average cost curves and the marginal cost curve shows that marginal cost (MC) crosses AVC and ATC at their lowest point.

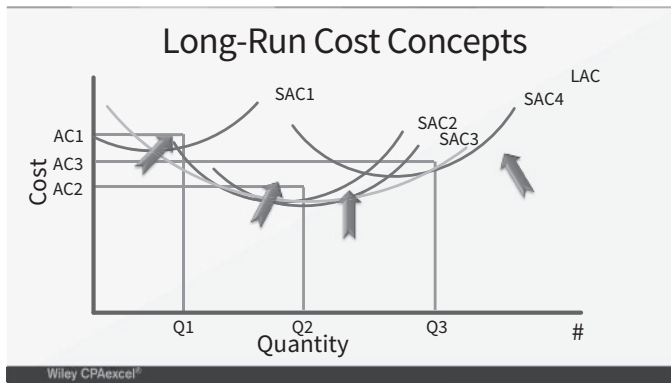
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Long-Run Cost Concepts

Long-Run: All cost are variable, including size and number of plants.

Long-Run Average Cost Curve: Developed as minimum points on a series of short-run average cost curves for different size or number of plant facilities.

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Economies of Scale

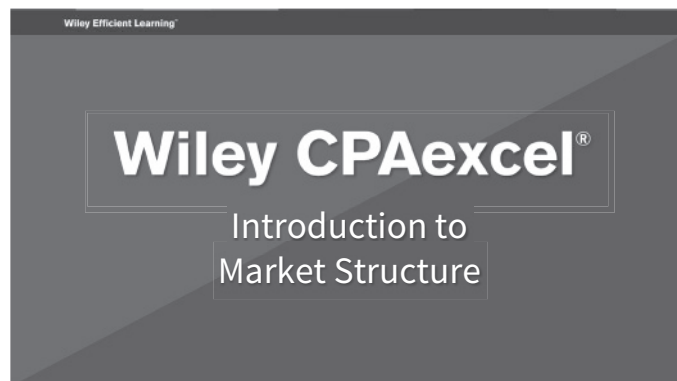
U-shaped long-run average cost curve shows:

- Where downward sloping = economies of scale: Quantity of output increases in **greater** proportion than increase in all inputs.
- Where minimum (no slope) = constant return to scale: Quantity of output increases in **equal** proportion to increase in all inputs.
- Where upward sloping = diseconomies of scale: Quantity of output increases in **lesser** proportion than the increase in all inputs.
 - Caused by coordination/communication problems

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Market Structure and Firm Strategy

Introduction to Market Structure



Basic Market Structures

Market structure is the economic environment within which a firm produces and distributes its good or service.

The primary factors that distinguish different market structures are:

- Number of sellers and buyers in the market
- Nature of the commodity in the market
- Difficulty of entry into the market

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Basic Market Structures

Conceptually, market structures exist along a continuum with perfect competition at one extreme and perfect monopoly at the other extreme.

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Basic Market Structures

Any number of market structures could be identified between those extremes.

We consider four different market structures:

1. Perfect competition
2. Perfect monopoly
3. Monopolistic competition
4. Oligopoly

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Perfect Competition

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Perfect Competition

Characteristics of Perfect Competition

Perfectly competitive market or industry is characterized by:

- Large number of independent buyers and sellers, each too small to affect price.
- Firms sell a homogeneous product.
- Market entry and exit are easy.
- Buyers and sellers have complete information.

Such a market is virtually nonexistent in modern society, but analysis is useful to understand a number of economic factors.

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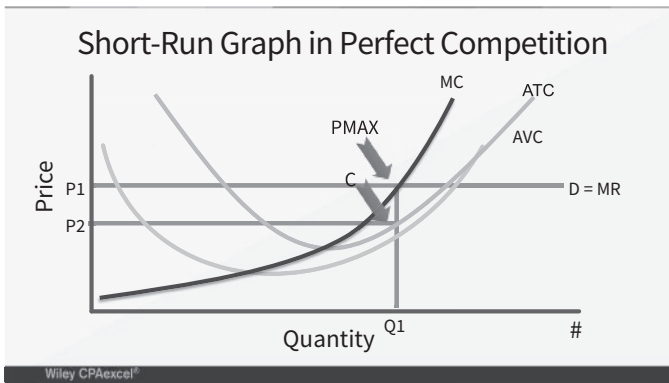
Characteristics of Perfect Competition

A market with all of the characteristics of perfect competition is virtually nonexistent in modern society.

Nevertheless, analysis of an assumed perfectly competitive market is useful to understand a number of economic factors, including:

- Production
- Pricing, and
- Profits

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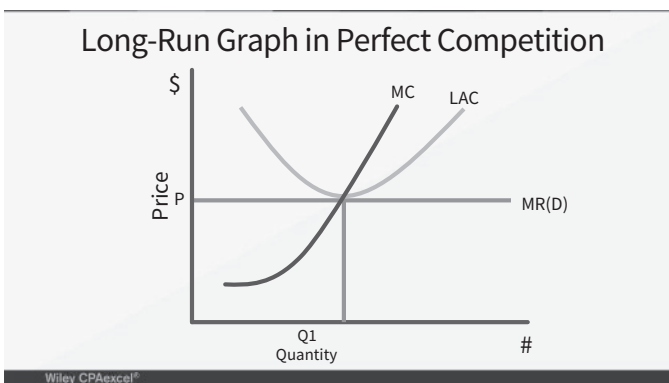


Short-Run Analysis in Perfect Competition

Short-run result depends on firm's Average Total Cost (ATC)/ Average Variable Cost (AVC) vs. market price:

- Market price > ATC = Short-run profit
- Market price = ATC = Breakeven in short-run
- Market price < ATC, but > AVC = Short-run losses, but covering some fixed cost
- Market price < ATC and < AVC = Short-run losses on each unit—therefore exit market

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Perfect Monopoly



Characteristics of Perfect Monopoly

A perfect monopoly market or industry is characterized by:

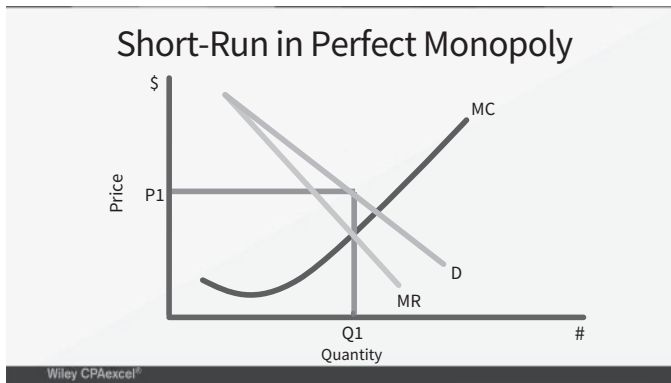
- Single seller
- Good or service for which there are no close substitutes, and
- Market entry is restricted

In a monopoly market: Single firm = Market

Bases for Monopoly Firms

There are two basic reasons monopolies exist:

- **Economies of Scale:** A single producer can produce at a lower cost than multiple producers.
 - Example: Public utilities
 - Called "natural monopoly"
- **Legal Authority or Control:** A single producer has sole legal authority or sole control of resources.
 - Example: holding a patent



Short-Run Analysis in Perfect Monopoly

Short-run result depends on the firm's Average Total Cost (ATC) vs. Market Price:

- $ATC < \text{Market price} = \text{Profit}$
- $ATC = \text{Market price} = \text{Breakeven}$
- $ATC > \text{Market price} = \text{Loss}$

Monopoly does not assure firm of profit!

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Long-Run Analysis in Perfect Monopoly

Monopolistic firm produces where $MR = MC$.

- It can make a profit in the long-run and can increase profits in the long-run by:
 - Reducing marginal and average cost by changing plant size
 - Increasing demand by advertising and promotions

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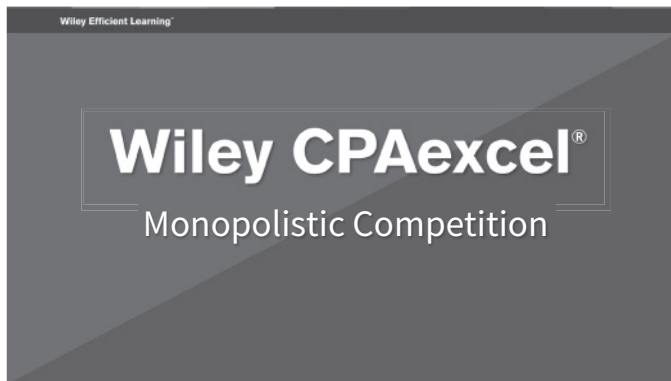
Long-Run Analysis in Perfect Monopoly

Monopolistic firms result in higher price and inefficient use of resources compared with perfect competition.

- Price at optimum output $>$ MC (= excess profit)

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Monopolistic Competition



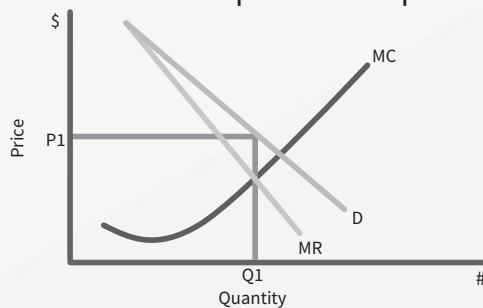
Characteristics of Monopolistic Competition

Monopolistic competition is characterized by:

- Large number of sellers.
- Firms sell differentiated product, or one that is similar, but not identical.
- Product sold has close substitutes
- Market entry and exit are easy.

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Short-Run in Monopolistic Competition



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Short-Run Analysis in Monopolistic Competition

Short-run result depends on firm's Average Total Cost (ATC) vs. market price:

- $ATC < \text{Market price} = \text{Profit}$
- $ATC = \text{Market price} = \text{Breakeven}$
- $ATC > \text{Market price} = \text{Loss}$

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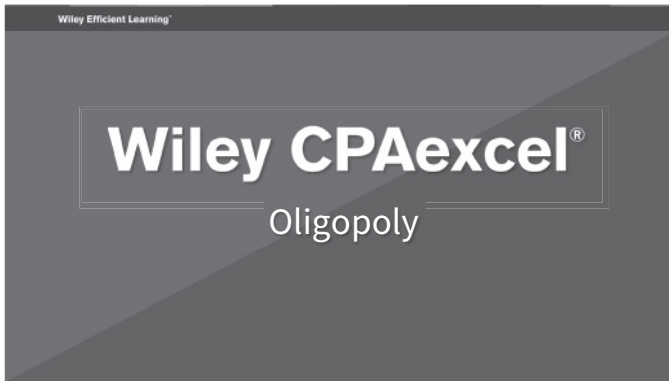
Long-Run Analysis in Monopolistic Competition

Long-run analysis:

- Firms making profit = firms enter market
= less demand for each
- Firms have loss = firms leave market
= more demand for each
- Equilibrium = all firms just break even; no long-run excess profits
- Resources are misallocated vis-à-vis perfect competition because $P > MC$

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Oligopoly

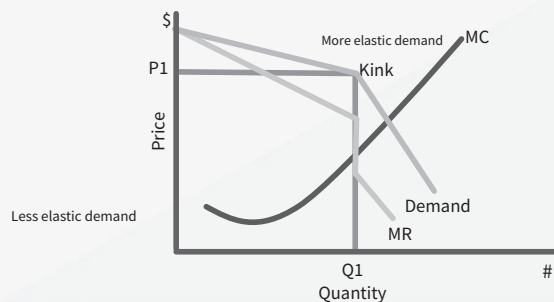


Characteristics of Oligopoly

Oligopoly is characterized by:

- Few sellers
 - Firms that sell either homogeneous or differentiated products, and
 - Market entry is restricted.
- Few sellers in the market means there is interdependence among sellers.
- The actions of each seller affects other sellers.

Short-Run Graph in Oligopoly



Short-Run/Long-Run Analysis in Oligopoly

Short-run results depend on the firm's Average Total Cost (ATC) vs. market price:

- $ATC < \text{Market price} = \text{Profit}$
- $ATC = \text{Market price} = \text{Breakeven}$
- $ATC > \text{Market price} = \text{Loss}$

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Short-Run/Long-Run Analysis in Oligopoly

Long-run result:

- If firms make profits in the long-run, the firms can continue to make profits because entry is restricted.
- $\text{Price} > MC = \text{Misallocation of resources}$

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Oligopoly Market Analysis

Because there are a few sellers in an oligopoly market there is interdependence among firms.

Each firm makes production, price and other economic decisions taking into account the possible responses of other firms.

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Oligopoly Market Analysis

As a result, price tends not to change, because a change could result in a “price war.”

Firms tend to compete on factors other than price:

- Advertising/promotion
- Packaging
- Service

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Oligopoly Market Analysis

Oligopoly firms may seek to cooperate with each other to benefit all firms in the market.

Overt collusion which involves conspiring to set outputs, prices or profits among firms is illegal in U.S.

Tacit collusion which involves firms following prices set by the market leader is not illegal.

- Example: airline industry

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Summary of Market Structure

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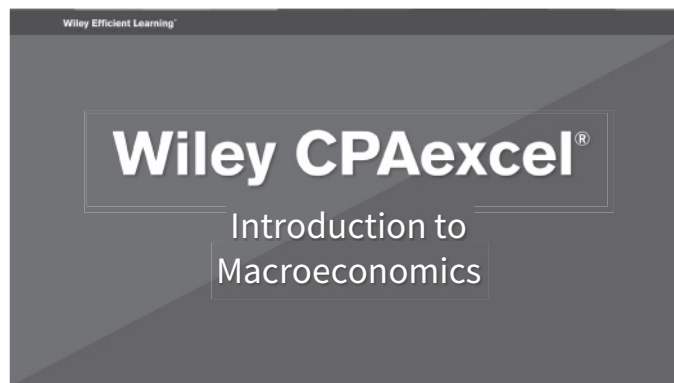
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Summary of Market Structure

Market Characteristics Summary				
Characteristic	Perfect Competition	Monopolistic Competition	Oligopoly	Perfect Monopoly
# of Firms	Very Many	Many	Few	One
Type of Product	Homogenous	Differentiated	Homogenous or Differentiated	Unique
Ease of Entry	Very Easy	Fairly Easy	Difficult	Very Difficult
Firm Price Setting Ability	None (Price Taker)	Some	Limited	Full (Price Setter)
Long-run Profits	None	None	Possible	Possible
Economic Efficiency	High	Less Than PC	Less Than PC	None
Sample Industry	None	Fast Food, Cosmetics	Oil, Cigarettes	Some Utilities

Macroeconomics

Introduction to Macroeconomics



Macroeconomics

Macroeconomics: Study of economic activity and outcomes for an entire economy.

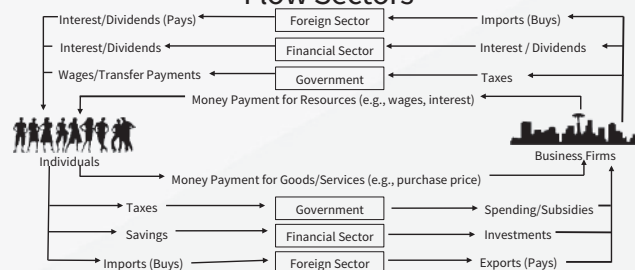
- Focus is on free-market U.S. economy.

At macroeconomic level we need to expand the earlier two sector flow model introduced in Microeconomics to add the role of:

- Government
- Financial sector
- Foreign sector (imports/exports)

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Free-Market Flow Model— Flow Sectors



Free Market Model: Five-Sector

Leakages: Individuals' income not spent on domestic consumption:

- Taxes
- Savings
- Imports

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Free Market Model: Five-Sector

Injections: Additions to domestic production not from individuals' expenditures:

- Investment expenditures
- Government spending
- Exports

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Aggregate Demand



Aggregate Demand Defined

Aggregate Demand: Total spending in economy (spending approach to GDP)

Sum of all market demand curves

Aggregate demand is the sum of:

- Consumption spending
- Investment
- Government spending
- Net exports (net imports would be subtracted)

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Consumption Spending Defined

Consumption Spending: Spending by individuals on goods and services.

- Does not include new housing (that is Investment)
- Accounts for about 70% of aggregate U.S. spending
- Primarily determined by Personal Disposable Income (PDI)

Several measures are associated with consumption.

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Measures of Consumption

Consumption Function: Measures the relationship between Personal Disposable Income (PDI) and Consumption Spending (CS).

- $CS > PDI$ = Borrowing (going in debt) or spending savings
- $CS < PDI$ = Savings or reducing debt

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Measures of Consumption

Average Propensity to Consume (APC): Measures the percent of disposable income (PDI) spent on consumption (CS).

- Example: If $PDI = \$1.00$ and $CS = .85$, then $APC = 85\%$
- Average Propensity to Save (APS) = Reciprocal of APC
- $APS + APC = 100\%$

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Measures of Consumption

Marginal Propensity to Consume (MPC): Measures the change in consumption spending as a percent of the change in disposable income.

- Example: If \$1.00 additional disposable income is received and .90 is spent on consumable goods, $MPC = 90\%$
- Marginal Propensity to Save (MPS) is the reciprocal of MPC
- $MPC + MPS = 100\%$

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Investment Defined

Investment Spending: Spending on capital items, including:

- Residential construction
- Non-residential construction
- Business property, plant and equipment
- Business inventory

Accounts for about 15% of aggregate U.S. spending:

- Tends to fluctuate more than consumption

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Factors Influencing Investment Spending

- **Interest rates:** Perhaps the most significant factor
- Demographics
- Consumer confidence
- Consumer income and wealth
- Level of capacity utilization
- Technological advances
- Vacancy rates
- Current and expected levels of sales

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Government Spending Defined

Government Spending: Purchase of goods and services by all levels of government.

- Excludes transfer payments—not for goods or services
- Changes in government spending typically impact taxes, which impact personal disposable income, which change personal consumption
 - Changes normally occur in different periods
- Changes in government spending are also financed by government borrowing

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Government Spending and Aggregate Demand

Government directly affects aggregate demand by changes to:

- Government spending
- Government taxation

Discretionary Fiscal Policy: Government changes to spending or taxation to impact aggregate demand.

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Discretionary Fiscal Policy Actions

Fiscal Policy Action	To Increase <u>Aggregate Demand</u>	To Decrease <u>Aggregate Demand</u>
Government Spending	Increase	Decrease
Taxation	Decrease	Increase
Transfer Payments	Increase	Decrease

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Exports/Imports Defined

Exports: Amount of foreign spending on U.S. goods

Imports: Amount of U.S. spending on foreign goods

Net Exports = Exports – Imports

- Positive = Exports > Imports: Increases aggregate demand
- Negative = Imports > Exports: Decreases aggregate demand
- U.S. = Net import country

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Factors Influencing Imports/Exports

Primary factors influencing a country's relative imports/exports include:

- Relative levels of income and wealth
- Relative currency exchange rates
- Relative price levels
- Relative inflationary rates
- Import/export restrictions and tariffs

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Change in Aggregate Demand

Change in Aggregate Demand: Shift in aggregate demand curve.

- Caused by factors other than price change

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Change in Aggregate Demand

Example of factors that would shift curve outward:

- Reduction in personal or corporate taxes
- Improved consumer confidence
- New technology resulting in increased investment
- Interest rate declines
- Government spending increases
- Exports increase/Imports decrease
- Increases in wealth (e.g., stock market gains)

Opposite effects would shift curve inward.

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Multiplier Effect

Multiplier Effect: Ripple effect of a change in demand on total change in demand.

- Example: Increased investment spending = more personal income = more consumption spending
- A change in spending is multiplied as it flows through the economy

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Multiplier Effect

Multiplier effect measured using marginal propensity to consume (MPC).

- Multiplier = Change in spending $\times [1/(1 - \text{MPC})]$

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Multiplier Effect Measured

Example: Assume MPC = .80

- Investment spending = + \$10,000,000
- Multiplier = $\$10 \text{ M} \times [1/(1 - .80)] =$
 $\$10 \text{ M} \times [1/.20] =$
 $\$10 \text{ M} \times 5 = \$50 \text{ M}$
- An increase in investment spending of \$10 million would cause an increase in demand of \$50 million.

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Aggregate Supply



Aggregate Supply Defined

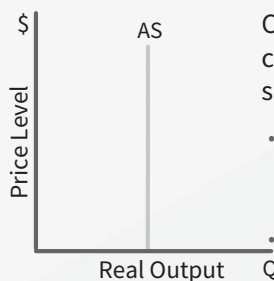
Aggregate Supply: Total output of goods and services produced in the economy at different price levels.

Aggregate supply curve slope depends on theory followed:

- Classical aggregate supply curve
- Keynesian aggregate supply curve
- Conventional aggregate supply curve

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Classical Aggregate Supply Curve

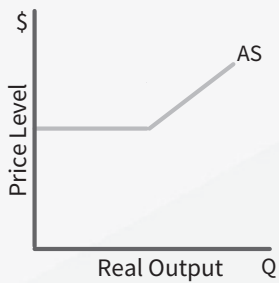


Classical aggregate supply curve = completely vertical supply curve

- No change in output as price increases at full employment
- It may be associated with the very short-term

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Keynesian Aggregate Supply Curve

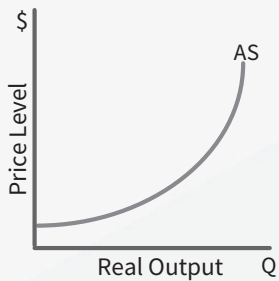


Keynesian aggregate supply curve = Horizontal up to the output at full employment, then slopes upward

- Increasing supply at a price until full employment, then increased supply **only** with increased price

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Conventional Aggregate Supply Curve



Conventional aggregate supply curve = Continuous positive slope that is steeper for output after full employment

- At full employment, prices increase proportionately faster than output supplied.

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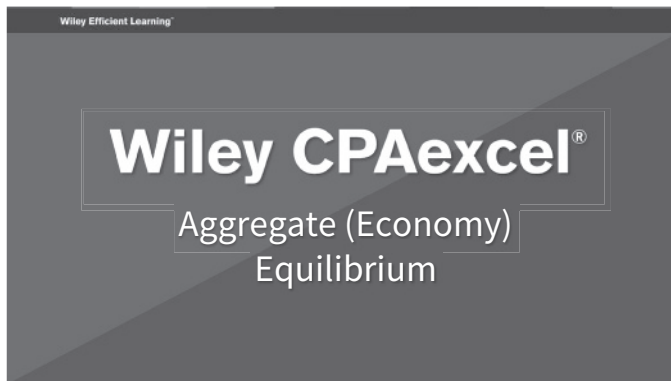
Changes in Aggregate Supply

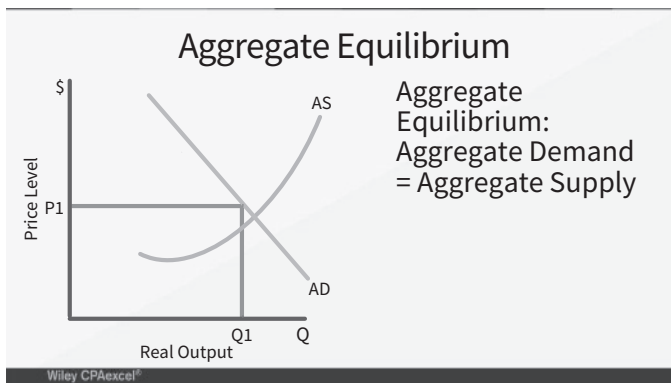
Change in Aggregate Supply: Shift in aggregate supply curve.

- Factors other than price change
- Example of factors that would shift curve outward:
 - Resources available increase
 - Cost of resources decrease
 - Technological advances occur
- Opposite effects would shift curve inward.

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Aggregate (Economy) Equilibrium





Changes in Aggregate Demand and/or Changes in Aggregate Supply

Changes in aggregate demand and/or aggregate supply will change aggregate (economy) equilibrium.

The new aggregate equilibrium will depend on:

- Whether demand or supply is increased or decreased
- The extent of each increase and/or decrease
- Which theoretical supply curve is assumed

Changes in Aggregate Demand and/or

Changes in Aggregate Supply

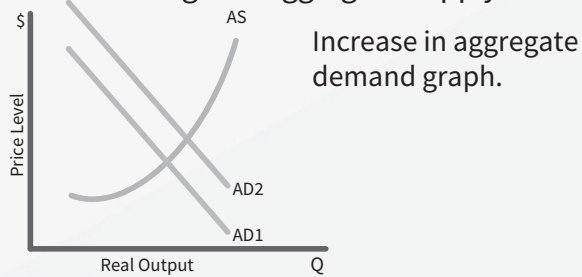
Assuming conventional supply curve =
Continuous upward sloping supply curve:

- Demand only changes—Equilibrium quantity and price will change in the same direction as demand.

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Changes in Aggregate Demand and/or

Changes in Aggregate Supply



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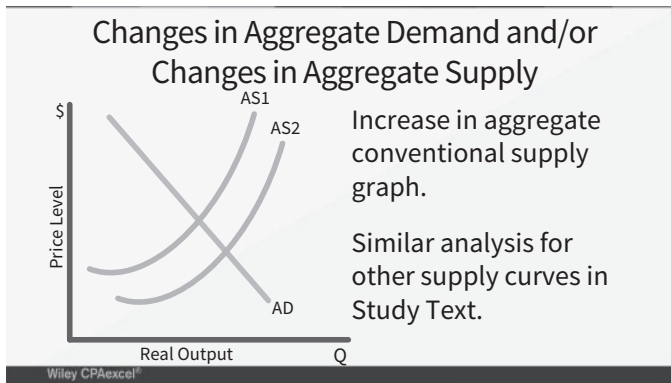
Changes in Aggregate Demand and/or

Changes in Aggregate Supply

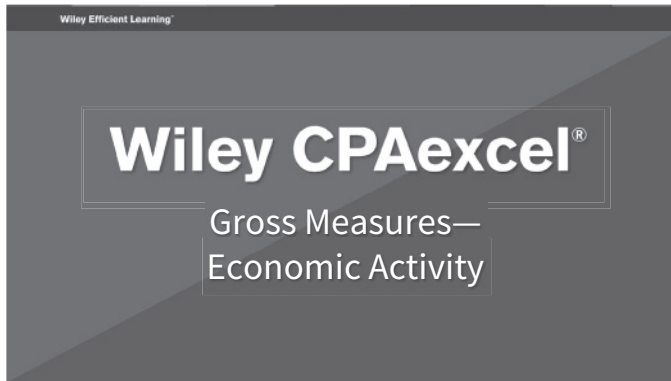
Assuming convention supply curve =
Continuous upward sloping supply curve:

- Supply only changes—Equilibrium quantity will change in the same direction as supply; equilibrium price will change in the opposite direction.

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Gross Measures—Economic Activity



Macroeconomic Measures

Nominal Gross Domestic Product (GDP):
Measures the total output of **final goods** and services produced in the domestic market **for exchange** during a period.

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Macroeconomic Measures

GDP does **not** include:

- Goods/services which require additional processing
- Illegal activities
- Activities for which there is no market exchange (e.g., do-it-yourself activities)
- Goods produced in foreign countries by U.S.-owned entities

Nominal GDP is **not** adjusted for changing prices.

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Macroeconomic Measures

Two GDP measurement approaches:

- Expenditures approach—Measures GDP using final sales/purchases; the sum of spending by:
 - Individuals
 - Businesses
 - Governments
 - Foreign buyers (net exports)

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Macroeconomic Measures

GDP measurement approaches:

- Income approach—Measures GDP as the value of incomes and amounts received for resources; the sum of:
 - Compensation
 - Rental income
 - Proprietors' and Corporate income
 - Net interest
 - Taxes on production and inputs
 - Depreciation, and Miscellaneous other items

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Macroeconomic Measures

Real Gross Domestic Product (Real GDP): Measures the total output of final goods and services produced in the domestic market for exchange during a period **at constant prices**.

- Real GDP = Nominal GDP adjusted for changing prices
- Real GDP per capita = Real GDP per Individual
 - Real GDP/Population

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Macroeconomic Measures

Net Domestic Product (Net DP): Measures GDP less capital consumption during the period (GDP – Depreciation).

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Macroeconomic Measures

Potential Gross Domestic Product (Potential GDP): Measures maximum output that can occur in domestic economy at a point in time without creating upward pressure on the general level of prices

- Theoretical measure
- Assumes full use of available technology and current resources
- Commonly estimated by adjusting actual GDP (for business cycles, unemployment, etc.)

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Gross Domestic Product (GDP) Gap

Gross Domestic Product (GDP) Gap: Difference between Real GDP and Potential GDP.

- Real GDP < Potential GDP = Negative GDP Gap—inefficiency in the economy
- Real GDP > Potential GDP = Positive GDP Gap—creates upward pressure on prices

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Macroeconomic Measures

Gross National Product (GNP): Measures the total output of all goods and services produced **world-wide using U.S. resources**.

- Includes goods and services produced in foreign countries by U.S.-owned entities

Net National Product (NNP): Measures the total output of all goods and services produced world-wide using U.S. resources, but does not include a value for depreciation.

- $NNP = GNP - \text{Depreciation factor}$

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Macroeconomic Measures

National Income (NI): Measures the total payments for economic resources included in the production of all goods and services; includes payments for:

- Wages
- Rents
- Interest
- Profits

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Macroeconomic Measures

Personal Income (PI): Measures total payments for economic resources received by individuals.

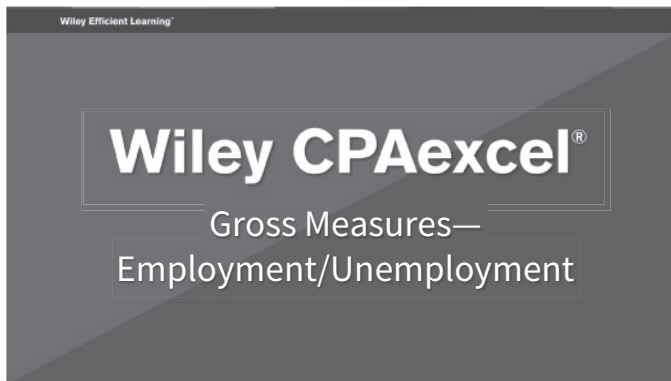
- $PI = NI - \text{Corporate profits} - \text{Social security deductions} + \text{Dividends and interest received by individuals} + \text{Government transfer payments to individuals}$

Personal Disposable Income (PDI): Measures the amount of income individuals have to spend.

- $PDI = PI - \text{Income taxes}$

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Gross Measures—Employment/Unemployment



Employment/Unemployment Data
Determined by Bureau of Labor Statistics (BLS)

BLS uses two survey sources:

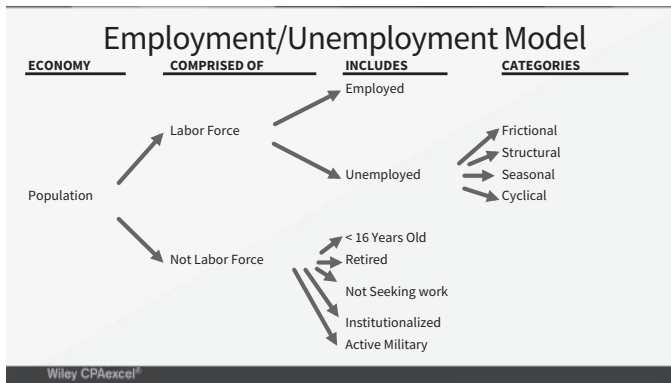
- Current employment survey
 - Monthly survey of 160,000 businesses and governments
 - Measures employment
 - Includes industry and geographical area data

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Employment/Unemployment Data
BLS survey sources:

- Current population survey
 - Monthly survey of 60,000 households
 - Measures employment and unemployment
 - Includes demographic details

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Frictional Unemployment

Frictional Unemployment: Those in labor force not employed because they:

- Are in transition between jobs
- Don't have information needed to get matched up with an employer
- Includes, for example:
 - Those moving to seek employment
 - Those looking for a job they believe meets their education or experience

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Structural Unemployment

Structural Unemployment: Those not employed because:

- The need for their prior types of jobs have been greatly reduced or eliminated.
- They lack the skills for currently available jobs.
- For example, advent of computers and software greatly reduced the need for bookkeepers; many became structurally unemployed.

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Seasonal Unemployment

Seasonal Unemployment: Those out of work because their jobs regularly and predictably vary by the season of the year.

For example, school bus drivers generally are seasonally unemployed during the summer.

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Cyclical Unemployment

Cyclical Unemployment: Those who are not employed because of a downturn in the business cycle.

- An economic downturn (e.g. recession) reduced the current demand for employees (labor)
- Unemployment number of greatest policy concern

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Employment/Unemployment Concepts

Unemployment Rate: Percentage of **labor force** not employed.

- Not percentage of **population** not employed

Natural Unemployment Rate: Those unemployed due to frictional, structural, and seasonal reasons.

- You would have this unemployment regardless of the state of the economy.

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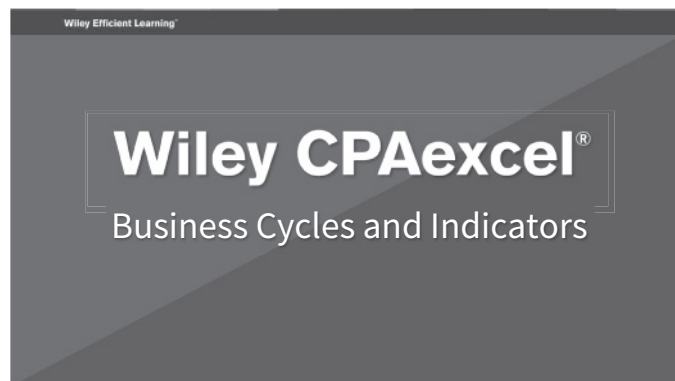
Employment/Unemployment Concepts

Full employment is only when there is no cyclical unemployment.

- Frictional, structural, and seasonal are not counted as unemployed in measuring full employment.
- You can have frictional, structural, and seasonal unemployment and still have full employment (because of the way full employment is defined).

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Business Cycles and Indicators



Business Cycles Defined

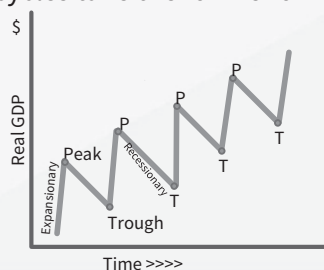
Business Cycles: Cumulative fluctuations up and down in aggregate real gross domestic product.

- Measured in **real** GDP
- Recur over time
- No consistent pattern of length (duration) or magnitude
- Impact different industries at different times and with different effects

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Business Cycles Graph

Business cycles take the form shown in this graph:



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Recession Defined

No official quantitative definition.

National Bureau of Economic Research qualitative definition:

“A significant decline in economic activity spread across the country, lasting more than a few months, normally visible in real GDP growth, real personal income, employment, ... industrial production and wholesale-retail sales.”

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Recession Defined

Unofficial quantitative definition:

- Two or more quarters of negative change in real GDP
- Downturn in real GDP of 10% or less

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Depression Defined

No official quantitative definition.

Not officially recognized by National Bureau of Economic Research as a separate circumstance or time period.

“If you don’t define it, you won’t have it.”

Unofficially depression defined:

- Decline in real GDP exceeding 10%
- Decline in real GDP lasting 2 or more years

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Causes of Business Cycle

No single cause of ups and downs of the business cycle.

Changes in business cycle result from inter-related factors, including:

- Changes in interest rate
- Changes in taxes
- Changes in outlook and confidence

Changes in interest rate seems to be a primary cause > affects investment in durable goods by individuals and firms.

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Business Cycle and Indicators

Business Cycle Indicators: Changes in specific measures of economic activity that are associated with changes in overall business cycle.

Indicator types:

- Leading economic indicators
- Lagging economic indicators

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Leading Economic Indicators

Leading Indicators: Changes in measures that occur before changes in business cycle

- Examples:
 - Consumer expectations
 - Initial unemployment claims
 - Weekly manufacturing hours
 - Stock prices
 - Building permits issued
 - New orders for consumer goods
 - Level of real money supply

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Lagging Economic Indicators

Lagging Indicators: Changes in measures that occur after changes in business cycle.

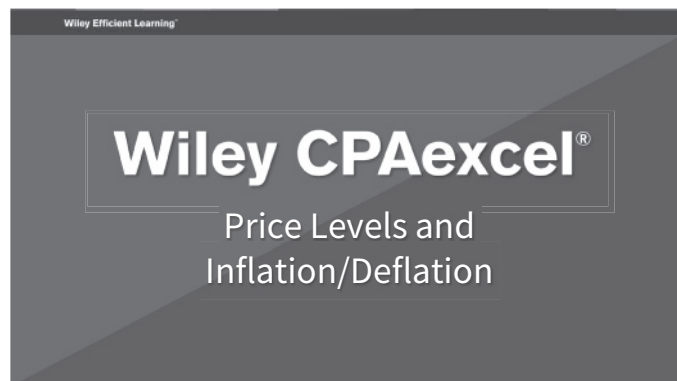
Examples:

- Changes in labor cost per unit of output
- Relationship between inventory and sales
- Length of unemployment
- Amount of commercial loans outstanding
- Relationship between consumer installment credit and personal income

Help confirm timing and magnitude

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Price Levels and Inflation/Deflation



Changing Prices and Price Indexes

- Changing prices by themselves create changes in measures of economic activity and outcomes.
- Price indexes neutralize the effects of changing prices on such measures.

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Changing Prices and Price Indexes

Price indexes convert prices of multiple periods to what they would have been in a single base period.

- Base period = 100%
- Each period measured as percent of base period
- Bureau of Labor Statistics (BLS) prepares most U.S. indexes

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Consumer Price Index

Consumer Price Index (CPI) relates price of a basket of goods and services during a period to price of the basket of consumer goods and services in a prior base period.

- Most common CPI index is CPI-U = Consumer price index for all urban (U) consumers.
- Base period for CPI-U is average prices for 36-month period 1982 through 1984.
- Base period = 100%.

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CPI-U Example

CPI-U values:

- 1982–84 Base 100.0%
- 2013 233.049%
- 2014 234.812%

Meaning:

- 2013 prices were 133.049% higher than 1982–84 base period.
- 2014 prices were 134.812% higher than 1982–84 base period.

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Measuring Inflation/Deflation

Rate of change in CPI-U measures rate of inflation/deflation.

- Example:
- 2014 CPI-U = 234.812
- 2013 CPI-U = 233.049
- 2013 -> 2014 Change 1.763
- Rate of change = $1.763/233.049 = 0.00756$
- 2014 Inflation rate = 0.756%

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Producer Price Index

Producer Price Index (PPI): Measures the average change over time in the selling prices received (revenue received) by domestic producers for their output.

- Includes a greater set of goods and services than the CPI-U, spanning the entire range of output by U.S. producers.
- Measured by the revenue (selling price) received by the first commercial transaction of producers for their domestically produced goods, services, and construction output.

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Producer Price Index (PPI)

Producer Price Index:

- Calculations essentially the same as CPI-U calculations.
- Results measure inflation/deflation at the producer level:
 - Might “trickle down” to the retail level
- Used to deflate revenue streams in order to measure real growth in output.

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Gross Domestic Product Deflator

Gross Domestic Product (GDP) deflator relates nominal GDP to real GDP.

- Attempts to include all spending in GDP.
- More comprehensive than CPI-U or PPI.
- Composition of “basket” changes more frequently than CPI or PPI.

$$\text{GDP deflator} = (\text{Nominal GDP} / \text{Real GDP}) \times 100$$

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Inflation/Deflation Defined

Inflation: Rate of increase in the price level.

Deflation: Rate of decrease in the price level.

For the last 60 years or so the U.S. has experienced annual inflation.

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Causes of Inflation

Two fundamental causes of inflation:

1. Demand-induced (demand-pull) inflation—Aggregate spending for goods and services exceeds productive capacity of the economy at full employment.
 - Excess demand pulls prices up.
2. Supply-induced (cost-push) inflation—Increases in the cost of inputs result in higher prices passed on to end user.

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Consequences of Inflation

- Results in lower current wealth and real income, which results in reduced aggregate demand.
- Results in higher interest rates as lenders seek to keep up with inflation, which results in reduced investment in capital goods.
- Generally leads to uncertainty in the economy, which results in postponed economic commitments.
- Inflation = primary target of fiscal/monetary policy.

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Causes of Deflation

Two fundamental causes of deflation:

1. Demand-induced deflation—Aggregate spending for goods and services decreases significantly resulting in widespread price decreases to spur demand.
2. Supply-induced deflation—Aggregate supply significantly exceeds aggregate demand resulting in widespread price decreases to spur demand.

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Consequences of Deflation

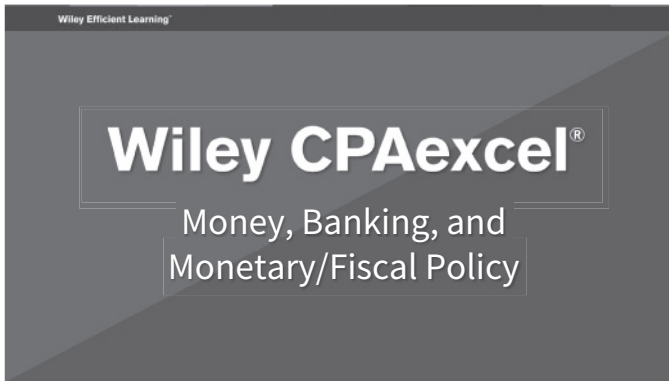
Falling prices give consumers and businesses expecting lower prices an incentive to delay purchases.

Results in further reduction in aggregate demand, causing further reductions in prices (as well as increased idle production and unemployment, together with reductions in wages, lending, and interest rates).

This cycle is called “deflationary spiral” and can have serious adverse economic consequences.

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Money, Banking, and Monetary/Fiscal Policy



Money Roles Defined

Money is central to economic activity.

Functions of money:

- Medium of exchange—Common means of payment in exchange for goods/services
- Measure of value—Common denominator for assigning value and measuring economic activity
- Store of value—Retains value over time to be used in the future

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Money Supply Control and Measures

Federal Reserve System (Fed) controls money supply in U.S.

Fed provides three measures of money:

- M1
- M2
- M3

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M1 Measure of Money

M1: Narrowest definition (measure) of money.

Definition based on instruments used for transactions.

Includes:

- Paper and coin currency held outside banks
- Check-writing deposits in banks—funds that can be accessed using checks

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M2 Measure of Money

M2: Includes all items in M1, plus:

- Savings deposits
- Money-market deposits
- Certificates of deposit less than \$100,000
- Individual-owned money-market mutual funds

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M3 Measure of Money

M3: Includes items in M2, plus:

- Certificates of deposits greater than \$100,000
- Institutional-owned money-market mutual funds

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Federal Reserve System

Federal Reserve System (Fed): Central banking system in U.S.

- Fed is bank for banks.

Fed Board of Governors: Seven-member policy making body of the Federal Reserve System.

Fed Open-Market Committee: Twelve-member body responsible for implementing monetary policy to effect money supply through open-market operations.

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Federal Reserve System

Federal Reserve Banks: Twelve district banks each responsible for a geographical area.

Owned by member institutions, including:

- Commercial banks
- Savings and loan associations
- Mutual saving banks
- Credit unions

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Federal Reserve System

Member banks operate under uniform policies of the Fed.

Individuals and businesses deal with member institutions, not directly with the Federal Reserve Banks.

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Monetary Policy Defined

Monetary Policy: Managing the money supply to achieve national economic objectives, including:

- Economic growth
- Price level stability

Fed exercises monetary policy through:

- Reserve requirement
- Open market operations
- Discount rate

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Fed Reserve Requirement

Reserve Requirement: Percent of loans made by banks that must be held in reserve.

Example:

- 10% reserve requirement = \$10 held in reserve for every \$100 in loans

Increasing reserve requirement = decreased loans and money supply.

Decreasing reserve requirement = increased loans and money supply.

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Fed Open Market Operations

Open Market Operations: Fed buying and selling U.S. Treasury debt with member banks.

Example:

- Buying U.S. Treasury debt from member banks = Increases funds available to banks for loans

Buying debt from member banks = increased money supply

Selling debt to member banks = decreased money supply

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Fed Discount Rate

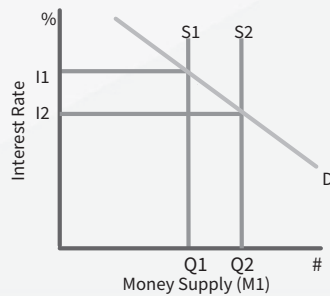
Discount Rate: Interest rate member banks pay when borrowing from the Fed.

- Increasing discount rate = decreased borrowing and reduced money supply
- Decreasing discount rate = increased borrowing and increased money supply

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Money Supply and Interest Rates

Increase in money supply = lower interest rates:



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Fiscal and Monetary Policy Summary

Elements of Fiscal and Monetary Policy:

<u>Policy Type</u>	<u>Government Action</u>
Fiscal	Increase/Decrease government spending
Fiscal	Increase/Decrease taxes
Monetary	Increase/Decrease money supply

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Fiscal and Monetary Policy Summary

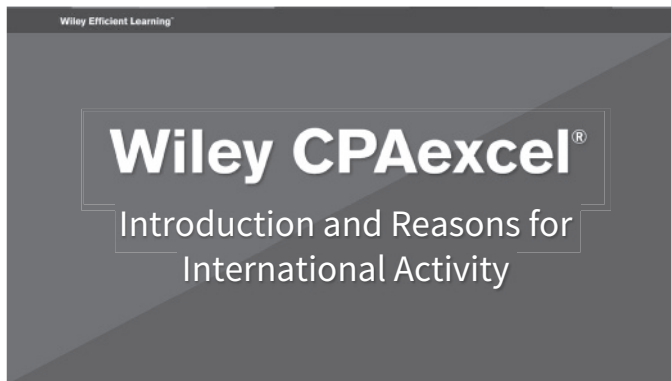
Monetary Policy: Primary approach used:

- Implemented more quickly
- Less political influence
- Does not redistribute output and income as much as fiscal policy

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International Economics

Introduction and Reasons for International Activity







Absolute and Comparative Advantage

Absolute Advantage: Ability of a country, business or individual to produce a good or provide a service more efficiently than another entity.

- More efficiently = with fewer input resources

Comparative Advantage: Ability of one country, business or individual to produce a good or provide a service with lower opportunity cost than another entity.

Both advantages derive from differences in availability of resources and technology among entities.

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Comparative Advantage

To maximize output:

- Entities should specialize in the goods or services they produce at the least opportunity cost.
- Entities should trade with other entities for goods or services for which they do not have a comparative advantage.

This is the Principle of Comparative Advantage.

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Principle of Comparative Advantage

Principle of Comparative Advantage:

The total output of two or more entities will be greatest when each produces the goods or services for which it has the lowest opportunity cost and they engage in trade with each other.

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Comparative Advantage Illustration

Assume the following for the U.S. and China in the production of TVs and provision of financial services with a given set of inputs:

	<u>Televisions</u>	<u>Financial Services</u>
U.S.	20	60
China	100	80

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Comparative Advantage Illustration

- **U.S. Entity** with same inputs = 1 TV or 3 Services
 - 1 Financial Service = .33 TV—Opportunity cost
- **Chinese Entity** with same inputs = 1 TV or .8 Services
 - 1 Financial Service = 1.25 TVs—Opportunity cost
- U.S. has lower opportunity cost for FSs.
- China has lower opportunity cost for TVs.

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Comparative Advantage Illustration

Conclusions:

- U.S. entity should produce financial services.
- Chinese entity should produce TVs.
- Entities should engage in international trade.

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Porter's Four Attributes

Porter's Four Attributes of National Advantage:

- Factor Endowment—advantages in factors of production—land, labor, infrastructure, etc.
- Demand Conditions—nature of domestic demand for a good or service
- Relating and Supporting Industries—extent to which supplier and related industries are internationally competitive
- Firm Strategy, Structure and Rivalry—how entities are created, organized, managed and how they compete

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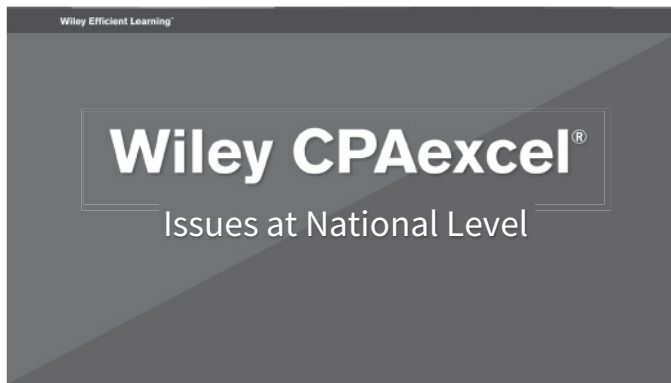
Porter's Four Outcomes

Porter's Four Outcomes—that give national advantage:

- Availability of resources and skills
- Information used to determine which opportunities to pursue with resources and skills
- Goals of individuals within entities
- Pressures on entities to innovate and invest

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Issues at National Level



Socio-Political Issues

Central Claim: International economic activity causes or exacerbates domestic social and economic problems, including:

- Increased domestic unemployment from using cheaper foreign labor
- Loss of domestic manufacturing capabilities
- Loss of industries essential to defense
- Lack of protection for domestic start-up companies

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Responses to Socio-Political Issues

Primary historical responses to socio-political issues:

- Import quotas = Restrictions on the quantity of goods that can be imported
- Import tariffs = Taxes on imported goods that increase cost in domestic market

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Responses to Socio-Political Issues

Such responses are generally inappropriate.

- They can “backfire” if other countries response in like manner

Better responses = Policies that support domestic economic activity; e.g.:

- Training/retraining
- Research and development support
- Improved infrastructure

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Currency Exchange Rate Issue

Currency Exchange Rate: Price of one unit of a country’s currency expressed in units of another country’s currency.

- Examples:
 - \$1.00 = .80 Euro
 - 1.00 Euro = \$1.25

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Exchange Rate and Imports/Exports

Lower cost in domestic currency of buying a foreign currency = cheaper cost of foreign goods and services in domestic currency.

Alternative exchange rates:

- \$1.10 = 1 Euro (stronger \$)
- \$1.25 = 1 Euro (weaker \$)

At \$1.10 = 1 Euro, U.S. dollar can buy more goods than at \$1.25 = 1 Euro.

More imports of Euro-based goods.

Less exports to Euro-based buyers

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Balance of Trade

Balance of Trade: Difference between money value of imports and exports.

- Exports > Imports = Trade surplus
- Exports < Imports = Trade deficit

Balance of Trade = Element of a country's Balance of Payments accounting with other countries.

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Balance of Payments Issue

Balance of Payments: Summary accounting of U.S.-based transactions with all other countries during a period of time.

Balance of Payments accounts:

- Current account
- Capital account
- Financial account

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Current Account

Current Account: Net dollar value for period of:

- Amounts earned from export of goods and services
- Amounts spent on import of goods and services
- Net factor flow (income) from foreign investments —dividends and interest
- Net factor flow from foreign aid and grants = Net Balance

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Capital Account

Capital Account: Net dollar value for period of:

- Inflows from investments and loans by foreign entities
- Outflows from investments and loans by U.S. entities made abroad

Reflects net change in foreign ownership of U.S. assets and U.S. ownership of foreign assets.

Foreign Investment in U.S. > U.S. investment abroad = Surplus for period

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Financial Account

Financial Account: Net dollar amount of:

- U.S.-owned assets located abroad
- Foreign-owned assets in the U.S.

Shows accumulated amount of investments:

- Both government and private
- Monetary (e.g., gold, securities, etc.) and non-monetary (e.g., property, plant and equipment, etc.)

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Balance of Payments Outcomes

Balance of payments may result in:

- Surplus—Sum of earnings and inflows exceeds sum of spending and outflows
- Deficit—Sum of spending and outflows exceeds sum of earnings and inflows

U.S. has had record deficit balance of payments in recent years.

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Consequence of Deficit Balance of Payments

Deficit Balance of Payments: Imports and foreign investment by U.S. entities > Exports and investment by foreign entities in U.S.

Greater demand for foreign currency than dollars.

Demand for foreign currency increases its value relative to the dollar; now takes more dollars to buy given amount of foreign currency.

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Consequence of Deficit Balance of Payments

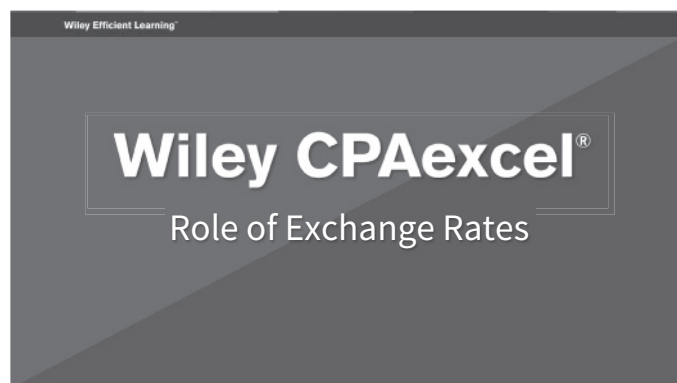
Exchange rate of dollar weakens relative to foreign currency = More dollars to buy a fixed amount of foreign currency.

Imports decrease and exports increase causing import/export trend to reverse.

Thus, free-floating exchange rates (free market rates) help maintain balance of payment equilibrium.

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Role of Exchange Rates



Role of Exchange Rates

Currency Exchange Rate = Price of one unit of a country's currency expressed in units of another country's currency

Direct exchange rate = Domestic price of one unit of a foreign currency

- 1 Euro = \$1.10

Indirect exchange rate = Foreign price of one unit of a domestic currency

- \$1.00 = .909 Euro (\$1.00/\$1.10)

Note: "D"irect = "D"omestic price—both "Ds"

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Exchange Rate Determination

Major ways exchange rates are determined:

- Free-floating currency—exchange rate is determined by market forces of supply and demand for a currency
- Pegged or movable currency—exchange rate is fixed by the government, with frequent revisions

Most industrialized countries have free-floating currencies.

Demand and supply determine the exchange rates between those currencies.

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Currency Demand Factors

Political and economic environment—political stability and a strong economy increases demand.

Relative interest rates—higher rates relative to comparable countries increases investment which increases demand.

Relative inflation rates—lower rates retain purchasing power which increases demand.

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Currency Demand Factors

Level of public debt—higher level of debt increases risk of inflation which deters investment and decreases currency demand.

Current account balance—higher deficit (excess imports over exports and investment outflows over inflows) increases demand for foreign currency relative to domestic currency.

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Currency Demand Factors

Other minor factors:

- Consumer preferences
- Relative incomes
- Currency speculation—attempts to make a profit on trading in currencies

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Currency Supply Factor

Supply of currency is determined by a country's Central Bank.

U.S. Federal Reserve Bank determines currency supply through monetary policy.

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Affecting Currency Exchange Rates

Examples of U.S. Fed affecting exchange rates:

- Supply side: Buying dollars in open market using foreign currency reserves to reduce supply of dollars; selling dollars would increase supply of dollars.
- Demand side: Increase or decrease interest rates to increase or decrease demand for domestic investments, which increases or decreases demand for dollars.

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Changes in Exchange Rates

Currency appreciation—The value of a currency increases (becomes stronger) relative to another currency.

- It takes less domestic currency to buy foreign currency or goods sold in that currency.

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Changes in Exchange Rates

Currency depreciation—The value of a currency decreases (becomes weaker) relative to another currency.

- It takes more domestic currency to buy foreign currency or goods sold in that currency.

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Currency Appreciation

Consequences of Currency Appreciation:

- Foreign goods become cheaper for domestic buyers.
- Encourages increased domestic efficiencies—in order to compete.
- Puts downward pressure on domestic inflation—by keeping prices low.
- Makes it difficult for domestic producers to compete in domestic and foreign market.

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Currency Depreciation

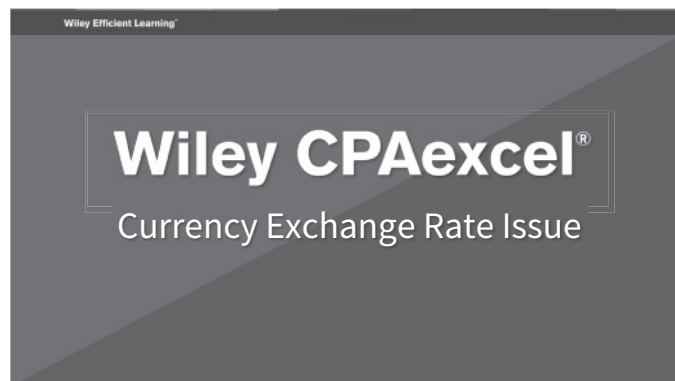
Consequences of currency depreciation:

- Domestic goods become cheaper relative to foreign goods, which increases exports.
- Increased exports increases domestic employment.
- Import goods become more expensive.
 - Drives up cost of foreign inputs—raw materials, components, etc., as well as consumer goods

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Issues at Entity Level

Currency Exchange Rate Issue



Currency Exchange Risks

Entities that engage in international economic activity face currency exchange risks that entities engaged in only domestic activity do not face directly.

The effects of exchange rates can determine success or failure in international economic activity.

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Currency Exchange Risks

There are three types of foreign currency exchange risk faced by an entity:

- Transaction risk
- Translation risk
- Economic risk

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Transaction Risk

Transaction Risk: The possible unfavorable impact of changes in currency exchange rates on transactions that are denominated in a foreign currency.

- For example:
 - A domestic firm buys, sells, lends, borrows, or invests with the transaction denominated in a foreign currency.
 - *Denominated* means the transaction is carried out in a foreign currency, not the dollar.

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Transaction Risk

- Such transactions result in receivables or payables that will be collected or paid using a foreign currency.
- The domestic entity will need to either:
 - Convert the foreign currency it receives to dollars, or
 - Convert dollars to foreign currency to pay its liability.
- The risk is a change in exchange rate will:
 - Decrease dollars collected from the receivable.
 - Increase dollars need to satisfy the payable.

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Transaction Risk

Transaction risk example:

- Assume U.S. firm buys foreign goods on October 15 and agrees to pay 500,000 foreign currency units (FCU) in 60 days.
- Exchange rates and dollar values are:
 - 10/15 1 FCU = \$.72 × 500,000 FCU = \$ 360,000
 - 12/14 1 FCU = \$.75 × 500,000 FCU = \$ 375,000
- Foreign exchange loss = \$15,000

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Transaction Risk Mitigation

How can a firm mitigate transaction risk?

- Matching—Incurring equal payables and receivables in the same currency for offsetting effects; a loss on one would be offset by a gain on the other
- Leading/Lagging Payments and Collections—Paying obligations or collecting receivables earlier or later than otherwise to avoid exchange rate changes
- Hedging—Using offsetting or contra transactions so that a loss on one would be offset by a gain on the other

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Foreign Currency Exchange Rate Hedging

What is hedging and how can it be used?

Hedging is a risk management strategy that involves using offsetting or contra transactions so that a loss on one would be offset by a gain on the other.

Foreign currency hedging is the hedge of exposure to changes in the dollar value of assets, liabilities or planned transactions to be settled (denominated) in a foreign currency.

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Transaction Risk Hedging

Example of hedging a receivable:

- Assume an account receivable denominated in a foreign currency.
- Foreign currency will be received when the receivable is collected in the future.
- The dollar value of that foreign currency when collected may be less than now due to a change in exchange rates.
- How can that risk be hedged?

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Transaction Risk Hedging

- The firm can enter into a contract now (called a forward contract) to sell the foreign currency when it is received at a price or rate set now.
- As a consequence of the contract, the dollar value of the foreign currency to be received in the future is "fixed."
 - The possible adverse effects of a change in the exchange rate between when the receivable occurs and when it is collected is mitigated.

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Other Transaction Risks

In addition to payables and receivables, there are other kinds of transactions at risk from changes in exchange rates, including:

- Forecasted foreign currency-denominated transactions
- Unrecognized firm commitments

These are covered in the Study Text.

But these risks are not likely to be included in BEC; they are more likely subjects to be in FAR.

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Translation Risk

Translation Risk: The possible unfavorable impact of changes in currency exchange rates on financial statements of foreign operation that are converted from a foreign currency to the domestic currency.

- Translation occurs when a domestic entity has foreign operations which prepares its financial statements in a foreign currency.
- The foreign operation may be a branch, joint venture, partnership, equity investment, or subsidiary.

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Translation Risk

The translation of foreign financial statements may be needed to:

- Apply equity method accounting
- Combine with other entities
- Consolidate with domestic parent

Foreign currency financial statements are translated (converted) using exchange rates.

Foreign currency account balances are multiplied by an exchange rate to get the dollar amount.

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Translation Risk

Example:

- Foreign balance sheet reports Cash = 100,000 Euros
 - Exchange rate: \$1.25 per 1 Euro
 - Dollar value: $100,000 \text{ E} \times \$1.25 = \$125,000$
- Assume exchange rate changes:
 - Exchange rate: \$1.10 per 1 Euro
 - Dollar value: $100,000 \text{ E} \times \$1.10 = \$110,000$
- A change in the exchange rate caused the dollar value of cash to be \$15,000 less than before the rate change.

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Translation Risk

Some accounts are translated using the current (spot) exchange rate; that is the rate at the B/S date.

Current exchange rates change continuously.

Therefore, dollar values change continuously.

Risk = Exchange rate changes such that:

- Dollar value of assets decreases.
- Dollar value of liabilities increases.

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Translation Risk Mitigation

How can a firm mitigate translation risk?

- Reduce the amount of assets and liabilities converted using the current (spot) exchange rate.
- Create offsetting assets or liabilities so that a gain on one is offset by a loss on the other.
- Borrow in the foreign currency in an amount approximating the net asset exposure so that a gain or loss on translation is offset by a loss or gain on the borrowing.

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Economic Risk

Economic Risk: The possibility that changes in exchange rates will alter value of **future** revenues and costs.

- Changes in exchange rates may make **future** foreign revenues convert to fewer dollars or **future** foreign expenses convert to more dollars.
- Such changes may make future sales or purchases in foreign currency not be economically feasible, adversely affecting operations.

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Economic Risk Mitigation

How a firm can mitigate economic risk:

- Distribute productive assets in different countries with different currencies.
- Shift sources of revenues and expenses to different locations with different currencies.

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Foreign Currency Hedging Instruments

When currency exchange risks are hedged, what are the instruments used?

Foreign currency hedging is accomplished primarily through forward contracts:

- A foreign currency **forward exchange contract** is a contract to buy or sell a specified amount of a foreign currency at a specified date at a specified rate.
- Exchange contracts are legal obligations to buy or sell.

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Foreign Currency Hedging Instruments

- A foreign currency **option** contract—a contract that gives the right—the option—to buy or sell a specified amount of a foreign currency for a specified time at a specified rate.
- Exercise of the contract is at the discretion of the option holder (buyer).
- If the exchange rate changes adversely, the holder will exercise the contract.
- If the exchange rate does not change adversely, the holder will not exercise the contract.

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International Transfer Price Issue



Transfer Pricing Issue Defined

Transfer Price: Amount at which goods and services are transferred between affiliated entities.

- When the affiliated entities are located in different countries, the transfer price determines for the affiliated entity in each country:
 - Profit/Loss, and therefore
 - Taxes owed.
- By manipulating transfer prices, firms can manipulate taxes and, therefore, profits.

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Transfer Pricing Issue Illustrated

Example 1: Transfer Price = \$200

	Co.S	Co.S to Co.P	Co.P	
	Original Cost	Transfer Price	Selling Price	Totals
	\$100	\$200	\$300	
Pretax Profit	\$100		\$100	\$200
Tax Rate	.20		.50	
Tax	\$ 20		\$ 50	\$ 70
After-Tax Profit	\$ 80		\$ 50	\$130

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Transfer Pricing Issue Illustrated

Example 2: Transfer Price = \$250

	Co.S	Co.S to Co.P	Co.P	
	Original Cost	Transfer Price	Selling Price	Totals
	\$100	\$250	\$300	
Pretax Profit	\$150	\$50		\$200
Tax Rate	.20	.50		
Tax	\$ 30	\$ 25		\$55
After-Tax Profit	\$120	\$ 25		\$145

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Transfer Pricing Guidance

In U.S. appropriate allocation of income between entities under common control is provided in the IRS code.

- Generally requires income allocation based on functions performed and risks assumed by each party

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Transfer Pricing Guidance

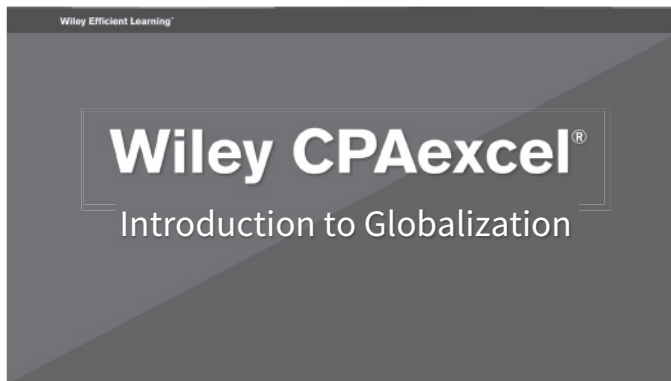
In practice transfer price may be based on:

- Cost to the selling unit—either variable or full cost
- Market price—the price of such goods or services in the market, if available
- Negotiated price—between buying and selling units

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Globalization

Introduction to Globalization



Globalization Defined

Globalization is the movement toward a more integrated and interdependent world economy.

Globalization is evidenced by increased mobility of:

- Goods and services
- Labor
- Technology, and
- Capital

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Globalization Drivers

Globalization has been driven by several factors, including:

- Advent of global institutions (e.g. World Bank, International Monetary Fund, Multinational corporations, etc.)
- Reductions in trade and investment barriers, and
- Technological advances

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Global Institutions

Modern era of globalization can be traced back to the:

Bretton Woods Agreement (1944) which established the framework for increased international commerce and finance following World War II.

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Global Institutions

The Bretton Woods Agreement established two institutions to oversee the process:

- World Bank—To promote general economic development
- International Monetary Fund (IMF)—To maintain order in the international monetary system by providing funds to economies in financial crisis, including:
 - Currency crisis
 - Banking crisis, and
 - Financial debt crisis

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Reductions in Trade Barriers

Reduction in worldwide trade barriers originated in 1947 with the initial General Agreement on Tariffs and Trade (GATT).

- Original GATT and subsequent variations are multilateral agreements to:
 - Liberalize and encourage trade by eliminating tariffs, subsidies, import quotas and other barriers.
 - Harmonize related laws across nations.
 - Reduce transportation and other costs as a group undertaking.

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Reductions in Trade Barriers

- Today, the World Trade Organization (WTO), established in 1995, coordinates GATT accomplishments
- Broader WTO responsibilities include:
 - Overseeing the implementation, administration and operation of the covered trade agreements, and
 - Providing a forum for negotiations and for settling international trade disputes

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Reductions in Investment Barriers

Concurrent with reductions in trade barriers, many countries have removed restrictions on investment in the country by foreign investors.

- Such investments are called Foreign Direct Investments (FDI)

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Technological Advances

Final major reason for globalization has been technological advances.

Significant technological advances have occurred in:

- Communication and info processing—the ability to transmit and process large quantities of voice and data at low costs
 - Internet and World Wide Web

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Technological Advances

- **Transportation Advances:** The ability to move people and products faster and cheaper, including:
 - Large, long-range jet aircraft—think FedEx and UPS
 - Large cargo ships—think supertankers and container ships
 - Containerization—containers handled by ships, trains, and trucks with the same standardized equipment

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Globalization Challenges

Globalization involves new challenges for an entity; challenges not faced in a strictly domestic operations.

Engaging in global business activity requires an understanding of the foreign environments in which the activity occurs or may occur.

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Globalization Challenges

Participating in international business activity requires an understanding of some or all of the following elements of the operating location:

- Political system
- Economic system, and
- Legal system, especially:
 - Property rights
 - Contract laws
 - Intellectual property laws
 - Product and safety laws

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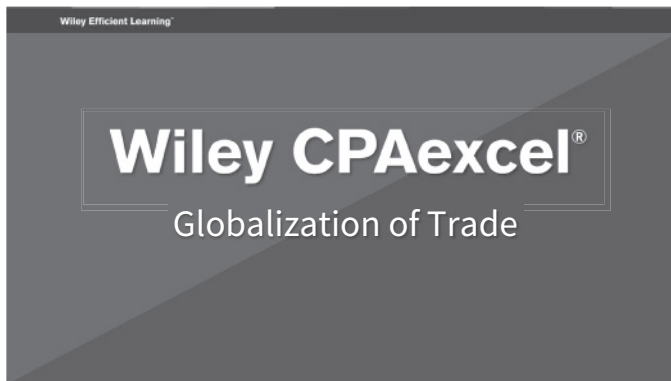
Areas of Globalization

Major areas in which globalization has occurred include:

- Trade
- Production
- Capital markets

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Globalization of Trade



Globalization of Trade

Globalization of Trade: The exchange of goods and services between and among countries.

- Exports—Goods and services sold to a buyer in a foreign country.
- Imports—Goods and services acquired from a seller in a foreign country.

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Globalization of Trade

Reasons for International Trade Growth:

- Reduction in trade barriers to imports.
- Increased economic integration of countries.
- Regional trade agreements (e.g., NAFTA, EEU, etc.)
- Internet and World Wide Web capabilities.
- Development of financial sector that supports international trade.

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Global Trade Growth

Between 1950 and 2000:

- World economic output grew 6-fold
- Global trade grew 17-fold

Between 2000 and 2008:

- World exports grew at average annual rate of 5%.

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Global Trade Growth

In 2009:

- World exports declined by 12%.

In 2010 and 2011:

- World exports grew by 14% and 5, respectively.
- Since 2011 worldwide exports have continued to grow and have more than recovered the decreases of the 2009 global downturn.

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U.S. Trade



Between 1994 and 2014:

- U.S. imports grew from about \$60 B/month to about \$285 B/month.
- U.S. exports grew from about \$50 B/month to about \$239 B/month.

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U.S. Imports and Exports

U.S. imports and exports as portion of GDP have increased significantly since 1960.

- Imports:
 - In 1960, imports were 4% of GDP.
 - In 2013, imports were 17% of GDP.
- Exports:
 - In 1960, exports accounted for 5% of GDP.
 - In 2013, exports accounted for 14% of GDP.

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Largest Export/Import Countries

List of Top 5 Countries by Exports—2014
(In U.S. dollars, add 000,000)

1. China	\$2,342,000
2. United States	\$1,621,000
3. Germany	\$1,508,000
4. Japan	\$683,000
5. Netherlands	\$672,000

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Largest Export/Import Countries

List of Top 5 Countries by Imports—2014
(In U.S. dollars, add 000,000)

1. United States	\$2,413,000
2. China	\$1,959,468
3. Germany	\$1,216,000
4. Japan	\$822,000
5. United Kingdom	\$684,000

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U.S. EXPORTS/IMPORTS COMPOSITION—2014

End-Use Category	Percentage of Total	
	Exports	Imports
Capital Goods/Equipment	24%	21%
Industrial/Natural Resources	22%	24%
Consumer	9%	20%
Automotive	7%	11%
Agriculture/Food	6%	4%
Other Goods	2%	3%
Services	<u>30%</u>	<u>17%</u>
Totals	100%	100%

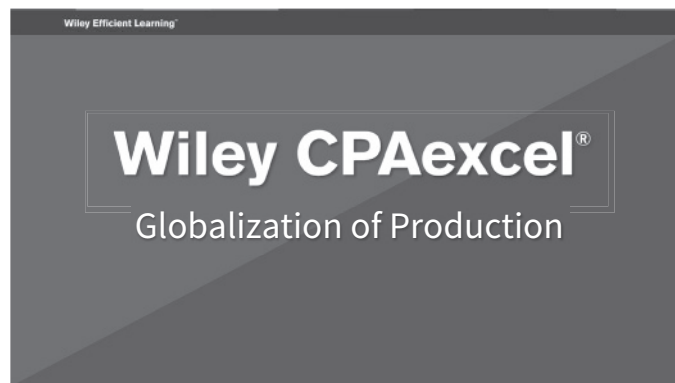
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Globalization of Trade “Take Aways”

- International trade had grown dramatically over recent years.
- U.S. trade also has grown dramatically over recent years, especially since the 1990s.
- U.S. imports have grown much more than U.S. exports.
 - U.S. is world’s largest import country.
- China has experienced greatest export growth.
 - China is world’s largest export country.

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Globalization of Production



Globalization of Production

Globalization of Production: Sourcing or producing goods and services from around the world.

General ways of sourcing:

- Outsourcing of goods and services
- Foreign Direct Investment (FDI)

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Outsourcing

Outsourcing: Acquiring goods or services from a separate or external provider under contractual terms

- International outsourcing—Provider is in a foreign country
- Goods obtained may be:
 - Raw materials
 - Intermediate goods
 - Final goods
- Services—call centers, data entry, etc.

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Outsourcing Reasons

Reasons for outsourcing include:

- Cost savings
- Improved quality
- Reduced delivery time
- Enable entity to focus on core business
- Scalability
- Access knowledge, talent, and best practices of foreign provider

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Outsourcing Risks

Quality—Goods or services do not meet buyer's standards.

Security—Provider misappropriates intellectual property, trade processes, data, etc.

Export/Import—Home country or source country restricts the transfer of goods.

Currency Exchange—Cost of goods and services in domestic currency increases.

Legal—Possible violation of a country's laws.

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Outsourcing Risk Mitigation Methods

Use due process in selecting foreign providers —“Check'em out”.

Use qualified lawyer in foreign country.

Determine legal requirements before entering into contracts.

Execute thorough contracts with arbitration clause.

Negotiate for payment in home currency.

Strict policies concerning legal compliance.

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Foreign Direct Investment

Foreign Direct Investment: Establishing owned or controlled facilities in a foreign location to produce goods or services.

- Entity acquires property, plant, equipment, and other assets in foreign country to carry out production or service functions.
- Locate facilities based on country's advantages—cost, quantity and quality of factors of production/service, etc.
 - Raw materials
 - Skilled labor

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Foreign Direct Investment Objectives

Objectives of FDI include:

- Lower cost structure for goods or services.
- Improve quality of goods or services.
- Expand markets.
- Increase growth potential.

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Globalization of Capital Markets



Globalization of Capital Markets

Capital Markets: Bring together providers of capital (investors) and users of capital (borrowers).

Capital market examples:

- Stock markets
- Bond markets
- Money markets
- Commodities markets

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Globalization of Capital Markets

Historically, only domestic capital markets served as intermediary between providers and users of capital.

Limitations of domestic capital markets:

- Limited by size and wealth of domestic residents
- Limited supply of domestic capital increases cost
- Providers are limited to domestic investment opportunities.

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Globalization of Capital Markets

Globalization permits interaction between providers and users world-wide.

The Global Capital Market: Interconnected set of financial institutions and national markets that permit the trading of securities and other financial assets between and among investors and borrowers world-wide.

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Global Markets

The global capital market is made up of many institutions.

In addition to well-known stock, bond and commodities markets, two formal international financial markets should be noted:

- Eurodollar market (Euromarket)
- Eurobond market (International bond market)

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Global Markets

Formal important international financial markets:

- Eurodollar market (Euromarket)—provides short and intermediate-term loans world-wide denominated in U.S. dollars.
- International bond market (Eurobonds)
 - Long-term loans outside borrower's home country.
 - Offered in most major currencies.
 - Avoids most government regulation.

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Global Capital Growth

Between 1990 and 2006 (according to Hill):

- Cross-border loans increased from \$3,600 billion to \$17,875 billion ($\approx + 500\%$)
- International equity offerings increased from \$18 billion to \$377 billion ($\approx 2,100\%$)

But, starting in about 2007, the worldwide recession caused cross-border financial flows to decline significantly. Beginning in 2009, cross-border flows began a rebound, but since 2010 have leveled off.

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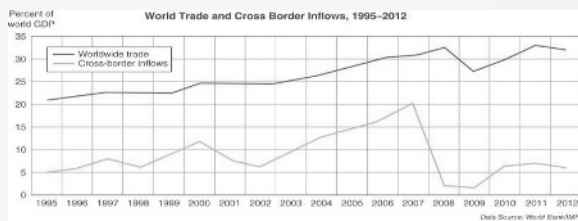
Global Capital Growth

Major reasons for global growth in capital flows:

- Government deregulation of international financial services
- Advances in communication and data processing

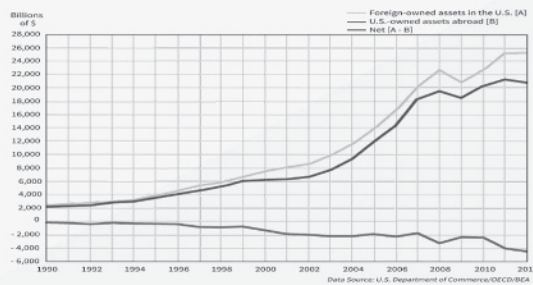
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Worldwide Capital Flows: Percent Of GDP



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Foreign Direct Investment



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Global Capital Benefits

Benefits of global financial markets:

- For investors—Greater range of investment opportunities:
 - Chance for greater returns
 - Diversification of investments
- For capital users—Greater funds availability:
 - More sources of capital
 - Chance for lower costs of capital

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Global Capital Unique Risk

Participation in capital markets incur the currency exchange risks that a change in exchange rates will:

- Reduce domestic currency value of returns on foreign investments.
- Increase domestic currency cost of borrowing in foreign currency.

Hedging can be used to mitigate risks.

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Globalization and Power Shifts



Globalization and Power Shifts

Growth of globalization has resulted in shifts in the economic importance among nations.

Shifts in importance have occurred in:

- Output
- Trade
- Services
- Foreign direct investment
- Home country of multinational entities

Our concern is the impact on U.S.

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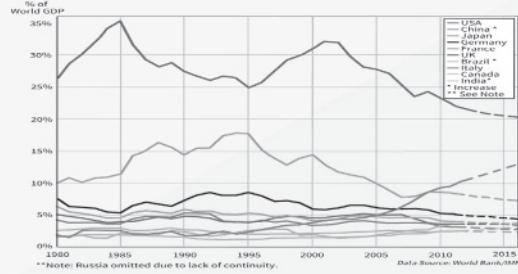
Globalization and Power Shifts—Output

1969–2009 World output more than tripled.

- Mid 1960s—U.S. = 40% of world output
- 1969—U.S. = 30% of world output
- 1969 to 2007—U.S. = 25% – 35% of world output
- Since 2007—U.S. = less than 25% of world output
- 2012—U.S. = about 22% of world output
- 2013—forward = projected to continue to decline

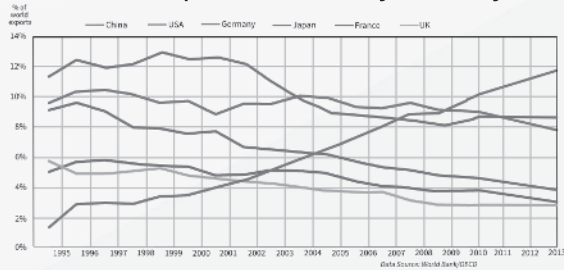
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Share of World GDP (Output) by Country



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World Exports (Trade) by Country



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World-Wide Services

Two major reasons for movement of services world-wide:
Internet and global communications—enables entities to relocate value-adding services to low-cost locations

- Call centers
- Help desks
- Programming
- Relocation of services necessary to support foreign trade and production

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World-Wide Foreign Direct Investment

U.S. share of world-wide accumulated foreign direct investment:

- 1980 = 40%
- 2005 = 20%

In 2010 the U.S. was one of the three largest FDI investing countries and one of the three largest FDI receiving countries.

Developing countries share of world-wide accumulated foreign direct investment:

- 1980 = 5% >>>>> 2005 = 15%

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Multinational Entities Home Country

U.S. as home company for multinational entities:

- 1973—U.S. = 50% of largest 260 multinationals
- 2005—U.S. = 30% of largest 100 multinationals
- 2009—U.S. = 28% of largest 500 multinationals
- 2015—U.S. = 25% of largest 500 multinationals

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Becoming Global



Becoming Global

Alternatives for engaging in international business:

- Importing/exporting
- Foreign licensing
- Foreign franchising
- Foreign joint venture
- Foreign subsidiary

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Becoming Global

Exporting/importing = most basic form of international business.

Advantages of exporting:

- Increases domestic sales and output—achieve economies of scale domestically
- Avoids cost of establishing foreign production capability
- Provides experiences in international business at low risk

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Exporting/Importing

Advantages of importing:

- Obtaining goods not otherwise available
- Obtaining goods at lower cost
- Obtaining goods of better quality than similar goods produced in the home country

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Exporting/Importing

Exporting/importing disadvantages:

- Possible high cost of transportation
 - Especially for low value-to-weight ratio goods (i.e., heavy relative to value)
- Existence or possibility of trade barriers
 - Quotas
 - Tariffs

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Becoming Global

Foreign Licensing: Granting a foreign entity the right to use an asset:

- Patent
- Trademark
- Formula
- Etc.

Licensee makes royalty payments to the licensor.

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Foreign Licensing

Advantages of foreign licensing:

- Increases revenue through royalties
- Avoids trade barrier concerns
- Avoids costs and risks of opening a foreign operation

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Foreign Licensing

Disadvantages of foreign licensing:

- Licensee may misuse patents, technology processes, and other proprietary information
- Licenser may not be able to control licensee sufficiently to assure standards are met
- Licensee may not have management or technical capabilities to fully realize benefits of the license

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Becoming Global

Foreign Franchising: Special form of licensing in which the franchisor typically mandates strict operating procedures

- Used primarily in foreign retail and service markets
 - Restaurants
 - Hotels
- Franchisor frequently provides on-going assistance

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Becoming Global

Advantages of foreign franchising:

- Provide increased revenues from royalties
- Avoids costs and risks of opening foreign facilities

Disadvantages of foreign franchising:

- Franchisee may misuse proprietary information.
- Franchisee quality controls may not meet franchisor standards.

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Becoming Global

Foreign Joint Venture: An entity established in a foreign location and jointly owned by two or more otherwise unrelated entities.

- One of the owners is typically located in the foreign country.
- May be used for various kinds of undertakings.

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Becoming Global

Advantages of foreign joint venture:

- Host country co-owner has knowledge of local environment.
- Costs and risks of undertaking are shared with one or more other venture partners.
- Foreign local resistance from government, labor and other businesses may be less with a local stakeholder.

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Becoming Global

Disadvantages of foreign joint venture:

- Foreign co-owner may misuse partner's patents, technology, proprietary information, etc.
- Home country co-owner does not have absolute control.
- Shared ownership can lead to differences in goals, objectives, strategy, etc.

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Becoming Global

Foreign Subsidiary: Entity acquires or establishes a foreign subsidiary—a controlled, but legally separate entity.

Advantages of **acquiring** foreign subsidiary:

- Quick entry into the foreign market—don't have to develop a new entity
- Known level of operating results and related historical information
- May block or preempt competitors from entering the market

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Foreign Subsidiary

Disadvantages of **acquiring** foreign subsidiary:

- Possible lack of understanding of acquired firm's values, culture, operating processes, etc.
- Pre-existing corporate culture may be difficult to integrate with parent.
- Synergies or other expected benefits may not materialize.

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Foreign Subsidiary

Establishing a new foreign subsidiary:

- An alternative to acquiring pre-existing entity
- Also called a Greenfield Venture
 - Founding entity is “breaking new ground”

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Foreign Subsidiary

Advantages of **establishing** foreign subsidiary:

- Foreign subsidiary can be built from “ground up” to have desired culture, operating style, and procedures.
- Parent better able to transfer organizational competencies, skills, routines, and culture.

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Foreign Subsidiary

Disadvantages of **establishing** foreign subsidiary:

- Time consuming
- More costly than acquisition
- Greater risk associated with unknown revenues, costs and other operating aspects

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Foreign Subsidiary

Advantages of foreign subsidiary—acquired or established:

- Parent maintains control over assets and operations.
- Parent is able to coordinate strategy with other operations and adapt as needed.

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Foreign Subsidiary

Disadvantages of foreign subsidiary—acquired or established:

- Capital investment most costly of alternatives for engaging in international business.
- Greater unknowns about outcomes and risks.
- Costs and risks burden of the single parent.

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Summary Conclusions

- Importing/Exporting provides a low-cost, low-risk means of engaging in international business.
- When protection of patents, technology processes, or other proprietary information is important, avoid foreign licensing and joint ventures.

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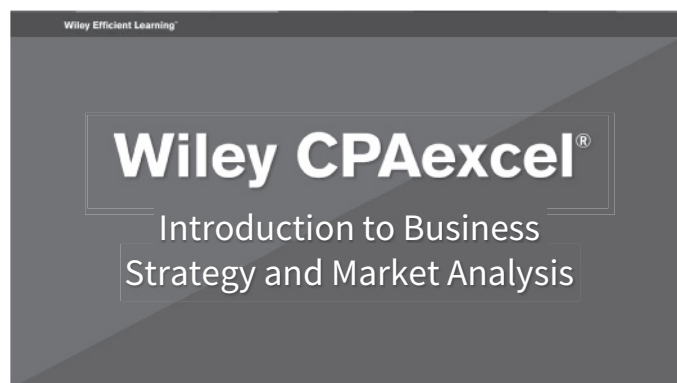
Summary Conclusions

- Use joint ventures to overcome foreign opposition to establishing foreign operations.
- Use wholly-owned foreign subsidiary to retain complete control and facilitate global strategy.
- Use foreign licensing and franchising to minimize cost and risk in establishing foreign operations.

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Business Strategy and Market Analysis

Introduction to Business Strategy and Market Analysis



Introduction

Prior lessons considered:

- Economic systems
- Economic market structures

These make up the larger economic environment in which an entity operates.

To be successful, entity must:

- Understand that environment.
- Develop and execute a strategic plan to succeed in that environment.

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To the right of this slide are seven horizontal lines for notes.

Business Strategy

Strategic Planning: Sequence of interrelated procedures for determining an entity's long-term goals and objectives, and identifying the best approaches for achieving those goals and objectives.

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Business Strategy

General steps in strategic planning process:

- Establish mission, values and goals.
- Assess the environment.
- Establish objectives.
- Formulate strategies.
- Implement strategies.
- Evaluate and control activities.

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Establish Mission, Values and Goals

Mission statement: Provides expression of the purpose and range of entity activities.

- Example: Subway (International)
“Be the #1 Quick Service Restaurant (QSR) franchise in the world, while delivering fresh, delicious sandwiches and an exceptional experience.”

Values: Establish the underlying beliefs that govern operations and how relationships with other parties are conducted.

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Establish Mission, Values, and Goals

Goals: General purposes toward which entity endeavors are directed.

- Typically mid-to-long-term in outlook
- May encompass multiple objectives

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Business Strategy

Assess external and internal environment:

- Analyze macro-environment (external)
- Analyze industry (external)
- Analyze
 - Strengths and weaknesses of the entity
 - Opportunities and threats in the environment
 - Relationship between environment and entity

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Business Strategy and Market Analysis

Establish Objectives—State the desired measurable results to be achieved, typically including measures related to:

- Profitability
- Growth
- Market share
- Innovation

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Business Strategy and Market Analysis

Formulate strategies for achieving goals.

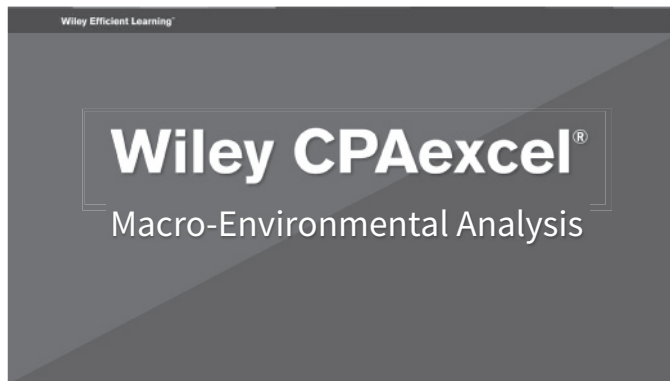
- Generic strategies: (from Michael Porter)
 - Cost leadership
 - Differentiation
 - Focus

Implement strategies.

Evaluate and control implemented activities.

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Macro-Environmental Analysis



Macro-Environmental Analysis

Entity operates within:

- Economic System
- Industry Economic Market Structure

Entity needs to assess and understand that over-all operating environment.

PEST Analysis = a macro-assessment of:

- **P**olitical,
- **E**conomic,
- **S**ocial, and
- **T**echnological elements of an environment

Macro-Environmental Analysis

Political Element—Concerned with:

- Nature of the political environment
- Includes, for example:
 - Political stability
 - Ways and extent government intervenes in economy
 - Labor laws
 - Environmental laws
 - Tax policy
 - Trade restrictions—tariffs, quotas, etc.

Macro-Environmental Analysis

Economic Element—concerned with:

- Economic growth rate and related demographics
- Interest rates
- Inflation rates
- Currency exchange rates
- And others

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Macro-Environmental Analysis

Social Element—concerned with culture, values and demographics, including:

- Population growth rate
- Age distribution
- Educational attainment and career attitudes
- Emphasis on health and safety
- And others

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Macro-Environmental Analysis

Technology Element—concerned with nature and level of technology, including:

- Level of research and development
- State of technology infrastructure
- State of automation capability
- Level of technology “savvy”
- Rate of technology change
- And others

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Macro-Environmental Analysis

PEST analysis (or similar analysis) provides framework for assessing and understanding macro-environment.

Relative importance of factors will be unique to each analysis.

Macro-environment analysis is particularly important in considering establishment of operations in a new location, especially in a foreign location.

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Industry Analysis



Industry Analysis

- **Industry:** Group of entities that produce goods or provide services which are close substitutes and which compete for the same customers
- Industry element of the macro-environment requires special analysis
- Porter developed a model that can be used to assess an industry:
 - Called **Five Forces** factor analysis

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Industry Analysis

Porter's Five Forces model considers five factors in assessing competitive state of an industry:

1. Threat of new entrants into the market—New entrants increase competition and reduce market attractiveness
2. Threat of substitute goods or services—Presence or possibility of substitutes reduces ability to set prices and reduces market attractiveness

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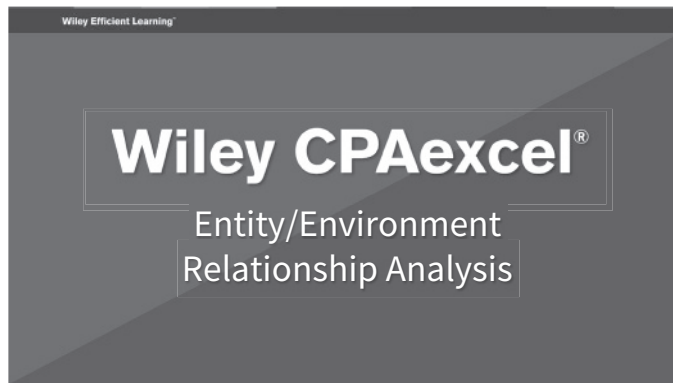
Industry Analysis

Porter's Five Forces model considers:

3. Bargaining power of buyers—greater their bargaining power, the less ability providers have to determine characteristics and price; reduces market attractiveness
4. Bargaining power of suppliers—greater their bargaining power, the less ability of buyer to influence availability and cost of inputs; reduces market attractiveness
5. Intensity of rivalry—greater the rivalry the less attractive the market

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Entity/Environment Relationship Analysis



Entity/Environment Relationship Analysis

Assessment of the relationship between external environment and firm's internal environment.

SWOT analysis can be used.

- SWOT analysis develops profile of internal **S**trengths and **W**eaknesses and external **O**pportunities and **T**hreats.
- Facilitates matching entity's strengths to competitive environment.

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Entity/Environment Relationship Analysis

SWOT—internal environment:

- **S**trengths—Resources and capabilities that provide relative competitive advantage in the market
 - E.g., patents, desirable location, good reputation, etc.
- **W**eaknesses—Shortcomings that place entity at relative competitive disadvantage in the market
 - E.g., poor location, unfavorable reputation, lack of proprietary processes, etc.

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Entity/Environment Relationship Analysis

SWOT—external environment:

- **Opportunities**—Chances to benefit from new or unmet demand in the market
 - E.g., opening of new markets, apply new technology, reduced regulations, etc.
- **Threats**—Chances of adverse consequence as result of external forces
 - E.g., new substitute products, increased regulation, change in consumer preferences, etc.

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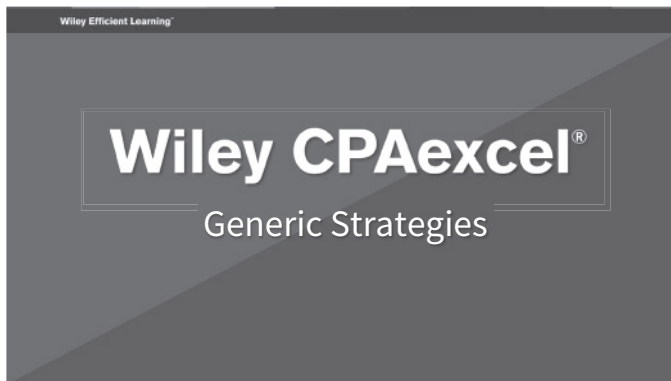
Entity/Environment Relationship Analysis

SWOT Matrix Strategy Approaches:

- **Strengths and Opportunities**—Utilize strengths to take advantage of opportunities in market.
- **Weaknesses and Opportunities**—Pursue opportunities to overcome weaknesses.
- **Strengths and Threats**—Utilize strengths to reduce susceptibility to external threats.
- **Weaknesses and Threats**—Pursue ways to prevent weaknesses from being overcome by threats.

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Generic Strategies



Generic Strategies

Basic strategy purpose = leverage strengths to achieve objectives and goals.

Specific strategy = unique to entity.

Porter identified three generic strategies:

- Identified at high level
- Independent of Industry
- Independent of entity

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Generic Strategies

Porter's three generic strategies:

- Cost leadership
- Differentiation
- Focus—cost leadership or differentiation applied to narrow market

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Generic Strategies

Cost leadership strategy:

- Become low cost provider in an industry
- Possible alternative objectives:
 - Sell goods or services at average market price and earn profits higher than competitors.
 - Sell goods or services below average market price and gain market share.

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Generic Strategies

Entity that pursues cost leadership strategy will:

- Seek to minimize costs.
- Invest significantly in production and distribution assets.
- Have high levels of expertise in product design, manufacturing and distribution.

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Generic Strategies

Cost leadership strategy risks:

- Other entities will be successful in adopting cost leadership strategy.
- Improved technology will enable other entities to produce and deliver at equally low cost, or lower cost.
- Multiple entities will focus on segments of industry and separately achieve lower cost in those segments.

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Generic Strategies

Differentiation strategy:

- Develop product or service that offers quality or uniqueness valued by customers.
- Value added by quality or uniqueness permits a premium price that more than covers extra cost of goods or services.

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Generic Strategies

Entity that pursues differentiation strategy will:

- Have highly skilled and creative product or service development personnel
- Have leading edge research capabilities
- Have strong and dedicated marketing and sales personnel
- Have reputation for innovation, quality, and service

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Generic Strategies

Differentiation strategy risks:

- Customers change preferences.
- Customers economic status changes.
- Imitation by competitors/“knock-offs.”
- Multiple firms will focus on segments of market and separately achieve greater differentiation in those segments.

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Generic Strategies

Focus strategy:

- Achieve either cost leadership or differentiation within a narrow segment of industry.
- “Niche” market.
- Identify a distinct subgroup within market and focus on providing goods or services that meet needs of that subgroup.

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Generic Strategies

Entity that pursues focus strategy will:

- Have outstanding market research and understanding of target group.
- Have ability to tailor strengths in product or service development to target group.
- Have a high degree of customer satisfaction and loyalty.

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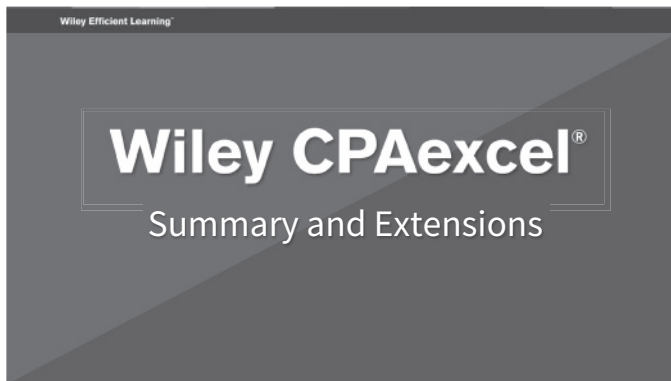
Generic Strategies

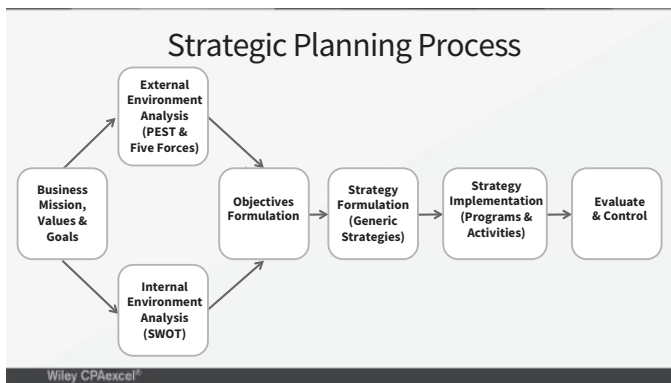
Focus strategy risks:

- Smaller in size with lower volume = Little bargaining power with suppliers
- Imitation by competitors (“knock-offs”)
- Changes in targeted customers’ preferences or economic status
- Industry cost leader will adapt products or services to compete in focus market.
- Other entities will carve out subgroups of target focus group.

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Summary and Extensions





Alternative Resources-Based Model (RBM)

- Alternative strategic planning model
- Assesses resources and capabilities of an entity
- Bases strategy on collection of resources and capabilities to take advantage of opportunities in market

Strategic Planning Process Caveats

Forms of analysis described do not provide comprehensive methodology for strategy formulation; they illustrate an approach.

Actual strategy formulated would consider the particular characteristics of the operating environment and of the entity.

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Strategic Planning Process Caveats

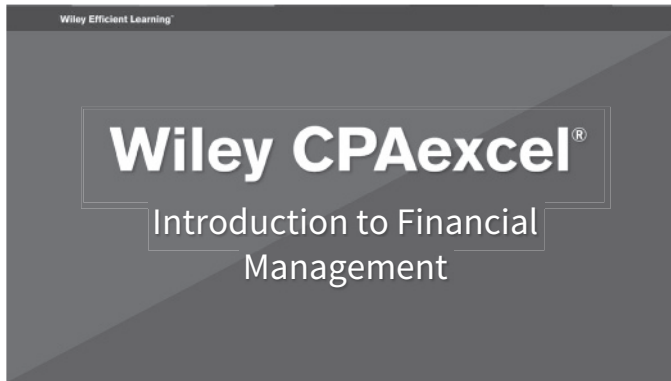
Actual strategy would address “operating-level” issues—financing, organization, production, marketing, etc.

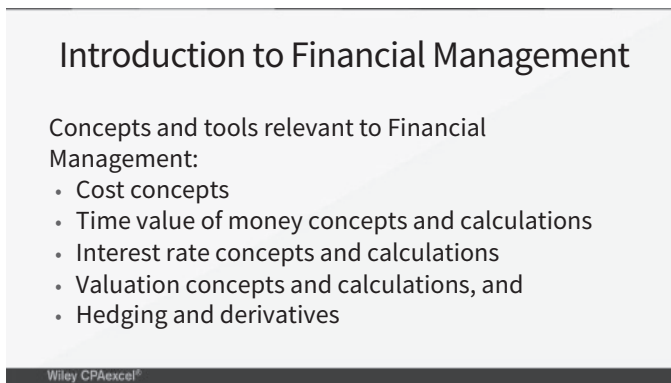
- Except for financing, those are not within the scope of the CPA Exam

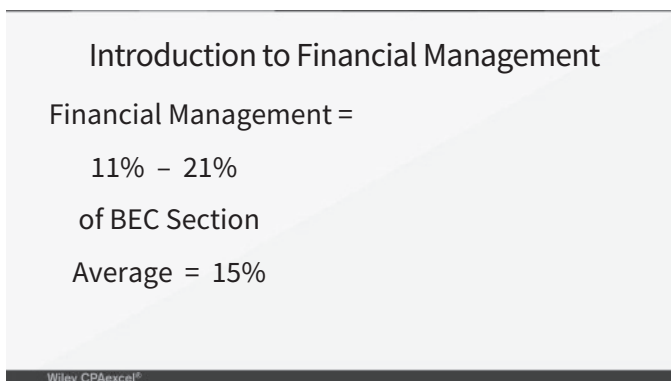
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Financial Management

Introduction to Financial Management







Concepts and Tools

Cost Concepts



Cost vs. Expense

- Cost is the amount paid in cash or other resources for a good or service.
- Expense is the portion of cost that relates to the portion of a good or service that has been used up.
- Cost and Expense are not the same concepts.
- Cost and Expense can occur at the same time or at different times.

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Cost vs. Expense

- Cost and Expense occurring at different times and in different amounts

Cost → Resource → Expense
 (Asset) (e.g., Depreciation)
\$10,000 → \$10,00 → \$2,000

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Cost vs. Expense

- Cost and Expense occurring simultaneously and in same amount

Cost
\$10,000
↓
Expense
(e.g., Wages)
\$10,000

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Sunk Costs

Sunk Costs: Costs of resources that have been incurred in the past and cannot be changed by current or future decisions.

- Not relevant in making current decisions

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Sunk Costs

Example:

In making a decision about equipment replacement, the original cost or carrying value of the current equipment is a sunk cost.

- Sunk cost is not relevant to making replacement decision.

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Opportunity Cost

Opportunity Cost: Discounted dollar value of next best benefit lost from an opportunity not taken as a result of choosing another opportunity.

Example:

- The revenue lost from an alternative **not** selected is an opportunity cost associated with the alternative **that is** selected.
- Opportunity costs do not involve actual cash flows.
- Are relevant to current decisions.

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Differential/Incremental Cost

Differential Costs: Costs that are different between two or more alternatives.

Example:

- In comparing two or more alternative projects, only cost elements that are different between the projects are relevant in making economic decisions.

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Differential/Incremental Cost

Cost elements that are the same are not relevant in making economic comparisons.

Cost of financing is not incremental cost because discounting will account for the cost of financing.

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Cost of Capital

Cost of Capital: Cost of long-term funds—debt/equity—used to finance an operation.

Major long-term sources of capital funding include:

- Long-term debt
- Preferred stock
- Common stock

Each source of capital funding has a cost associated with it—the cost of capital.

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Cost of Debt

Cost of Debt: Rate of return that must be paid to attract and retain lenders' funds.

Rate of return required is determined by:

- Level of interest rate in general market
- Perceived default risk of the firm
- Perceived interest rate risk
- Perceived inflationary risk
- Longevity risk—Length of debt
- [Perhaps others]

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Cost of Debt

- Generally debt is considered less risky than equity.
- Required rate of return on debt (cost of debt) is less than on preferred or common stock.

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Cost of Preferred Stock

Cost of Preferred Stock: Rate of return that must be paid to attract and retain preferred shareholders' investment.

- Preferred stock has characteristics of both debt and equity.
 - Like Debt—Dividends expected and paid before common dividends
 - Like Equity—Possible claim to additional dividends and priority claim to assets upon liquidation

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Cost of Preferred Stock

- Generally considered more risky than debt, but less risky than common stock.
- Required rate of return (cost) greater than debt, but less than common stock.

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Cost of Common Stock

Cost of Common Stock: Rate of return that must be paid to attract and retain common shareholders' investment.

- Rate of return required is determined by:
 - Perceived risk of stock
 - Expected dividends
 - Expected price appreciation

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Cost of Common Stock

- Considered more risky than debt or preferred stock
- Required rate of return greater than debt or preferred stock

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Cost of Capital

Underlying Concept: Rate of return required by each source is determined by the **opportunity cost** each source has in the market for comparable risk.

- Attracting and retaining each source of capital requires paying a rate of return at least equal to the next best available alternative rate in the market with comparable risk.
- Cost of each source can be consolidated into a **weighted average cost of capital** for all elements used by an entity.

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Weighted Average Cost of Capital (WACC)

Weighted Average Cost of Capital (WACC): Rate of return of each source of capital weighted by its share of the total capital.

- Calculation of WACC:
 - Percent of total capital is determined for each source.
 - Percent of each is multiplied by the cost of capital for that source of capital.
 - Resulting weighted costs of capital are summed to get the weighted average cost of capital.

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Weighted Average Cost of Capital Illustrated

Capital Elements	Amount	Percent of Total	x	Cost of Capital	=	Weighted Cost
Bonds Payable	\$ 40,000	.20		6%		1.2%
Preferred Stock	20,000	.10		10%		1.0%
Common Stock	140,000	.70		12%		8.4%
TOTALS	\$200,000	1.00				
Weighted Average Cost of Capital =						10.6%

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Time Value of Money Tools

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Time Value of Money Tools

Time Value of Money (TVM) Concepts

Money is the unit of measure used in accounting and finance.

Money has a “time value.”

- Money held today has a different value than money to be received in future, or
- Money to be received in future has a different value than if held today.
- To compare money amounts that relate to different periods of time, present value and future value concepts are used.

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Time Value of Money Concepts

Present value/future value concepts and calculations we cover include:

- Present value of a single amount (\$1)
- Future value of a single amount (\$1)
- Present value of an ordinary annuity
- Future value of an ordinary annuity
- Present value of an annuity due
- Future value of an annuity due
- Present value of a perpetual annuity

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Time Value of Money Concepts

We will:

- use a timeline graph to depict each concept
- identify the TVM factor tables to use for each concept
- show the calculation of each concept using TVM factors

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Present Value (PV) of a Single Amount

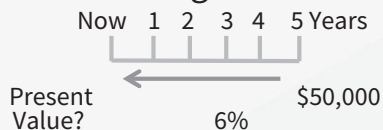
Present Value of a Single Amount:

- Determines the value now—at the present—of a single amount to be paid or received in the future.
- Example: Assume \$50,000 to be received at the end of 5 years and the appropriate discount (interest) rate is 6%.

What is the \$50,000 worth now (at present)?

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PV of Single Amount



Alternative solution approaches:

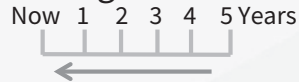
Formula: Present Value =

Future Cash Flow / $(1 + \text{Required Rate of Return})^{\text{Number of Years}}$

$PV = \$50,000 / (1 + .06)^5 = 37,350$ (rounded)

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PV of Single Amount



Present Value? \$50,000

Table: Present Value of \$1 for 5 periods:

Rate	2%	4%	6%	8%	10%
5 Periods	.906	.822	.747	.681	.621

Present value = \$50,000 × .747 = \$37,350

Table values are provided on the exam

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PV/FV Tables on Exam

- Table values are provided for virtually all questions on the exam
- Exception: A simple one-year time period

Example:

PV of \$50,000 to be received in 1 year
with 6% interest rate

$PV = \$50,000 / 1.06 = \$47,170$

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PV/FV Tables on Exam

- Questions commonly give table values from different tables, so you need to select the correct table.
- Know what table is appropriate for the facts

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Future Value (FV) of a Single Amount

Future value of a single amount:

Determines the value at some future date of a single amount invested now.

- Assumes annual “compounding” (i.e., interest is earned on unpaid interest)
- When compounding period is more than once a year:
 - Number of periods in year = Number of compounding periods
 - Interest rate = Annual rate ÷ Periods per Year

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FV of Single Amount

Compounding more than once a year.

- Example Facts:
 - 5 years
 - 6%
 - Compounds semi-annually
- Example Determination:
 - 10 periods (5 years x 2 periods per yr)
 - 3.0% rate (6% ÷ 2 periods per yr)
 - Table value for 10 periods at 3.0%

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FV of Single Amount

Now 1 2 3 4 5 Years

\$50,000 → Future Value?

Future Value of \$1 table for 10 periods:

Rate → 2% 3% 4% 6% 8%

10 Periods 1.289 1.344 1.480 1.791 2.159

Future value = \$50,000 × 1.344 = \$67,200

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Present Value (PV) of Ordinary Annuity

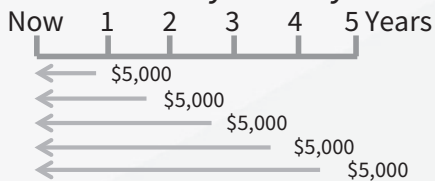
Present Value Of Ordinary Annuity:

Determines value now of a series of equal amounts to be paid or received at the **end** of equal intervals over a future period

- Annuity is series of **equal** dollar amounts
 - If amounts are not equal, it is not an annuity.
- Ordinary annuity = equal amounts received at the **end** of each period
- Also called *annuity in arrears*

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PV of Ordinary Annuity



Present Value?

Present value of **ordinary annuity** table for 5 periods:

Rate →	2%	4%	6%	8%	10%
5 Periods	4.713	4.452	4.212	3.993	3.791

Present value = $\$5,000 \times 4.212 = \$21,060$

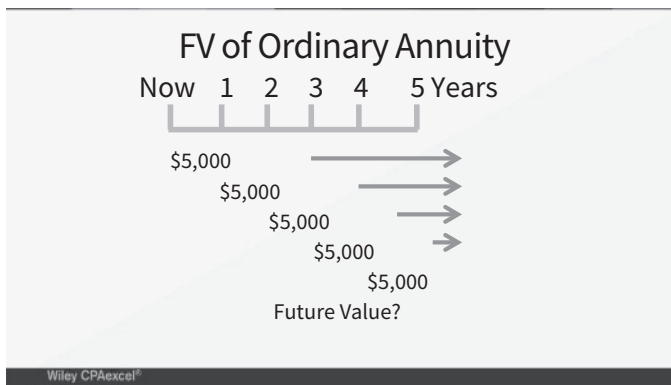
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Future Value (FV) of Ordinary Annuity

Future Value of Ordinary Annuity:

Determines the value at some future date of a series of equal amounts to be paid or received at the **end** of equal intervals.

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FV of Ordinary Annuity

Future value of ordinary annuity for 5 periods:

Rate →	2%	4%	6%	8%	10%
5 Periods	5.204	5.416	5.637	5.867	6.105

Future value = \$5,000 × 5.637 = \$28,185

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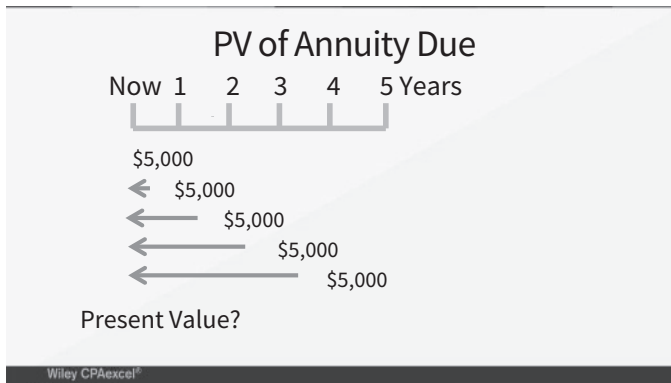
Present Value (PV) of Annuity Due

Present value of annuity due:

Determines value now of a series of equal amounts to be paid or received at equal intervals with payments at the **beginning** of each period.

- Annuity due = equal amounts received at **beginning** of each period
- Also called *Annuity in Advance*

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PV of Annuity Due

Present value of annuity due table for 5 periods:

Rate	2%	4%	6%	8%	10%
5 Periods	4.807	4.629	4.465	4.312	4.169

Present Value = \$5,000 × 4.465 = 22,325

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PV of Annuity Due (Beginning of Period)

Present value of **ordinary** annuity (**End of Period**) table for 4 and 5 periods:

Rate	2%	4%	6%	8%	10%
4 Periods	3.808	3.630	3.465	3.312	3.170
5 Periods	4.713	4.452	4.212	3.993	3.791

Calculation for PV of annuity due:

- Present value = 3.465 + 1.000 = 4.465 × \$5,000 = \$22,325

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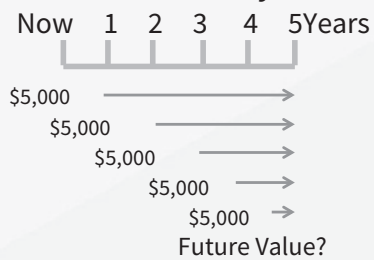
Future Value (FV) of Annuity Due

Future Value of Annuity Due:

Determines the value at some future date of a series of equal amounts to be paid at equal intervals with payments at the beginning of each period.

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FV of Annuity Due



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FV of Annuity Due

Future value of annuity due table for 5 periods:

Rate →	2%	4%	6%	8%	10%
5 Periods	5.308	5.633	5.975	6.335	6.715

$$\text{Future value} = \$5,000 \times 5.975 = \$29,875$$

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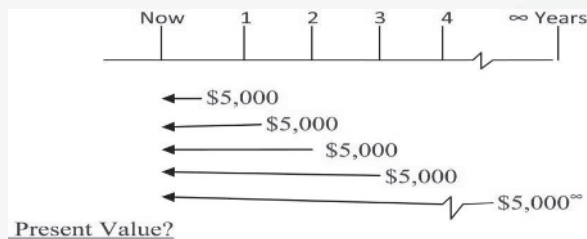
PV of Perpetual Annuity

Determines value now of a series of equal amounts to be paid or received at equal intervals indefinitely into the future with payments at the end of each period.

- Perpetual annuity = payments occur "forever."
- Also called *Perpetuity*

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PV of Perpetual Annuity



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PV of Perpetual Annuity

The PV of a perpetual annuity is calculated as:

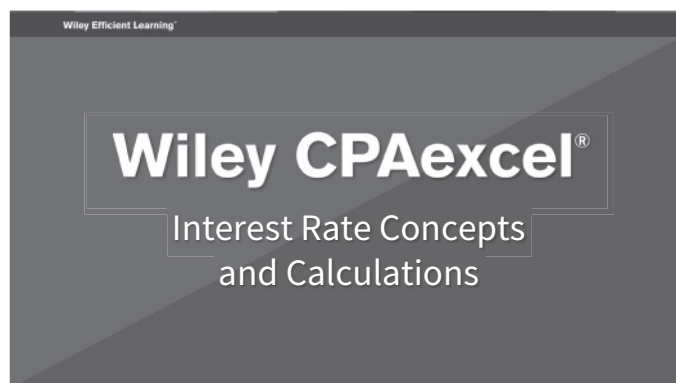
$$\text{PV Perpetual Annuity} = \text{Annuity Payment Amount} / \text{Interest Rate} = AP/R$$

Calculate PV of a Perpetual Annuity of \$5,000 with an interest (discount) rate of 10%

$$\text{PV} = \$5,000 / .10 = \$50,000$$

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Interest Rate Concepts and Calculations



Interest Concept

Interest: Cost of the use of money.

- Like paying rent for use of money
- It is expressed as a percentage—almost always an annual rate
- Percentage rate applied to principal to determine money (dollar) amount of interest
- Interest rates for an instrument may be:
 - Fixed
 - Variable
 - Changing rate base

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Interest Rate Types

Fixed: Percentage rate of interest does not change over the life of the instrument.

Variable: Percentage rate of interest can change over the life of the instrument.

- Changes usually related to macro-economic rate such as Fed rate or prime rate

Changing Bases: Rate type may change over the life of instrument:

- Fixed to variable
- Variable to fixed

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Bases for Expressing and Calculating Interest

Six interest and interest rate concepts:

1. Stated interest rate
2. Simple interest
3. Compound interest
4. Effective interest rate
5. Annual percentage rate
6. Effective annual percentage rate
7. Negative interest rate

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Stated Interest Rate

Stated Interest Rate: Annual rate of interest specified (stated) in a contract.

- Examples:
 - Rate per loan agreement
 - Bond coupon rate
- Does not take into account compounding effects of frequency of payments
- Assume:
 - Semi-annual interest
 - Stated rate = 6%
 - Effective rate > 6 % due to frequency of payments (one-half of the interest is paid before end of year)
 - Stated rate still 6%

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Simple Interest Concept

Simple Interest: Interest computed on original principal only.

- No compounding in interest calculation
- No interest paid on interest

Example:

2 year, \$2,000 note @ 6% with simple interest paid at end of borrowing period

- Interest = Principal × Rate × Time
- Interest = \$2,000 × .06 × 2 yrs. = \$240
- No interest paid on 1st year's interest

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Compound Interest Concept

Compound Interest: Interest computed on principal plus accumulated unpaid interest.

- Interest is paid on interest

Example:

2 year, \$2,000 note @ 6% compounded annually, but paid at end of borrowing period.

$$\text{Interest Yr. 1} = \$2,000 \times .06 \times 1 = \$120.00$$

$$\begin{aligned} \text{Interest Yr. 2} &= \$2,000 + \$120 = \$2,120 \\ &\quad \$2,120 \times .06 \times 1 = \$127.20 \end{aligned}$$

$$\text{Total interest} = \$247.20$$

Compounding = \$7.20 > than simple interest

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Effective Interest Rate

Effective Interest Rate:

Annual interest rate implicit in the relationship between the net proceeds of a borrowing and the dollar cost of that borrowing.

- Calculation: $\text{Net cost of borrowing} \div \text{Net proceeds}$
- Net proceeds received may be less than amount borrowed due to:
 - Discounting-interest deducted in advance
 - Compensating balance requirement

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Effective Interest Rate

Example:

- \$2,000, 2-year note **discounted** @ 6%
- Discounted = Interest deducted in advance
- Simple Interest = $\$2,000 \times .06 \times 2 = \$240$
- Net proceeds = $\$2,000 - \$240 = \$1,760$
- Effective interest = $(\$240/\$1,760)/2 \text{ years} = 13.64/2 = .0682 = 6.82\%$
- Stated rate = 6.00%
- Effective interest rate = 6.82%

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Annual Percentage Rate (APR)

Annual Percentage Rate:

Annualized effective interest rate without compounding on a borrowing that is for a fraction of a year.

- Computed: $APR = \text{Effective interest rate for fraction of year} \times \text{number of fractions in year}$
- Fractions:
 - Semi-annual = 2
 - Quarterly = 4

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Annual Percentage Rate (APR)

Example:

- \$2,000, **90-day** note discounted @ 6%
 - Simple Interest = $\$2,000 \times .06 \times (90/360) = \$30$.
 - Effective interest = $\$30/\$1,970 = 1.52\%$ for 90 days (quarter)
 - Annual percentage rate (APR) = $1.52 \times 4 \text{ quarters} = 6.08\%$
- APR is the legally required basis for interest rate disclosure in U.S.

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Effective Annual Percentage Rate (EAPR)

Annual percent age rate with compounding on borrowings for fraction of a year

- Also called “Annual percentage yield”
- Formula: $EAPR = (1 + I/P)^P - 1$
- Where:
 - I = Annual stated rate
 - P = Number of periods in a year

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Effective Annual Percentage Rate

Example:

\$2,000, 90-day note @ 6%

Formula: $EAPR = (1 + I/p)^p - 1$

Calculation:

$EAPR = (1 + .06/4)^4 - 1 = (1 + .015)^4 - 1 =$

$(1.015)^4 - 1 = 1.06136 - 1 = .06136 =$

EAPR

$EAPR = .06136 > .06 = \text{Stated rate}$

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Negative Interest Rate

Negative Interest Rate = Interest rate terms under which the owner of funds pays a recipient interest to hold (and possibly use) the funds

- Conventionally, the owner receives interest for the use of the owner's funds
- Under a negative interest arrangement, the owner pays another party interest for holding and using the owner's funds

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Negative Interest Rate

Examples:

- Central Bank (e.g., Federal Reserve Bank) would charge member banks interest to hold funds
- Commercial Bank would charge customers to hold money on deposit, rather than pay interest on those deposits
 - Big Bank charges a -.5% (negative) interest rate on deposits made by its largest corporate customers. A client that deposited \$1,000,000 would **pay** the bank \$5,000 annual interest.

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Negative Interest Rate

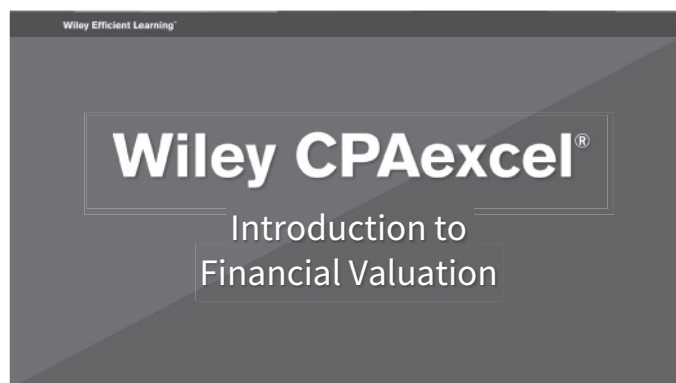
Negative Interest Rate:

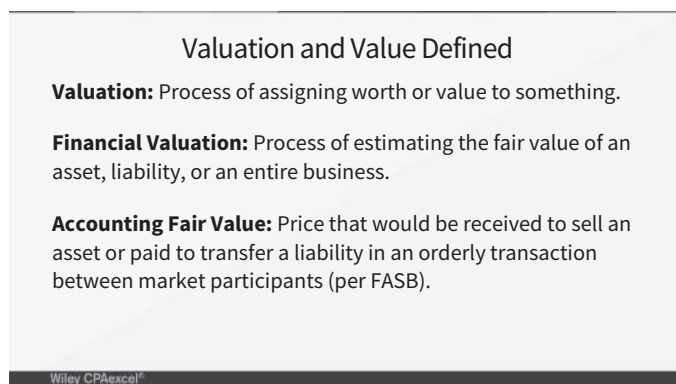
- Concept and use is primarily a monetary policy approach
- Resulted from the failure of the traditional zero (0.0%) lower limit to central banks' interest rate to adequately stimulate economic activity
- In theory, encourages businesses and individuals to spend, lend or invest funds, rather than pay to have those funds held by a financial institution.

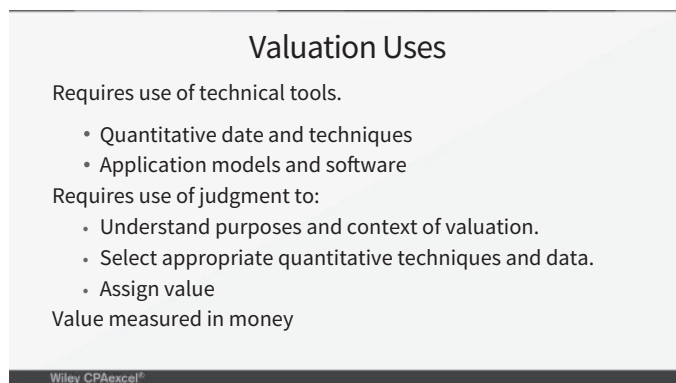
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Financial Valuation

Introduction to Financial Valuation







Characteristics of Valuation Process

Requires use of technical tools.

- Quantitative data and techniques
- Application models and software

Requires use of judgment to:

- Understand purposes and context of valuation.
- Select appropriate quantitative techniques and data.
- Assign value

Value measured in money

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Characteristics of Valuation Process

Value is determined for specific item:

- Separate asset, liability, or equity item
- Group of assets, liabilities, or entire business

Value must take into account attributes of item being valued, including:

- Condition
- Location

Value is at a point in time—called the **measurement date**.

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Fair Value Framework

U.S. GAAP provides a framework for ranking quality of assumptions and inputs in assessing fair value.

- Framework is relevant to finance and business in general

U.S. GAAP Hierarchy of Inputs:

- Level 1—Highest and best inputs
- Level 2
- Level 3—Lowest and least desirable inputs, with most assumptions

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Fair Value Framework

Level 1 Inputs: Unadjusted quoted prices obtained at the measurement date in active markets for assets and liabilities identical to those being valued.

- These inputs are the most reliable evidence of fair value.
 - Quoted price in active market
- Should be used when available.

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Fair Value Framework

Level 2 Inputs: Observable for the item being valued, either directly or indirectly, but are **other than** quoted prices described in Level 1; including the following four categories:

1. Quoted prices for similar, but not identical, item in active market
2. Quoted prices for identical or similar item in market that is not active

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Fair Value Framework

3. Inputs other than quoted prices that are observable for the item being valued, including for example:

- Interest rates
- Yield curves
- Credit risk
- Default rates
- Etc.

4. Inputs derived principally from, or corroborated by, observable market data by correlation or other means

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Fair Value Framework

Level 3 Inputs: Unobservable for item being valued.

- Entity's assumptions used
- Entity's internal data
- Use only when observable inputs not available.

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Fair Value Framework

U.S. GAAP also provides three approaches to developing fair value:

1. Market approach
2. Income approach
3. Cost approach

These approaches are appropriate for and used in financial management.

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Fair Value Framework

Market Approach (also called Sales Comparison Approach): Uses prices and other relevant information generated by market transactions for items identical or comparable to item being valued.

- Example: Common in establishing value of pre-existing house or building

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Fair Value Framework

Income Approach: Uses valuation techniques to convert future amounts of economic benefits or sacrifices of economic benefits to determine what the future amounts are worth at valuation date.

- Techniques include:
 - Discounted cash flows
 - Option pricing models
 - Earnings capitalization models
 - Etc.

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Fair Value Framework

Cost Approach: Uses valuation techniques to determine the amount required to acquire or construct a substitute item.

- Also called:
 - Replacement cost approach
 - Reproduction cost approach
- More limited than market approach or income approach.
 - Especially useful for specialized items

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Valuation Techniques—General

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Valuation Techniques—
General

GAAP Inputs Hierarchy

Level 1 Inputs: Quoted market prices in active markets for identical items.

- Used to value items traded in active markets
- If there is a public, active market for the item being valued, that market is the best indicator of fair value

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GAAP Inputs Hierarchy

Active markets include:

- Stock markets
- Bond markets
- Commodities markets
- Currency markets
- Over-the-counter markets

Active market price for identical item = Fair value.

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GAAP Input Hierarchy

Level 2 Inputs: Directly or indirectly observable inputs, but not for identical items in active market, including:

- Quoted prices for similar items, but not identical, or in markets that are not active
- Observable inputs other than quoted prices

Market is not active when:

- Few relevant transactions are available
- Prices are not current or vary substantially
- Little publicly available information

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GAAP Input Hierarchy

Level 2 Inputs: Examples of when used:

- Stock restricted from trading, but similar to traded shares
- Securities traded in brokered markets, rather than public markets
- Residential and commercial property with comparable sales
- Private debt securities for which there is publicly traded debt with comparable risks and terms

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GAAP Input Hierarchy

Level 3 Inputs: Unobservable inputs based on entity's assumptions, estimates, and internal data.

Examples of Level 3 inputs:

- Expected cash flows
- Expected life of an asset, etc.
- Expected residual value
- Likelihood of events occurring
- And similar estimates

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GAAP Input Hierarchy

Level 3 Inputs: Examples of when used:

- Asset retirement obligations
- Financial asset servicing rights
- Capital projects
- Closely held businesses
- And others

All use lots of assumptions and estimates.

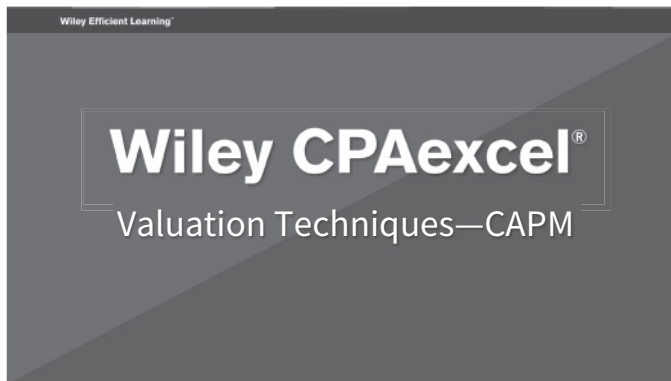
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Hierarchy/Inputs/Uses

- This lesson shows:
 - U.S. GAAP Hierarchy of Inputs
 - Specific examples of inputs
 - Examples of use of those inputs
- Notice:
 - Some items valued directly
 - Example: share of stock or barrel of crude oil
 - Other items require more judgment and use of valuation techniques

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Valuation Techniques—CAPM



Capital Asset Pricing Model (CAPM)

Capital Asset Pricing Model (APM): An economic model that determines a measure of relationship between risk and expected return

- That relationship measure is used in valuing various assets
- CAPM incorporates both:
 - Time value of money—using risk-free rate of return
 - Element of risk—using risk measure called *beta*

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Capital Asset Pricing Model

CAPM Basic Formula :

$$RR = RFR + [beta (ERR - RFR)]$$

- Where:
 - RR = Required rate of return
 - RFR = Risk-free rate of return—rate on U.S. government bonds
 - *beta* = Measure of volatility of asset being measured (i.e. a measure of risk)
 - ERR = Expected rate of return - Benchmark rate for the class of asset being valued

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CAPM Illustration

CAPM Formula and Illustration:

- $RR = RFR + [\textit{beta} (ERR - RFR)]$
- Assume:
 - Risk-free rate = 3%
 - $\textit{beta} = 2$
 - Expected rate of return = 10%
- Then:
 - $RR = .03 + [2 (.10 - .03)]$
 - $RR = .03 + [2 (.07)]$
 - $RR = .03 + .14 = .17 = 17\%$

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CAPM *beta*

beta: Measure of systematic risk as reflected by the volatility of an investment or other asset.

Technically, $\textit{beta} = \frac{(\text{Asset standard deviation})[a]}{(\text{Benchmark standard deviation})[b]} \times \text{Coefficient of correlation between [a] and [b]}$

beta: Measure of volatility of an asset when compared to a benchmark for the whole class of that asset

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beta Values

Three states of *beta* are possible:

- $\textit{beta} = 1$
- $\textit{beta} > 1$
- $\textit{beta} < 1$
- ***beta* = 1**: Asset being valued moves in line with benchmark
 - Asset being valued has the same level of systematic risk as that class of asset

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beta Values

- ***beta* > 1:** Asset being valued moves greater than benchmark
 - Asset being valued is more volatile (more systematic risk) than that class of asset
 - In earlier example:
 - Expected rate of return = 10%
 - *beta* = 2 = more risky than benchmark for class of asset being valued
 - Required rate of return = 17% (greater)

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beta Values

- ***beta* < 1:** Asset being valued moves less than benchmark
 - Asset being valued is less volatile (less systematic risk) than that class of asset

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CAPM Assumptions and Limitations

CAPM Assumptions and Limitations:

- There is an asset class and benchmark for the asset being valued.
- All investors have equal access to all investments of the class being valued and all use a one-period time horizon.
- Asset risk is measured solely by variance of the asset being valued from asset class benchmark.

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CAPM Assumptions and Limitations

- No external costs involved—no commissions, taxes, etc.
- No restrictions on borrowing or lending at the risk-free rate; all parties can do so
- Uses historical data, which may not be appropriate for computing future returns

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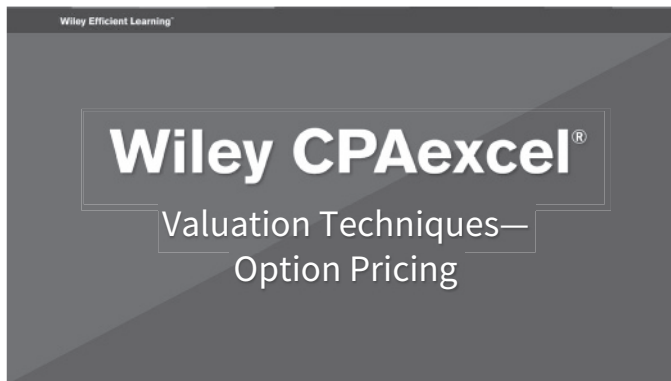
CAPM Uses

Uses of CAPM include:

- Securities analysis
- Capital budgeting
 - Company *beta* or industry *beta* used as surrogate for project beta
- Setting fair compensation for regulated monopolies

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Valuation Techniques—Option Pricing



Options Defined

Option: Contract that entitles owner to buy or sell an asset at a stated price within a specified period.

- **American-Style:** Option permits exercise any time before expiration
- **European-Style:** Option permits exercise only at maturity date

Option Value Factors

Option Value is determined by 6 factors:

- Current stock price relative to option price
 - Greater the stock price over the (call) option price = Greater the value of option
- Time to expiration of option
 - Longer the time = Greater the value of option
- Risk-free Rate of Return
 - Higher the risk-free rate = Greater the value of option

Option Value Factors

Option Value determined by 6 factors:

- Measure of risk of optioned asset
 - Standard deviation
 - Larger the standard deviation = Greater the value of option
- Exercise price of option
- Dividend payments on optioned security
 - Smaller the dividends = Greater the value of option

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Black Scholes Model

Black Scholes Option Pricing Model:

Developed to value options under specific circumstances, including:

- For European call options
- Stock pays no dividends
- Stock prices increase in small increments
- Risk-free rate of return is assumed constant

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Black Scholes Model

Black Scholes pricing model uses factors identified above, but incorporates two unique features:

- Use of probabilities:
 - Probability that the price of the stock (security) will pay off by expiration date
 - Probability that the option will be exercised
- Discounting of the exercise price

Modified Black Scholes models overcome most original limitations.

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Black Scholes Model

On the Exam:

- You will not be required to do calculations using the Black Scholes Model—that is extremely complicated
- You should know what it is:
 - Technique for valuing options on securities
- You should know why it is different:
 - Uses probabilities
 - Uses discounting

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Binomial Model (BOPM)

Binomial Option Pricing Model: Another method for determining the value of an option.

Uses “tree” diagram to estimate values at a number of time points between the valuation date and the expiration date.

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Binomial Model (BOPM)

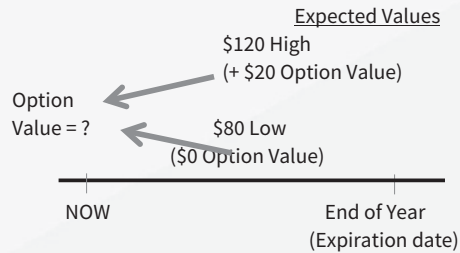
Binomial Option Pricing Model Steps:

- Generate price tree diagram—Use a branch for each desired time period until expiration.
- Calculate option value at each tree end node as of the expiration date.
- Calculate option value at each preceding node back to present valuation date.

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Binomial Option Price Model Tree

Assume: 1 year stock option; exercise price = \$100



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Binomial Option Price Model Tree

By assigning probabilities to the two possible outcomes, an expected value can be derived.

If probability of \$120 is 60%, probability of \$80 is 40%, and interest (discount) rate is 10%, expected value can be computed as:

$$\begin{aligned} \text{Expected Value} &= \\ &= [(.60 \times \$20) + (.40 \times \$0)] / 1.10 \\ &= \$12 / 1.10, \text{ or } \$10.91 \end{aligned}$$

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Binomial Option Price Model Tree

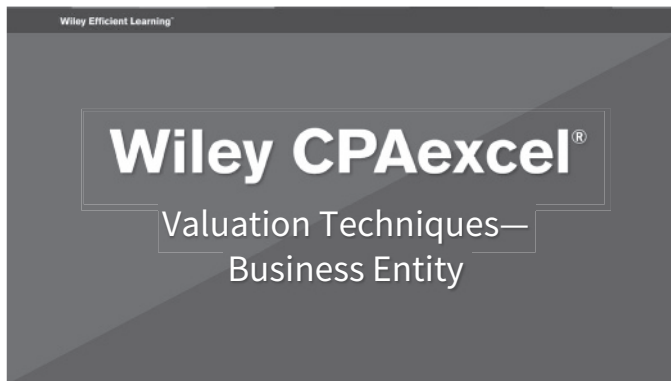
One-period example is very simple, but illustrates the process.

In practice, there would be multiple time periods.

- The expected outcome of one period would be the input for **prior period**—you work backwards
- You continue to work backwards until you get the current value.

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Valuation Techniques—Business Entity



Business Valuation Defined

Business Valuation: The estimation of the economic value of a business entity or portion thereof.

Uses of business valuation:

- Buying or selling a business
- Developing a buy/sell agreement
- Estate purposes
- And others

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Business Valuation Process

Business valuation process involves:

- Establishing standards and premise of valuation
- Assessing economic environment of entity being valued
- Analyzing financial statements and related information
- Formulating value

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Business Valuation Process

Establishing standards and premise:

Identifies reasons for and circumstances of valuation.

- Standards—Establish conditions of valuation:
 - Is valuation legally or otherwise mandated?
 - Is valuation at request of and for owners?
 - Is valuation for prospective buyer?

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Business Valuation Process

Establishing standards and premise:

- Premise—Establishes assumptions to be used
 - Will business continue as single going concern?
 - Will business be separated into separate units?
 - Will assets be sold separately?

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Economic Environment Assessment

Assessment of environment of the business being valued should consider:

- General economic environment
- Specific operating economic environment
- Economic nature of industry, and
- Economic conditions of physical location

Economic assessment provides framework for valuing a specific entity.

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Financial Statement Analysis

Financial Statement Analysis would include:

- Common-size analysis—Converting dollar amounts to percentages for comparison over time and with other entities
- Trend analysis—Determining changes in important measures over time
- Ratio analysis—Determining important ratios to assess change and compare with other entities
- Making adjustments to statements to better reflect normal, ongoing operations

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Alternative Business Valuation Approaches

The **Alternative Approaches to Business Valuation** are:

- Market Approach
- Income Approach
- Asset Approach

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Market Approach

Market Approach (also called Guideline Public Company Method): Determines value of a business by comparing it with highly similar entities for which there is a readily determinable value.

- Example:

Market value of publicly-traded company could be used as basis for determining value of highly comparable non-public company.

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Market Approach

Use of **Market Approach** may require adjustments to get final value for business.

Adjustments might include:

- Premium for controlling interest in business being valued
- Discount for lack of controlling interest in business being valued
- Discount when business being valued is not as marketable as entity on which its value is based

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Market Approach

Market approach disadvantages:

- Difficulty in identifying highly comparable entities for which there is a ready and objective market value
- Difficulty in determining appropriate liquidity ("sellability") and other discounts in valuing the comparable entity

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Income Approach

Income Approach: Determines value by calculating net present value of the benefit stream generated by the entity being valued.

- Net present value = Entity value.
- Net present value is calculated using discount rate.
- Discount rate should be based on rate of return needed to attract investor funding given the level of risk.

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Income Approach

Alternative income approach methods:

- Discounted cash flows—Uses discounted cash flows to get present value
- Capitalization of earnings—Applies capitalization or interest rate to earnings to get value
- Earnings multiple—Applies a multiple factor to earnings to get value
- Free cash flow—Applies discount rate to free cash flows to get present value
 - Variation of discounted cash flows

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Asset Approach

Asset Approach: Determines value by adding values of individual assets that comprise the entity being valued.

- Fair value of each individual asset (and liability) is determined
- Sum of **net** assets is value of entity.

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Asset Approach

Valuation of individual assets requires the use of specific valuation technique:

- Income Approach
- Market Approach
- Cost Approach

Certain assets are difficult to value alone.

- Intangible assets (e.g., trademark)

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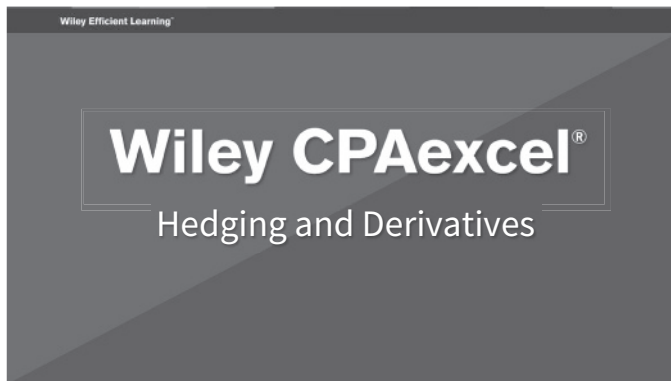
Asset Approach

Asset approach appropriateness:

- Less appropriate for valuing going concern
- Less appropriate for valuing non-controlling interest
- More appropriate for valuing entity in liquidation
- More appropriate for entity with little or no cash flows or earnings

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Hedging and Derivatives



Hedging

Hedging: A management strategy for mitigating (reducing) the risk of loss associated with certain transactions and positions.

- Commonly executed using offsetting (counter) transactions so that the loss on one transaction would be offset (in part at least) by a gain on the other transaction (or vice versa).
- Object is to minimize net loss, not to make a net profit.

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Hedging

Hedging Elements—Hedged Item and Hedging Instrument

- **Hedged Item**—The recognized asset, recognized liability, firm commitment, planned transaction or other item that is at risk of loss.
 - It is the possible loss on the hedged item that is hedged.

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Hedging

Hedged Items—Example Items

Recognized Assets	Accounts Receivable
	Investments
	Inventory
Recognized Liabilities	Accounts Payable
	Interest Payable

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Hedging

Hedged Items—Example Items

Firm Commitments	Executed contract to buy or sell a good or service, but not yet recognized
Planned Transaction	Budgeted revenue or expense (e.g., Budgeted royalty from foreign licensee)

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Hedging

- **Hedging Instruments**—The contract (or other arrangement) entered into to mitigate (or eliminate) the risk of loss associated with the hedged item.
 - **Derivatives** are the primary form of contract used as instruments for financial hedging.
 - Derivatives will be defined and described after will look at some typical circumstances in which hedging is used.

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Hedging

Common Hedged Items and Circumstances

- Inventory/Commodity price changes
- Foreign currency exchange rate changes
- Interest rate changes
- Default (credit) risk

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Hedging

Common Hedged Items and Circumstances

- Inventory/Commodity price changes: The risk that the price of inventory or commodities will change so as to adversely affect inventory values and/or profit margins
 - Increase in the market price of inputs to the production process
 - Decrease in the market price of inventory already under higher purchase price contract
 - Decrease in the market price of inventory held for resale

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Hedging

Common Hedged Items and Circumstances

- Foreign currency exchange rate changes: The risk that the exchange rate between currencies will change such that the value of revenues, expenses, assets or liabilities will be adversely affected when converted to the domestic currency
 - Transaction Risks—Risk that assets (e.g., collection of accounts receivable or sale of investment) will convert to fewer dollars when received, or that liabilities (e.g., accounts payable) will require more dollars to settle

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Hedging

Common Hedged Items and Circumstances

- Foreign currency exchange rate changes:
 - Translation Risk—The risk that the exchange rate between currencies will change such that asset and revenue accounts of foreign subsidiaries (or other foreign operations) will convert to fewer dollar and/or that liability and expense accounts will convert to more dollars.

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Hedging

Common Hedged Items and Circumstances

- Interest rate changes: The risk that the market rate of interest will change so as to adversely affect either investment value or interest costs.
 - An increase in the market rate of interest will cause a decrease in the value of outstanding fixed-rate interest debt investments.
 - An increase in the market rate of interest will cause an increase in the cost of interest on outstanding variable-rate interest debt.

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Hedging

Common Hedged Items and Circumstances

- Default (credit) risk: The risk that the issuer of debt (borrower) will fail to make interest payments or principal repayment when due resulting in a loss to the investor.

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Derivatives

Derivatives are the most common form of contract used for financial hedging.

Derivatives are contracts with all three of the following elements:

1. One or more “underlyings” and one or more “notional amounts.”
2. Requires no initial net investment or one that is smaller than would be required for other types of similar contracts.
3. Terms require or permit a net cash settlement.

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Derivatives

Derivatives have one or more “underlyings” and one or more “notional amounts”

- An **underlying** is a specified price, rate or other variable (e.g., a stock price, a commodity price, an interest rate, a foreign exchange rate, etc.).
- A **notional amount** is a specified unit of measure (e.g., shares of stock, pounds or bushels of a commodity, number of currency units, etc.).

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Derivative

Derivative Value

The value (or settlement amount) of a derivative instrument is determined as:

Derivative Value = Units of Notional Amount × Underlying

Example: Number of Shares of Stock × Price Per Share

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Derivatives

Derivatives require no initial net investment or one that is smaller than would be required for other types of similar contracts.

Derivatives require or permit a net settlement—it can be settled for cash or an asset readily convertible to cash in lieu of physical delivery of the subject matter of the contract.

- Most derivatives are settled with cash for the net difference between the contract price and the market price.

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Derivatives

Major derivative instruments include:

- Futures contracts
- Forward contracts
- Option contracts
- Swap contracts

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Derivatives

Derivative Instruments—Futures Contracts

- Contract to deliver or receive a commodity, foreign currency, security instrument, or other asset in the future at a price set now:
 - Executed through a clearinghouse (futures exchange)
 - Standardized contract terms—item, quantity, quality, delivery
 - Have margin requirements, marked-to-market and settled daily

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Derivatives

Derivative Instruments—Forward Contracts

- Contract to deliver or receive a commodity, foreign currency, security instrument, or other asset in the future at a price set now:
 - Executed directly between contracting parties
 - Can be customized to any item, quantity, delivery date, etc.
 - Settled only at end of contract

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Derivatives

Derivative Instruments—Option Contracts

- Contract between a buyer and seller that gives the buyer of the option the right to buy (call option) or sell (put option) a particular asset in the future at a price set now (strike price).
 - Buyer has right to buy or sell, but is not required to do so
 - Buyer will exercise option only if economically favorable to do so
 - Contract are traded either on an exchange or over-the-counter as contracts negotiated between parties

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Derivatives

Derivative Instruments—Swap Contracts

- Contract between a buyer and seller by which they agree to exchange cash flows (typically related to interest), currencies, commodities, or risk.
 - Executed directly between contracting parties.
 - Can be customized for any item, amount or length of time.
 - For cash flow swaps, commonly only interest cash flows are swapped, not principal amounts.

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Hedging with Derivatives

- When applied to items at risk (recognized assets or liabilities, firm commitments or planned transactions), derivatives mitigate or eliminate (hedge) certain risks associated with the hedged item.
- The following examples illustrate how derivatives can be used to hedge some of the risks described above as items that can be hedged.

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Hedging with Derivatives

- **Risk to Firm Commitment to Buy Inventory (or Commodity)**—Hedge the risk that market price changes will adversely affect the cost of inventory to be acquired through a firm contract to buy the inventory.
 - Value of inventory to be acquired under a firm, fixed-price contract would be adversely affected if the market price decreased before the delivery (i.e. a loss would be recognized as the difference between the contract price and the market price at delivery).

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Hedging with Derivatives

- **Risk to Firm Commitment to Buy Inventory (or Commodity)—Hedging Action**
 - Enter into a future contract to sell the inventory/commodity.
 - Decrease in market price of inventory would result in:
 - Loss on value of inventory under fixed-price contract
 - Gain on value of futures contract to sell inventory—contract provides for sale at higher price before price decline, giving the contract increased value (a gain in value of contract)

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Hedging with Derivatives

Risk to Existing Inventory—Hedge the risk that market price changes will adversely affect the carrying value of inventory.

- If the market price of inventory declines, the value of existing inventory would decrease, resulting in a lower of cost or market write down recognized as a loss for the period of decline.

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Hedging with Derivatives

• Risk to Existing Inventory—Hedging Action

- Enter into a forward contract or a put option contract to sell inventory
- A decline in market price would result in:
 - > Lower of cost or market write down loss on existing inventory
 - > Gain on value of forward contract or put option to sell inventory (at higher price before price decline)
- Put option would be exercised only if market price declines

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Hedging and Derivatives

• Risk to Existing Inventory—Hedging Example

- Hedgehog, Inc. acquired inventory that cost \$100,000. It expects to sell that inventory in 4 to 6 months.
- It is concerned that the market value of the inventory will decline prior to its sale.
- To hedge the possible decline in inventory value, it enters into a forward contract to sell comparable inventory at the end of 3 months.

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Hedging and Derivatives

• Risk to Existing Inventory—Hedging Example

- Hedgehog's forward contract provides for the sale of comparable inventory in 3 months for \$100,000 (the current price for delivery in 3 months; forward price = spot price)
- At the end of 3 months the market price of the inventory is \$80,000
- Hedgehog will have:
 - > \$20,000 Loss on LCM write down
 - > \$20,000 Gain on value of forward contract
- Net loss/gain = 0

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Hedging and Derivatives

• Risk to Existing Inventory—Hedging Example

- Gain on forward contract would be recognized as payment from counterparty to settle contract (i.e., cash settlement in lieu of delivery of inventory)
- Example simplified by:
 - Assuming spot price and forward price are the same = \$100,000
 - Ignoring any fees, etc. associated with the forward contract transaction

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Hedging with Derivatives

- **Risk to Recognized Assets/Liabilities Denominated in a Foreign Currency**—Hedge the risk that changes in currency exchange rates will change so as to adversely affect the settlement of assets and liabilities denominated in a foreign currency.
 - Dollar value of assets settled in a foreign currency may decline or dollar cost of liabilities settled in a foreign currency may increase, resulting in adverse financial consequence (a loss) upon settlement

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Hedging and Derivatives

• **Risk to Recognized Assets/Liabilities Denominated in a Foreign Currency—Hedging Action for Receivable**

- Receivable denominated in a foreign currency will result in collection of a fixed number of units of foreign currency
- If exchange rate changes such that fixed units of foreign currency convert to few dollars, a loss will occur
- Enter into forward contract to sell foreign currency units when received at price set now

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Hedging and Derivatives

• **Risk to Recognized Assets/Liabilities Denominated in a Foreign Currency—Hedging Action for Receivable**

- Upon collection of receivable, use foreign currency units to settle contract
- Receive number of dollars provided by contract, regardless of current exchange rate

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Hedging and Derivatives

• **Risk to Cost of Borrowing**—Hedge the risk that changes in market interest rates will adversely affect the cost of borrowing for variable-rate debt.

- Increase in market rate of interest would cause interest rate and interest expense on variable-rate debt to increase.

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Hedging and Derivatives

• Risk to Cost of Borrowing—Hedging Action

- Enter into interest rate swap contract to exchange variable-rate interest receipts for fixed rate interest payments.
- Entity would make a higher fixed rate payment to counterparty and receive a variable rate payment from counterparty.
- If interest rate increases firm will receive higher interest from counterparty to offset higher fixed interest payments.

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Hedging and Derivatives

• Risk of Credit Default—Hedge the risk that creditor will default on interest payments and/or principal repayment, resulting in loss to lender

- Failure of a creditor to make interest payments or to repay principal when due will result in loss to the lender/investor

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Hedging and Derivatives

• Risk of Credit Default—Hedging Action

- Enter into a credit default swap (CDS)
- Entity pays a fee to counterparty
- Counterparty assumes credit risk
- If creditor fails to pay holder of debt, counterparty compensates for loss
- Functions like an insurance policy

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Hedging and Derivatives

- Possible Hedging Costs include:
 - Hedging and related costs turn out to be unnecessary
 - Loss of possible favorable changes in hedged item
 - Difference between forward rates and spot rates
 - Contract related fees
 - Administration of hedging activities

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Hedging and Derivatives

- Risks Associated with Hedging:
 - Credit risk—Risk the counterparty fails to meet its contractual obligations
 - Market risk—Risk that market will change contrary to expectations
 - Basis risk—Risk that hedged item and hedging instrument do not experience equal change in opposite directions; measures the ineffectiveness of the hedge.

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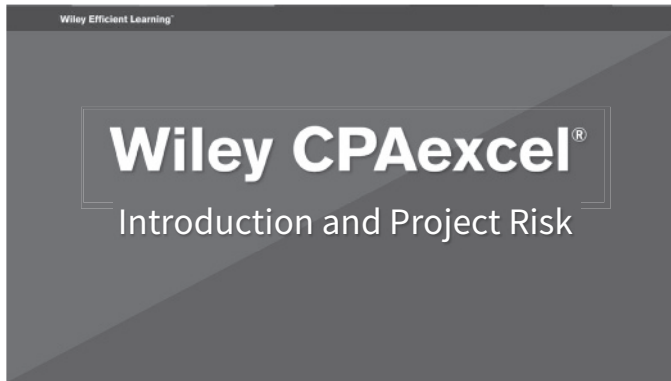
Derivatives and Speculation

- Derivatives can be used for speculation
 - Intent is to make a profit
 - No item being hedged; no intent to offset losses
 - Investor enters into derivative contract based on expectation about direction of subject matter of contract.
 - Example: Investor believe stock price will go up could buy an option contract (call) to purchase the stock in the future at a price set now

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Capital Budgeting

Introduction and Project Risk



Capital Budgeting Defined

Capital budgeting: The process of measuring, evaluating, and selecting long-term investment opportunities for a firm.

Example investments:

- Selecting new equipment and plants
- Evaluating new products
- Making advertising campaign decisions
- Similar undertakings

Effective capital budgeting is essential for a firm's success.

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Project Risks

Capital undertakings have elements of both:

- Risk
- Reward

Risk: The possibility of loss or other unfavorable results that derives from uncertainty implicit in future outcomes.

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Project Risks

Capital project risks include:

- Incomplete or incorrect project analysis
- Unanticipated actions of customers, suppliers, and competitors
- Unanticipated changes in laws and regulations
- Unanticipated macroeconomic changes, including interest rates, inflation rates, tax rates, etc.

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Risk–Reward Relationship

Reward: The benefit expected or required from investment of resources in capital projects and other undertakings.

The relationship between risk and reward is that:

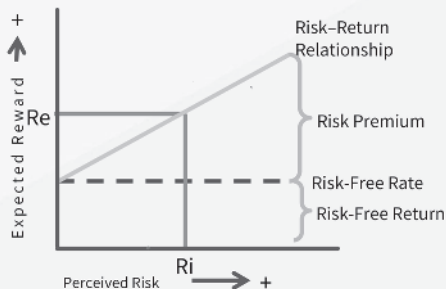
- The greater the perceived risk, the greater the expected reward

The risk–reward relationship is shown in this graph:

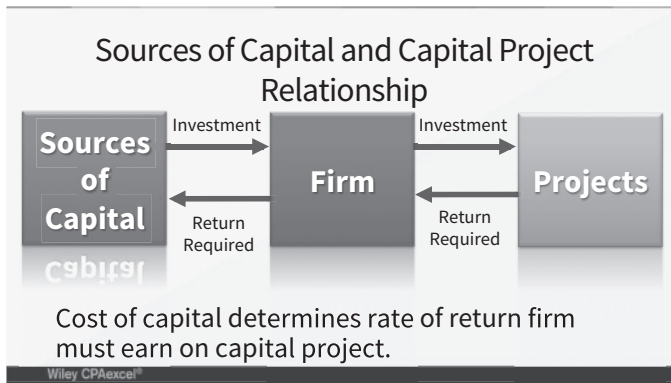
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Risk–Reward Relationship

The greater the perceived risk, the greater the expected reward.

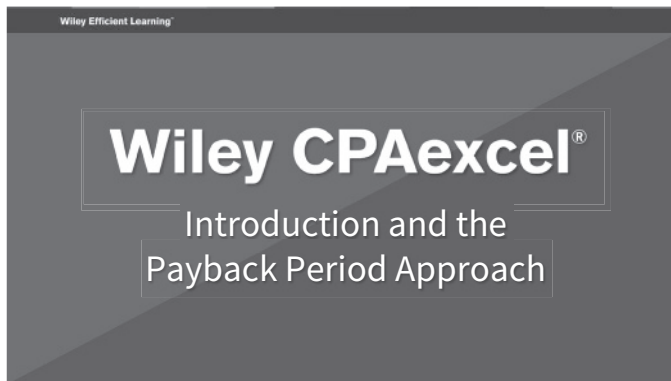


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Evaluation Techniques

Introduction and the Payback Period Approach



Evaluation Techniques

Six techniques for evaluation and selection of capital projects:

1. Payback period approach
2. Discounted payback period approach
3. Accounting rate of return approach
4. Net present value approach
5. Internal rate of return approach
6. Profitability index approach

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Payback Period Approach (PPA) Defined

Payback Period Approach: Determines the number of years needed to recover the initial cash investment in a project and compares that time with a pre-established maximum payback period

- If $\text{payback period} \leq \text{maximum period}$ = accept project
- If $\text{payback period} > \text{maximum period}$ = reject project

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PPA Illustrated

Proposed Project = \$250,000, no residual value.

Expected cash inflows:

- Year 1 \$50,000
- Year 2 75,000
- Year 3 75,000
- Year 4 75,000
- Year 5 25,000 $\Sigma = \$300,000$

Maximum payback period = 3 years

Payback period = \$50,000 + \$75,000 + 75,000 =
\$200,000 < \$250,000 Cost = Reject project

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Payback Period Approach

Advantages:

- Easy to use and understand.
- Useful in evaluating project liquidity.
- Establishing a short maximum period reduces uncertainty.

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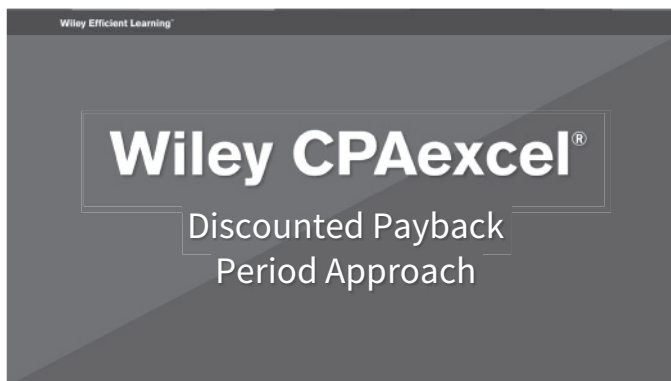
Payback Period Approach

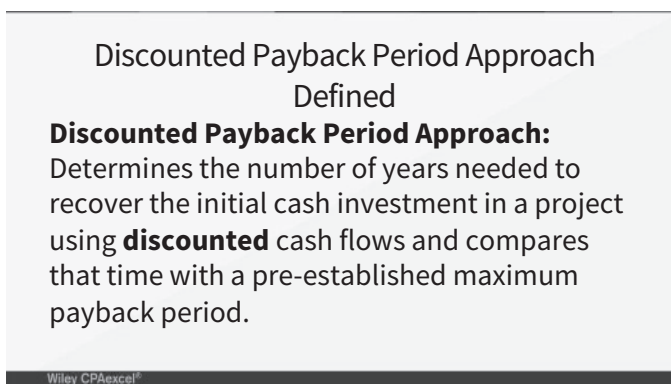
Disadvantages:

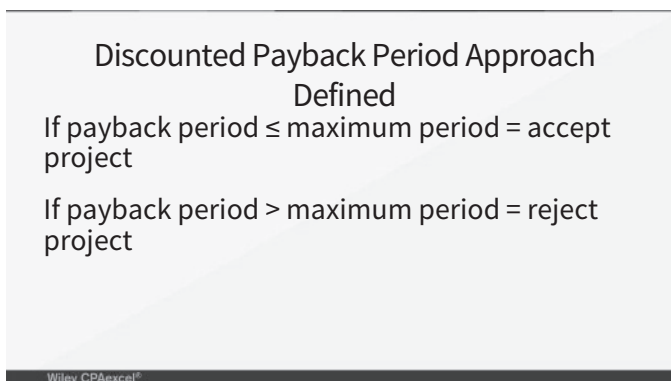
- Ignores time value of money (uses nominal values).
- Ignores cash flows after payback period.
- Does not measure total project profitability.
- Maximum payback period established may be arbitrary.

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Discounted Payback Period Approach







Discounted Payback Period Approach Illustrated

Proposed Project: \$250,000, no residual value.

YEAR	CASH FLOW	6% PV FACTOR	PV AMOUNT	PV SUM
Year 1	\$50,000	.943	\$47,150	\$ 47,150
Year 2	75,000	.890	66,750	113,900
Year 3	75,000	.840	63,000	176,900
Year 4	75,000	.792	59,400	236,300
Year 5	25,000	.747	18,675	254,975

Maximum payback period = 3 years

3-Year payback = \$176,900 < \$250,000 Cost = Reject project

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Discounted Payback Period Approach

Advantages:

- Easy to use and understand
- Useful in evaluating project liquidity
- Establishing a short maximum period reduces uncertainty
- Uses time value of money concept

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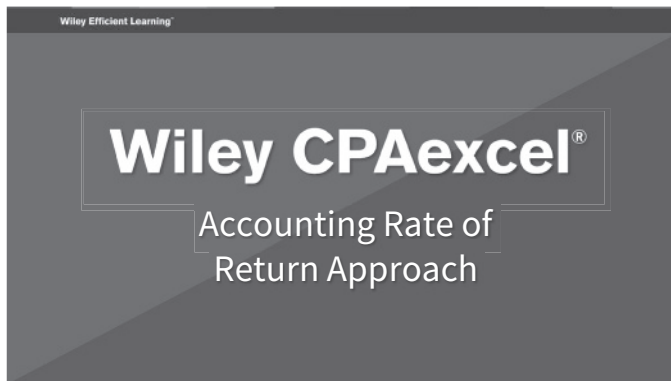
Discounted Payback Period Approach

Disadvantages:

- Ignores cash flows after payback period.
- Does not measure total project profitability.
- Maximum payback period may be arbitrary.

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Accounting Rate of Return Approach



Accounting Rate of Return Approach (ARR) Defined

Accounting Rate of Return: Determines the expected annual **incremental accounting net income** from a project as a percent of the initial (or average) investment.

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Accounting Rate of Return Approach Defined

Formula:

$$\text{ARR} = \frac{\text{Average Annual Incremental Revenue} - \text{Average Annual Incremental Expenses}}{\text{Initial (or Average) Investment}}$$

Incremental revenues and expenses are as determined using accrual accounting.

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ARR Approach Illustration

Proposed project: Initial cash outlay = \$250,000, no residual value.
Expected incremental net income:

Year 1	\$12,000
Year 2	18,000
Year 3	26,000
Year 4	24,000
Year 5	20,000
Total	\$100,000/5 years = \$20,000 Average

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ARR Approach Illustration

Investment = \$250,000

Average incremental net income = \$20,000

$ARR = \$20,000 / \$250,000 = .08 = 8.0\%$ ARR

- $ARR \geq$ Pre-established rate = Accept
- $ARR <$ Pre-established rate = Reject

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Accounting Rate of Return Approach

Advantages:

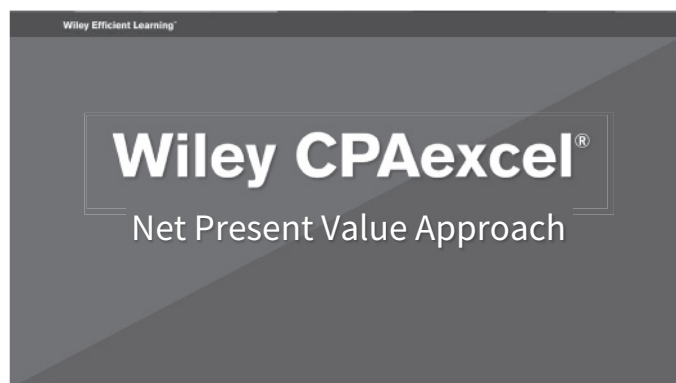
- Easy to use and understand
- Consistent with financial statement values
- Considers entire life and results of project

Disadvantages:

- Ignores time value of money
- Uses accrual accounting values, not cash flows

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Net Present Value Approach



Net Present Value (NPV) Approach Defined

NPV: Determines the present value of expected cash inflows and compares that value with the present value of expected outflows in the project.

- Present value is determined using discount rate, also called hurdle rate, based on cost of capital to firm (e.g., WACC).
- NPV = Difference between present value of cash inflows and outflows (initial cash investment):
 - $NPV \geq 0$ = Accept project
 - $NPV < 0$ = Reject project

NPV Approach Illustration

Proposed project: Initial cash outlay = \$250,000, no residual value, 6% discount rate

Expected cash flows:

Year	Cash Flow	PV Factor	PV Amount	PV Sum
Year 1	\$50,000	.943	\$47,150	\$47,150
Year 2	75,000	.890	66,750	113,900
Year 3	75,000	.840	63,000	176,900
Year 4	75,000	.792	59,400	236,300
Year 5	24,000	.747	18,675	254,975—Total PV

$NPV = PV \$254,975 - \text{Cost } \$250,000 = \$4,975$

NPV = Positive = Accept project

NPV Approach

Advantages:

- Recognizes time value of money
- Relates project rate of return to cost of capital
- Considers entire life and results of project
- Easier to compute than Internal Rate of return (IRR—the next technique)

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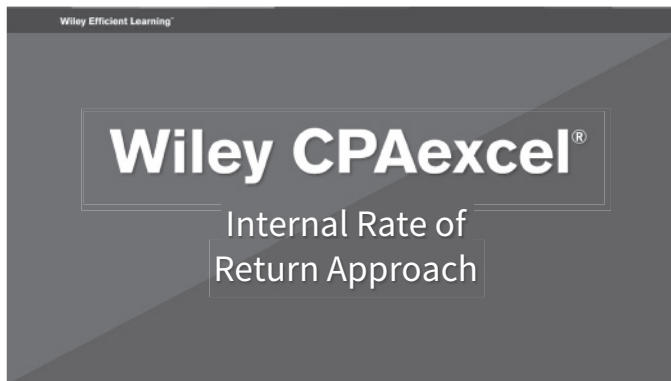
NPV Approach

Disadvantages:

- Requires the estimation of cash flows over the entire life of project, which could be very long
- Assumes cash flows are immediately reinvested at the discount (hurdle) rate of return used

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Internal Rate of Return Approach



Internal Rate of Return Approach (IRR) Defined

Internal Rate of Return Approach (IRR): Determines the discount rate that equates the present value of expected cash inflows with the present value of expected cash outflows.

That discount rate is the rate of return on the project.

IRR computes the discount rate that makes NPV of cash flows equal to zero.

Calculation of the IRR is best done with a financial calculator or computer program.

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IRR Approach Illustration

Equation for NPV = 0:

- Future annual cash inflows $\times$ PV factor = Investment cost

Rearranged equation:

- PV factor = Investment Cost / Future annual cash inflows

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IRR Approach Illustration

Proposed Project:

- Initial cash outlay = \$37,500, no residual value
- Expected cash inflow = \$10,000 per year for 5 years
- PV Factor = Initial Cost/Expected Cash =
\$37,500/\$10,000 = 3.750 (PV factor)

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IRR Approach Illustration

Look up PV Factor on Present Value Table to get rate of return for project

PV Table for 5 periods:

Rate -->	8%	10%	12%	14%	16%
5 Periods	3.993	3.791	3.605	3.433	3.274

Computed PV Factor = 3.750 falls between 3.605 and 3.791, or a discount rate between 10% and 12%.

To get the exact discount rate between 10% and 12% would require interpolation.

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IRR Approach

Advantages:

- Recognizes time value of money
- Considers entire life and results of the project

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IRR Approach

Disadvantages:

- Difficult to compute without a financial calculator; even more difficult when cash flows are uneven
- Requires estimation of cash flows over entire life of project, which could be very long, and that all cash flows be either positive or negative
- Assumes cash flows are immediately reinvested at internal rate of return

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NPV vs. IRR Approaches

NPV: Uses a rate of return (hurdle rate) to determine whether or not the present value of net cash flows is positive

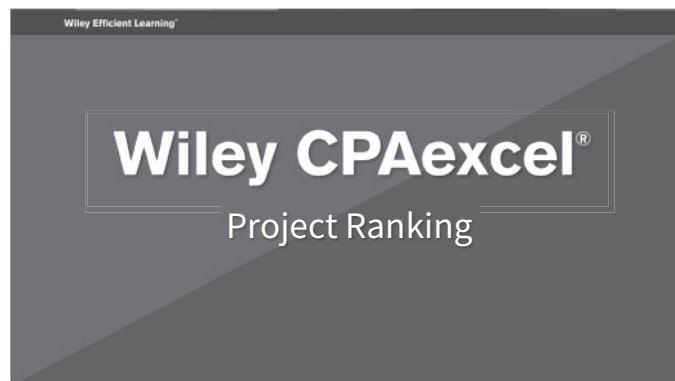
- If so, the project will earn at least the hurdle rate.

IRR: Determines what rate of return makes the net present value of net cash flows equal to zero

- That rate of return is the rate earned by the project.

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Project Ranking



Profitability Index (PI) Approach Defined

Profitability Index (also called Cost-Benefit Ratio): Determines project rankings by taking into account both the net present value and the cost of each project.

- Profitability index calculation:

$$PI = \frac{\text{NPV of project inflows}}{\text{PV of project cost}}$$

The resulting percentage index is used to rank projects.

- Higher the percentage = Higher the rank

PI Approach Illustrated

Proposed Projects:

Project A: $NPV = \$60,000 / \text{Cost} = \$50,000 = 1.20$

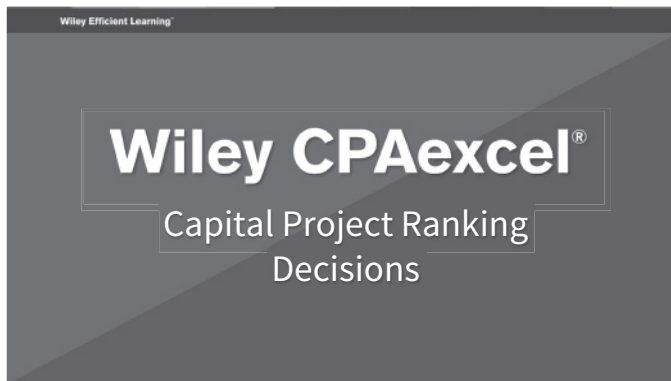
Project B: $NPV = \$110,000 / \text{Cost} = \$100,000 = 1.10$

Profitability Indexes (PI):

- Project A = 1.20
- Project B = 1.10

Based on PI: Project A ranks higher than Project B

Capital Project Ranking Decisions



Project Ranking Decisions

A firm is limited in the number of projects it can undertake in the short-run due to resource constraints.

- Limited capital
- Limited management capability

It needs to allocate resources to the most beneficial projects.

- Called capital rationing

How does each approach measure up?

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PPA and Ranking

Payback Period Approach (PPA): Ranks projects based on how quickly invested capital is recovered.

- It uses nominal dollars, not discounted values.
- It does not rank in terms of relative total economic value; it only considers outcome up to point at which initial investment is recovered.
- Useful for ranking when liquidity is a major concern.

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DPP Approach and Ranking

Discounted Payback Period (DPP) Approach: Ranks projects based on how quickly invested capital is recovered using discounted cash flows.

- It is better than the undiscounted payback period approach.
- It does not rank in terms of relative total economic value; it only considers outcome up to point at which the initial investment is recovered.
- Useful for ranking when liquidity is a major concern

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ARR Approach and Ranking

Accounting Rate of Return (ARR): Ranks projects based on annual incremental accrual-based net income as a percentage of initial investment.

- Higher percent = Higher ranking.
- It ignores the time value of money.
- It uses accrual accounting values, not cash flows.

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NPV Approach and Ranking

Net Present Value (NPV) Approach: Ranks projects based on their relative net present values.

- Higher net present value = Higher ranking
- It recognizes the time value of money—Rankings in terms of comparable dollars
- Projects with negative net present value = not considered
- It fails to consider differences in initial project costs.

NPV ranking of projects is a preferred method.

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IRR Approach and Ranking

Internal Rate of Return (IRR) Approach: Ranks projects based on their relative internal rate of return.

- Higher internal rate of return = Higher ranking
- It recognizes the time value of money— Rankings in terms of comparable dollars
- Fails to consider differences in initial project costs

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NPV vs. IRR Ranking

IRR and NPV may result in different rankings due to differences in:

- Project investment cost
- Timing of cash flows
- Project life-span

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PI Approach and Ranking

Profitability Index (PI) Approach: Ranks projects based on the net present value of each project as a percentage of initial investment cost of each.

- Higher PI index = Higher ranking
- Recognizes time value of money— Rankings in terms of comparable dollars
- Takes into account the cost of each project

PI ranking of projects is a preferred method.

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Project Ranking Methods Summary

Methods which use cash flows are better than the accounting rate of return method.

Methods which incorporate time value of money are better than those that don't.

Profitability index uses:

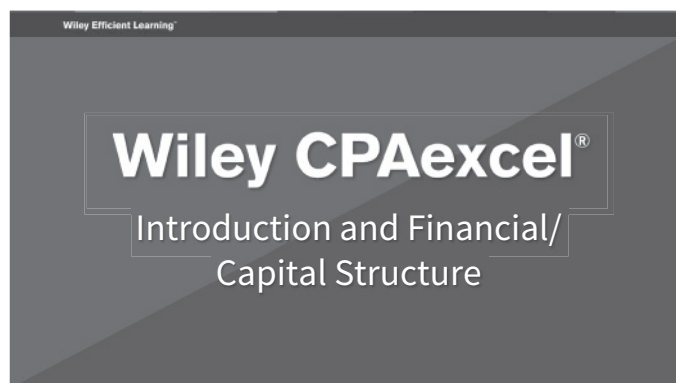
- Cash flows
- Time value of money
- Initial investment cost

Some degree of subjectivity is likely to enter into the final selection decision.

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Financing Options

Introduction and Financial/Capital Structure



Financial Structure Defined

Financial Structure: The mix of liabilities and owners' equity accounts of a firm.
From the accounting perspective, financial structure looks like this:

Balance Sheet

<u>Assets</u>	<u>Liabilities</u>	
Current	Current	
Non-Current	Non-Current	
	Owners' Equity	
		}

Total Assets = Total L + OE

Financial
Structure

Capital Structure Defined

Capital Structure: The long-term sources of funding—long-term debt and owners' equity.
From the accounting perspective, capital structure structure looks like this:

Balance Sheet

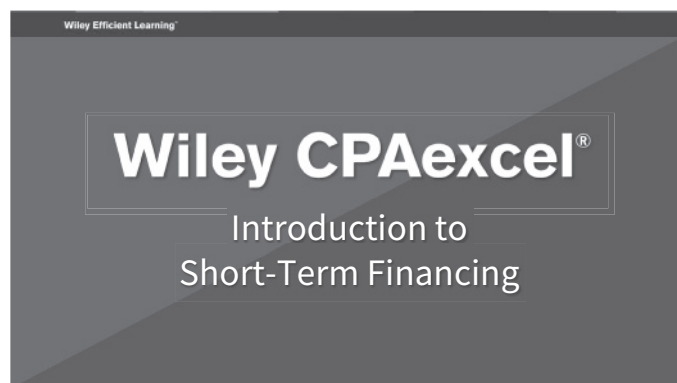
<u>Assets</u>	<u>Liabilities</u>	
Current	Current	
Non-Current	Non-Current	
	Owners' Equity	
		}

Total Assets = Total L + OE

Capital
Structure

Short-Term (Working Capital) Financing

Introduction to Short-Term Financing



Short-Term (Working Capital) Financing Defined

Short-Term (Working Capital) Financing:

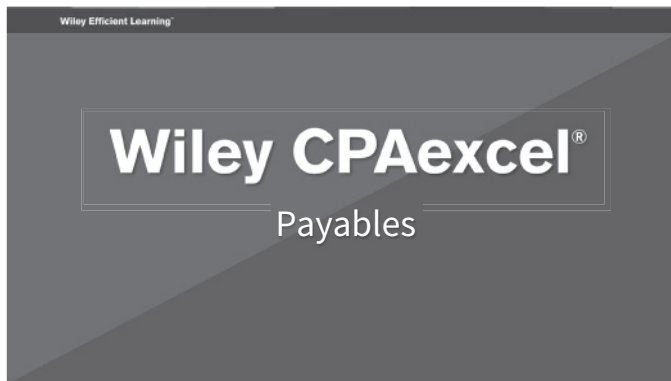
The funding provided by obligations which become due within one year (i.e., current liabilities)

Short-Term (Working Capital) Financing

Primary forms of short-term financing:

- Trade Accounts Payable
- Accrued Accounts Payable (e.g., wages, taxes, etc.)
- Short-term Notes Payable
- Lines of credit, revolving credit and letters of credit
- Commercial paper
- Pledging and factoring Accounts Receivable
- Inventory secured loans

Payables



Payables

- **Payables:** Occur through the acquiring of goods or services financed by incurring an obligation to pay in the future.
 - Trade payables are widely used in the normal course of business.
 - Financing of certain assets—like supplies and inventory—is highly flexible; the liability occurs concurrent with the acquisition of goods or services.
 - Discounts offered on trade Accounts Payable have favorable effective interest rates and should be taken when possible.

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Trade Accounts Payable

Advantages:

- Easy to use; little legal documentation required.
- Flexible; they expand and contract with needs (i.e., with purchases).
- Interest normally is not charged.
- Collateral normally is not required; they are unsecured.
- Discounts often are offered for early payment.

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Trade Accounts Payable

Disadvantages:

- Require payment in the short term.
- The effective cost is higher if discounts are not taken.
- Financing they provide is use specific.
 - Their use finances only the assets acquired through trade accounts.

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Accrued Accounts Payable

Accrued Accounts Payable result from acquiring cash and other benefits financed by an obligation to be satisfied in the future.

- Examples are:
 - Salaries and wages payable
 - Taxes payable
 - Unearned revenue, including gift and other prepaid cards
- The time between when the benefit or cash is received and the obligation is satisfied provides short-term financing.

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Accrued Accounts Payable

Advantages:

- Easy to use; occur in the normal course of business.
- Flexible; they expand and contract with activity.
- Collateral normally is not required, though some creditors may have specific legal claims.

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Accrued Accounts Payable

Disadvantages:

- Require payment in the short term.
- Some financing is use specific; many things cannot be financed through accrued accounts.

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Short-Term Notes Payable

Short-Term Notes Payable result from acquiring cash through borrowing with repayment due in one year or less.

- Typically a promissory note is required.
- Interest rate charged is based on credit rating of borrower.
- A **compensating balance** may be required.
 - An amount that must be maintained in a demand deposit account with lender.
 - A required compensating balance increases effective cost of borrowing.

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Short-Term Notes Payable

Advantages:

- Commonly available for creditworthy firms.
- Flexible; amounts and periods can be varied with need.
- Collateral normally is not required; they are unsecured.
- Provides cash for various purposes.

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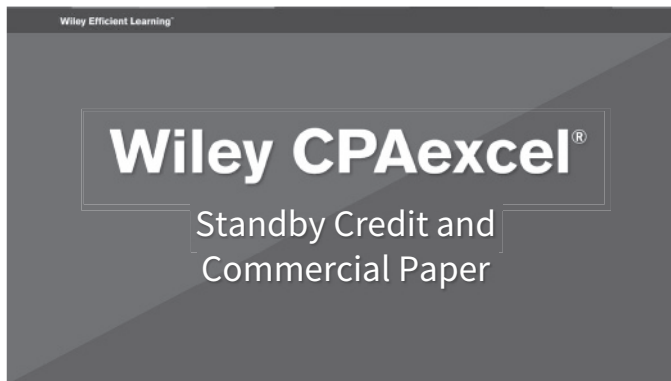
Short-Term Notes Payable

Disadvantages:

- Poor credit rating will mean a higher interest rate and possibly require collateral.
- Require repayment in the short term.
- Compensating balance would increase the effective cost and reduce funds available.
- Refinancing would be necessary, if the note cannot be paid when due.

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Standby Credit and Commercial Paper



Stand-By Credit Arrangements

Stand-By Credit: An arrangement to have financing available for a specific purpose or period of time.

- Three forms of stand-by credit
 - Line of Credit
 - Revolving Credit
 - Letter of Credit

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Stand-By Credit Arrangements

- **Line of Credit:** An informal agreement whereby a financial institution agrees to a maximum amount of credit that will be extended at any one time
 - Not legally binding on financial institution, but
 - Provides reasonable assurance of funds.
 - Available funds generally can be used for any purpose.

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Stand-By Credit Arrangements

Revolving Credit: Formal agreement whereby a financial institution or other lender agrees to a maximum amount of credit that **will be** extended.

- Revolving credit is like a line of credit, but with a legally binding agreement.

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Stand-By Credit Arrangements

Letter of Credit: A conditional commitment by a financial institution to pay a third party in accordance with specified terms and conditions.

- Example: Payment to third party upon proof of shipment of goods
- Provides third-party assurance of payment without the buyer (who is also the borrower) having to pay in advance
- Often used in connection with foreign transactions

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Stand-By Credit

Advantages:

- Commonly available for creditworthy firms.
- Highly flexible; credit used, and debt incurred, only when needed.
- Usually no collateral required; it is unsecured.
- Both line of credit and revolving credit provide cash for general use.

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Stand-By Credit

Disadvantages

- Poor credit rating will mean a higher interest rate and possibly require security.
- Typically involves a fee.
- Requires satisfaction in the short term.
- Required compensating balance increases effective cost and reduces funds available for use.
- Line of credit not legally binding on financial institution.

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Commercial Paper

Commercial Paper is short-term, unsecured promissory notes sold by large, **highly-creditworthy firms**.

- Most are for 180 days or less
- If more than 270 days SEC registration is required
- May be sold directly to investors or through dealers
- May be sold on discounted bases or with interest paid over the short life of the note

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Commercial Paper

Advantages:

- Interest rates are generally lower than other short-term sources.
- Large amounts can be obtained.
- Compensating balances are not required.
- No assets need to be pledged as collateral; unsecured.
- Provides cash for general use.

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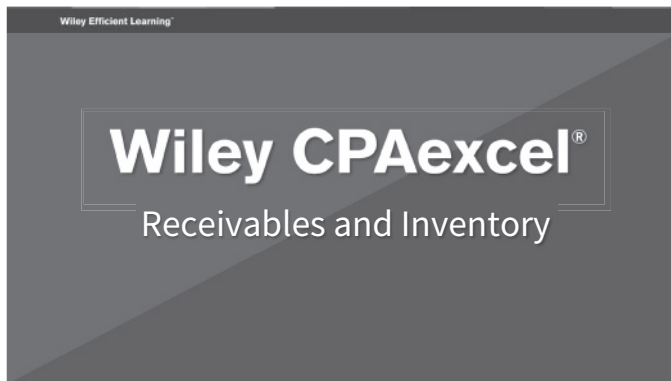
Commercial Paper

Disadvantages:

- Only available to most creditworthy firms
- Requires satisfaction in the short term, usually of a large amount
- Lacks flexibility of extension or other accommodations (as compared with bank loans)

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Receivables and Inventory



Pledging Accounts Receivable

Pledging Accounts Receivable: Using Accounts Receivable as security for short-term borrowings.

- Level of borrowing available for a set of Accounts Receivable depends on:
 - Creditworthiness of the Accounts Receivable
 - Level of lender's recourse against borrower
- A fee based on the value of Accounts Receivable pledged is usually charged

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Pledging Accounts Receivable

Advantages:

- Commonly available.
- Flexible; as new Accounts Receivable occur, they can be used as security.
- Compensating balances are not required.
- Provides cash for general use.
- Lender may provide billing and collection services, usually for a fee.

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Pledging Accounts Receivable

Disadvantages:

- Accounts are committed to lender as security.
- Cost of pledging accounts receivable may be greater than other sources of short-term financing.
- Requires repayment in the short term.

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Factoring Accounts Receivable

Factoring: The sale of Accounts Receivable.

- Buyer is called *factor*
- Terms of sale may be:
 - Without recourse—The factor bears the risk associated with collectability, except in the case of fraud.
 - With recourse—The factor has recourse against the seller for some or all of the risk associated with uncollectability of the receivables.

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Factoring Accounts Receivable

- Factor charges a fee, known as a factor's fee, based on:
 - Creditworthiness and length of maturity of the receivables
 - Extent to which the factor assumes risk of uncollectability

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Factoring Accounts Receivable

Advantages:

- Commonly available
- Flexible; as new Accounts Receivable occur they can be sold
- Compensating balance is not required
- Provides cash for general use
- Buyer generally assumes billing and collection responsibilities

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Factoring Accounts Receivable

Disadvantages:

- Cost may be greater than certain other sources of short-term financing
- If sold with recourse, selling firm may have an on-going risk
- Sale of Accounts Receivable may alienate customers

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Inventory Secured Loans

Inventory Secured Loans occur when a firm pledges all or part of its inventory as collateral for a short-term loan.

- Amount that can be borrowed usually depends on value and marketability of the inventory.
- Several alternative inventory security arrangements are used.

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Inventory Secured Loan Arrangements

Floating Lien Agreement: Borrower gives a lien on all of its inventory, but retains control of its inventory which it continuously sells and replaces.

Chattel Mortgage Agreement: Lender has a lien against specifically identified inventory; borrower retains control of that inventory, but cannot sell it without lender approval.

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Inventory Secured Loan Arrangements

Field Warehouse Agreement: Inventory remains at borrower's warehouse, but under the control of an independent third party.

Terminal Warehouse Agreement: Inventory is moved to a public warehouse and placed under the control of an independent third party.

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Cost of Inventory Secured Loans

Cost of inventory secured loans depends on:

- Nature of inventory
- Credit standing of the borrower
- Specific type of security agreement used

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Inventory Secured Loans

Advantages:

- Commonly available for certain inventories, including commodities, automobiles, etc.
- Flexible; as new inventories become available they can become security.
- May provide cash for general use.

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Inventory Secured Loans

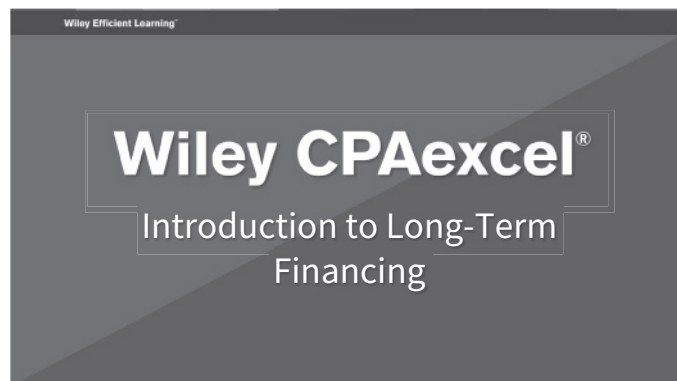
Disadvantages:

- Pledged inventory may not be available when needed.
- Cost of using inventory secured loans may be greater than other short-term financing.
- May require repayment in the short-term.
- Not available for certain inventories.

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Long-Term (Capital) Financing

Introduction to Long-Term Financing



Long-Term (Capital) Financing Defined

Long-term, or capital, financing is provided by funding which does not become due within one year.

It is the primary source of funding for most firms.

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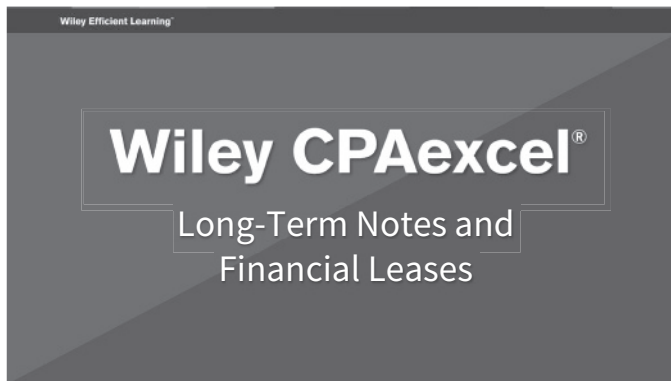
Long-Term (Capital) Financing Defined

Primary forms of long-term financing are:

- Long-term notes
- Financial (capital) leases
- Bonds
- Preferred stock
- Common stock

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Long-Term Notes and Financial Leases



Long-Term Notes

Long-term notes result from acquiring cash through borrowing with repayment due in more than one year.

- Typically a promissory note is required.
- Borrowings are commonly from one to ten years, but may be longer.
- Repayment is usually in periodic installments.
- Note may be secured by a mortgage on property or real estate.
- Promissory note often contains restrictive covenants.

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Long-Term Notes Restrictive Covenants

Common restrictive covenants include:

- Maintaining a certain working capital condition (e.g. a minimum working capital ratio)
- Restrictions on incurrence of additional debt without the lender's approval
- Specification of required frequency and nature of financial information provided to lender, perhaps audited
- Restrictions on management changes without lender approval

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Cost of Long-Term Notes

Cost of financing through long-term notes will depend on:

- General level of interest
- Creditworthiness of the borrowing firm
- Nature and value of collateral, if any

Interest rate is likely to be expressed as a function of a macroeconomic benchmark.

- For example, the prime rate
- Interest rate on note changes as the benchmark changes

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Long-Term Notes

Advantages:

- Commonly available to creditworthy firms
- Provides long-term financing, often with periodic repayment

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Long-Term Notes

Disadvantages:

- Poor credit rating results in higher interest rate, greater security required, and more restrictive covenants.
- Violation of restrictive covenants can trigger serious consequences, including technical default.

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Financial Leases

Leasing is a common way of acquiring use of certain assets.

- In some cases the cost of leasing may be less than the cost of buying.

When leasing of assets is possible—the acquisition of assets should be evaluated under both purchase and lease options:

- Is proposed project economically feasible if assets are purchased?
- Is proposed project economically feasible if assets are leased?

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Financial Leases

Possible outcomes:

- Reject project, if neither alternative shows the project is feasible
- Purchase assets, if the purchase alternative is feasible and the leasing alternative is not; or if both are feasible, but purchase has a higher return
- Lease assets, if lease alternative is feasible but the purchase alternative is not; or if both are feasible, but lease has higher return

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Reasons Cost of Leasing < Cost of Buying

Cost of leasing may be less than cost of buying because:

- Lessor has buying power or efficiencies that the lessee does not.
- Lessor has lower interest rates than the lessee.
- Lessor has tax advantages that the lessee does not.

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Reasons Cost of Leasing < Cost of Buying

In practice, there are non-cost reasons for leasing rather than buying; they include:

- Flexibility
- Convenience

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Lease Terms

Leases may be described in several ways:

- Net lease—Lessee assumes cost associated with ownership:
 - Maintenance
 - Taxes
 - Insurance
 - Called *executory costs* in accounting
- Net-net lease—Lessee assumes cost associated with ownership (above) and responsibility for residual value at end of the lease.

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Financial Leases

Advantages:

- Limited immediate cash outlay required
- Possible lower cost than purchasing
- Related obligation specific to amount needed; that is, the cost of the asset leased
- Possibility of scheduling lease payments to pattern cash inflows from use of the leased asset

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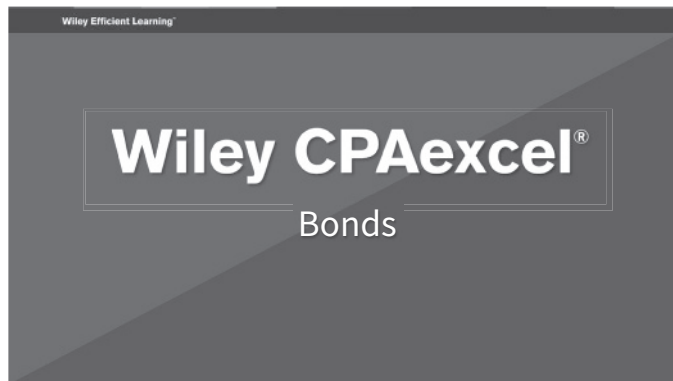
Financial Leases

Disadvantages:

- Not all assets are commonly available for lease.
- Lease financing is asset specific; no funds are provided for other uses.
- Lease terms may prove different than asset usefulness to the lessee.
- Leasing may be chosen for non-economic reasons (e.g., convenience).

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Bonds



Bonds Defined

Bonds are long-term promissory notes.

- In return for proceeds (cash), the issuer of the bonds (the borrower) promises to pay bondholder (the investor) a fixed amount of interest each period and repay the face or principal of the bond at maturity

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Bonds Features

Common bond characteristics include:

- Bond indenture = Bond contract
- Par/Face value = Bond principal, commonly \$1,000 per bond
- Coupon rate of interest = Annual rate of interest stated on face of bond (*stated rate*)
- Maturity = Time at which the issuer repays the bondholder principal and extinguishes debt

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Bond Security Features

Debenture bonds = Unsecured bonds:

- No specific assets are designated as collateral
- They carry more risk and have higher cost than secured bonds

Secured bonds = Have specific assets designated as collateral

- Mortgage bonds are secured by real property:
 - Land
 - Buildings

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Bond Selling Price

Bond selling price depends on the relationship between the rate of interest the bonds pay (the coupon rate) and the rate of interest in the market for comparable risk when the bond is issued.

- Sells at less than par if coupon rate is less than the market rate; sells at a *discount*
- Sells at more than par if coupon rate is more than the market rate; sells at a *premium*
- Sell at par if coupon rate is equal to the market rate at the time of issue

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Bond Selling Price

Bond selling price is determined as the present value of cash flows from the bonds.

- Bonds have two cash flows:
 - **Periodic Interest:** Discounted as the present value of an annuity using current interest rate
 - **Face Value:** Discounted as the present value of a single amount using current interest rate
- Discount using the market rate of interest
- Sum of present values = selling price of bonds and reflects any premium or discount

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Rate of Return on Bonds

Two measures of rate of return on bonds:

Current yield (CY) = Ratio of annual interest payments to
current price of the bonds in the market

Example:

\$1,000, 6% bond, currently selling for \$900

Calculation: $CY = \text{annual coupon interest} \div \text{current market price}$

$CY = \$1,000 \times .06 = \$60 / \$900 = 6.67\%$

As market price changes = CY changes

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Rate of Return on Bonds

Yield to **maturity**—Determines the discount rate that equates the present value of future cash flows from the bonds with the current price of the bonds.

- It is the rate of return required by investors as implied by the current price of bonds in the market.
- It is computed like internal rate of return and is best done with a financial calculator or computer program.
- Not likely on exam, but know the concept.

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Market Rate of Interest and Market Price of Bonds

The market price of bonds changes **inversely** with changes in the market rate of interest:

- Market rate of interest goes up = Market price of bonds goes down
- Market rate of interest goes down = Market price of bonds goes up
- Why?
 - Let's see

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Market Rate of Interest and Market Price of Bonds

Assume \$1,000 bonds outstanding that pay 4%
—that rate does not change!

The market rate of interest goes up to 5%.

As a consequence the value of 4% bonds goes
down.

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Market Rate of Interest and Market Price of Bonds

No one will buy 4% bonds for \$1,000 when they
can get a better rate of interest (5%) on new
bonds.

So, your 4% bonds will sell in the market only if
the price is such that they earn 5%.

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Market Rate of Interest and Market Price of Bonds

What is that price?

The market price of the \$1,000 bond would be \$800.

- The bond would have to sell in the market for
\$800 in order for the buyer to earn 5% interest
- $\$1,000 \times .04 = \$40 \div \text{\textbf{\$800}} = \text{\textbf{.05}}$

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Market Rate of Interest and Market Price of Bonds

Bondholders face what is called *market interest rate* risk:

- The risk that the market value will go down due to interest rates going up.
- The longer the maturity of the bonds, the greater the risk of that happening and the higher the required face (stated) interest rate.

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Bonds

Advantages

- Source of large sums of capital.
- Issuance does not dilute ownership or earnings per share.
- Interest payments are tax deductible.

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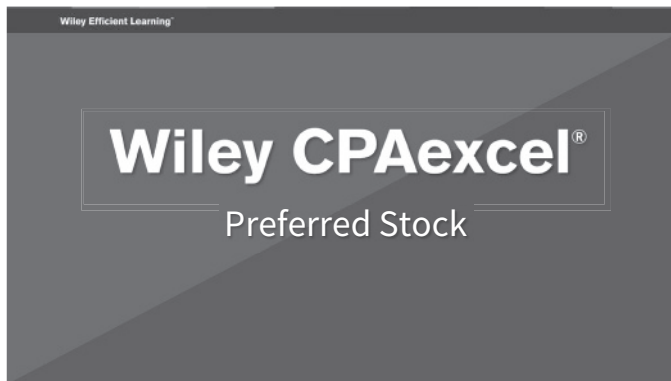
Bonds

Disadvantages:

- Require periodic interest payments, which if missed can result in default and bankruptcy
- Require principal repayment, which if missed can result in default and bankruptcy
- May require security and/or have restrictive covenants
- Generally not available to small, privately held entities

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Preferred Stock



Preferred Stock Defined

Preferred stock is ownership interest with preference claims (over common stock).

Preferred stock has characteristics of both bonds and stock.

- It is like bonds because:
 - Usually does not have voting rights
 - Dividends usually are limited in amount and expected (like bond interest)

Preferred Stock Defined

Has characteristics of bonds and stock.

- It is like common stock because:
 - Grants ownership interest
 - Has no maturity date
 - Does not **require** dividends be paid, though they are expected
 - Dividends are not an expense and are not tax deductible

Preferred Stock Characteristics

Preferred stock characteristics include:

- Possibility of having different classes or types of preferred stock with different preferences
- May be cumulative or noncumulative—To distinguish whether or not dividends not paid accumulated
- May be participating or nonparticipating—To distinguish whether or not dividends in excess of preference claim can be paid

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Preferred Stock Characteristics

- May have protective provision—To protect preferred shareholders' interest (e.g. the right to vote in certain circumstances)
- May be convertible or nonconvertible—To distinguish whether or not preferred stock can be exchanged for common stock (and under what circumstances), and
- May be callable—Which gives the firm the right to buy back preferred shares, usually at pre-established price

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Preferred Stock Valuation

Preferred Stock (PS) value is the present value of expected cash flows.

- Preferred cash flow is preferred dividends
- Elements used to value preferred stock are:
 - Estimated future annual dividends
 - Investors' required rate of return,
 - An assumption that dividend stream will exist in perpetuity

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Preferred Stock Valuation

Preferred Stock Theoretical Value (PSV) calculation:

- $PSV = \text{Annual Dividend} \div \text{Required Rate of Return}$
- Example:
 - Annual dividend = \$4.00
 - PS Investors' required rate of return = 8%
 - $PSV = \$4.00 / .08 = \$50.00$

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Preferred Stock Valuation

Preferred Stock Expected Rate of Return (PSER) calculation:

- $PSER = \text{Annual dividend} \div \text{Market price}$
- Example:
 - Annual dividend = \$4.00
 - Market price = \$52.00
 - $PSER = \$4.00 / \$52.00 = 7.7\%$
- Current cost of preferred stock = 7.7%
- As the current price changes, so does the expected rate of return.

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Preferred Stock

Advantages:

- No legally required payment of dividends or repayment of investment
- Lower cost of capital than common stock, because it has less risk
- Usually does not bestow voting rights
- No maturity date
- No security required

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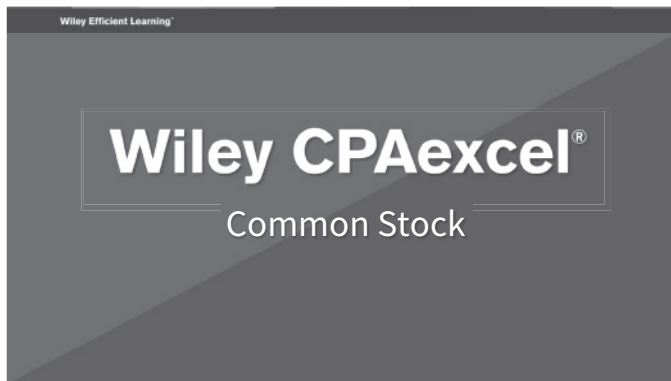
Preferred Stock

Disadvantages:

- Dividend expectation are high
- Dividend payments are not tax deductible
- If triggered, protective provisions may be onerous
- Generally, has a higher cost of capital than bonds

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Common Stock



Common Stock Defined

Common stock is the basic ownership interest in a corporation.

- Regulatory requirements limit most companies to one class of common stock
 - Some jurisdictions permit more than one class of common stock

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Common Stock Defined

Common share characteristics:

- Limited liability—liability is limited to amount of investment
- Residual claim on earnings and assets— a claim after creditors and preferred shareholders have been satisfied
- Right to vote for Directors, auditors and changes to the corporate charter
 - A **proxy** is used to delegate that right
- Preemptive right—the right of first refusal to acquire a proportionate share of any new common stock issue

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Common Stock Valuation

Common Stock Value (CSV) is the present value of expected cash flows.

- Common stock (CS) has two cash flows =
 - Common dividends
 - Common stock appreciation
- Assuming CS is held for one year (or less):
 - $CSV = PV \text{ of dividends expected} + PV \text{ of expected market price at end of one year (or less)}$
 - Both discounted at common investors' required rate of return

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Common Stock Valuation

Assuming common stock is held for multiple periods:

- Projecting dividends and future stock price is less certain.
- Possible approach—Assume dividends grow at a constant rate and that growth incorporates both dividends and market value appreciation.
 - $CSV = 1st \text{ Year Dividend} \div (\text{Required Rate of Return} - \text{Growth Rate})$

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Common Stock Valuation

Common stock valuation for multi-period example:

- CSV formula:
 - $CSV = 1st \text{ Year Dividend} \div (\text{Required Rate of Return} - \text{Growth Rate})$
- Assume:
 - Expected dividend = \$2.10
 - Expected dividend growth rate = 5%
 - Investor required rate of return = 8%

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Common Stock Valuation

Common stock valuation for multi-period example:

- CSV calculation:
 - $CSV = \$2.10 / (8\% - 5\%) = \$2.10 / .03 = \$70.00 = CSV.$
- Common Stock **Expected Rate of Return** (CSER)
 - CSER formula
 - $CSER = (1st\ Year\ Dividend \div Market\ Price) + Growth\ Rate$

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Common Stock Valuation

CSER Example:

- Assume:
 - 1st Year Dividend = \$2.10
 - Market Price = \$70.00
 - Growth Rate = 5%
- $CSER = (\$2.10 / \$70.00) + .05 = .03 + .05 = .08$
- Marginal (new) investor will require 8% rate of return
- 8% current cost of common stock capital

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Common Stock

Advantages:

- No legally required periodic payments
- No maturity date
- No security required

Disadvantages:

- Generally, a higher cost of capital than other sources
- Dividends are not tax deductible
- Additional shares dilute ownership and earnings per share

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Common Stock Comments

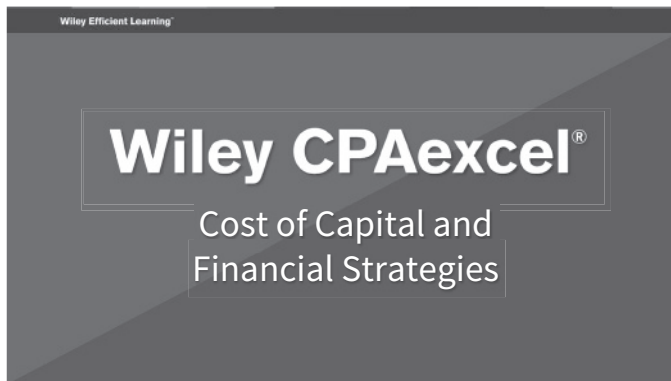
Common stock is the most fundamental source of capital financing for a corporate entity.

Since common shareholders have only a residual claim to earnings and assets, they face greater risk than preferred shareholders; therefore the cost of CS is greater than the cost of PS.

Also, since common shareholders do have a residual claim to Retained Earnings, the cost of capital for Retained Earnings is the cost of capital for common shareholders.

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Cost of Capital and Financing Strategies



Cost of Capital Summary Comments

Cost of capital of each source is the rate of return required by each source.

- Rate of return required is determined by other opportunities with comparable risk available to investors; it is the investors' opportunity cost.
- Higher perceived risk = Higher return required

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Factors Affecting Cost of Capital

Factors affecting cost of capital to a firm include:

- Macroeconomic conditions—including market conditions and expectations about the interest rate, tax rate and inflation rate
 - Increasing rates = Increasing cost of capital
- Past performance of the firm—the greater the firm risk the higher the cost of capital
- Amount of financing—the larger the absolute amount of financing sought, the higher the cost

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Factors Affecting Cost of Capital

Factors affecting cost of capital include:

- Relative level of debt financing—the higher the proportion of financing sought through debt, relative to equity, the higher the cost of debt capital.
- Debt maturity—the longer the maturity, the higher the cost of that debt.
- Debt security—the greater the value of collateral, the lower the cost of debt

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Empirical Cost of Capital

Typical long-run average rates of return for capital elements:

Security Type	Annual Rate of Return
Long-term corporate bonds	5.9%
Common stock	12.3%
Common stock—small firms	12.7%

- Preferred stock would be expected to be between 5.9% and 12.3%

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Guidelines for Financing Strategies

Hedging principle of financing (also called principle of self-liquidating debt) calls for matching cash flows from assets with cash requirements needed to finance those assets.

- Long-term assets should be financed with long-term financing.
- Short-term assets should be financed with short-term financing.

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Guidelines for Financing Strategies

Optimum capital structure objective—A firm should seek to structure its capital mix to achieve the set or sets of capital sources that results in the lowest composite cost of capital for the firm.

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Guidelines for Financing Strategies

Business risk constraint:

- Business risk is inherent in the nature of business operations.
- That general risk can be measured as the variability of the firm's expected operating Earnings Before Interest and Taxes—EBIT.
- Firms with higher business risk, that is high variability in EBIT, should use less debt financing than firms with a steady EBIT.

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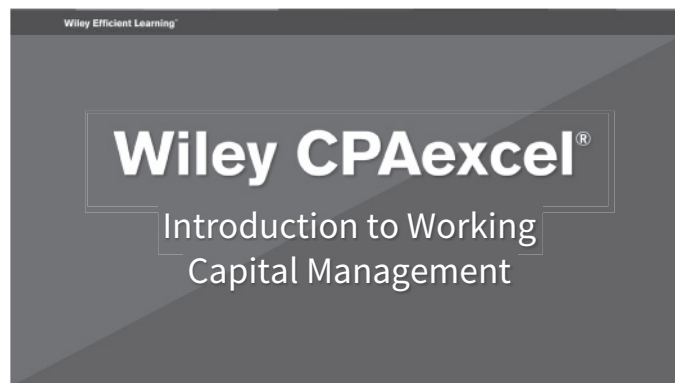
Guidelines for Financing Strategies

Tax rate benefit—The higher the tax rate faced by a firm, greater the amount of tax saved by use of debt financing.

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Working Capital Management

Introduction to Working Capital Management



Working Capital Defined

Working capital = Current Assets – Current Liabilities:

- **Current Assets:** Cash and other resources (assets) expected to be converted to cash, sold or consumed within one year
- **Current Liabilities:** Obligations due to be settled within one year

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Objective

Working capital management objective = Maintain level of working capital so as to:

- Meet ongoing operating and financial needs; for example:
 - Inventory to meet production requirements
 - Cash to meet obligations as they come due
- But, at the same time—

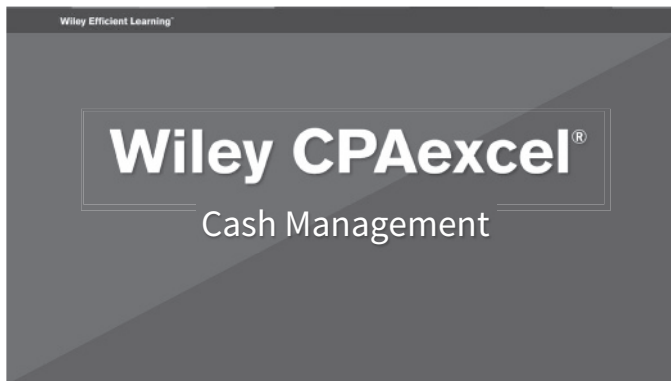
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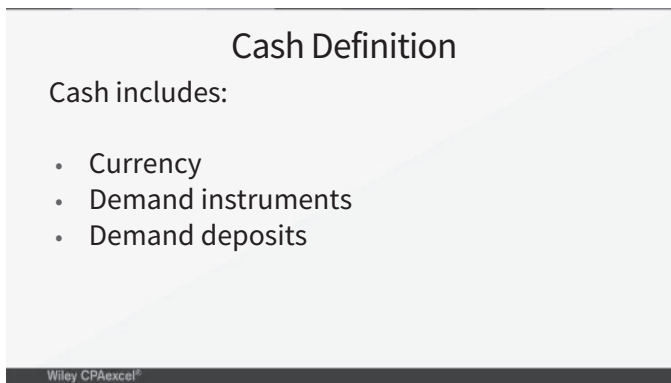
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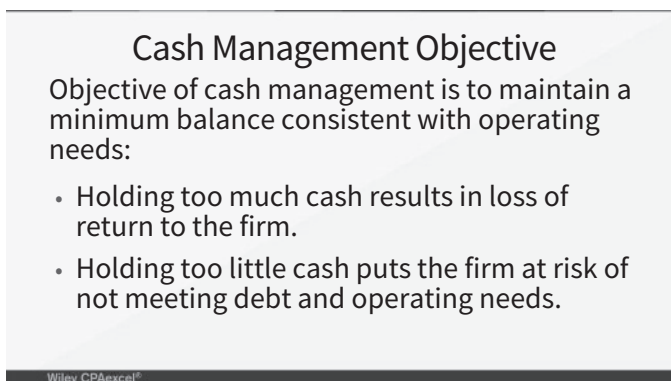
- Not over-invest in working capital, which provides low returns or increases cost; for example:
 - Excess idle cash—which has a low rate of return, if any
 - Excess accounts receivable—which don't earn interest
 - Excess inventory—which incurs storage costs and risks becoming obsolete

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Cash Management







Cash Budgeting

Basis for determining cash needs is a cash budget.

If the budget shows a:

- Projected cash shortfall, the firm can reduce cash requirements, borrow, or make other arrangements
- Projected cash surplus, the firm can make investments, pay down debt, or increase cash dividends

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Cash Management Strategies

Within context of a targeted cash balance, firms will seek to:

- Accelerate cash inflows, and
- Defer cash outflows

The longer a firm holds cash, the more that cash provides a source of financing.

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Accelerating Cash Inflows

Accelerating cash inflows involves reducing the time between when a firm has a claim to cash and when that cash is available for use.

Aspects of accelerating cash inflows include:

- Getting the customer or other payer to initiate payment promptly, and
- Efficient handling of cash after received

The first aspect is covered in the lesson on Accounts Receivable management.

Let's look at the second aspect.

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“Float” Definition and Reduction

Float is the time between when payment is initiated to a firm and when that payment is received and available for use.

- Firms seek to reduce incoming float; that is, speed up the availability of cash coming in.
- Firms may use a number of methods to reduce incoming float, including:

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Lock-Box System

Lock-Box System: Firm leases post office boxes in areas where it has high volume of cash inflow by mail.

- Customer remits payment to the local post office box.
- Payments are collected and processed by the firm’s bank.
- Bank notifies the firm of sources and amounts received.

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Lock-Box System

Lock-box advantages:

- Cash is available sooner than it would be otherwise.
- Handling of cash is reduced and security improved.
- Incident of dishonored checks is reduced and there is earlier detection of dishonored checks.

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Pre-Authorized Checks

Pre-Authorized Checks: Customers authorize checks in advance for payment of their obligations.

- This is especially useful when the amount being collected is same each period.
- Mortgage payment
- Cable bill
- Etc.

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Pre-Authorized Checks

Pre-authorized checks advantages:

- Cash is available sooner and the amount is highly predictable.
- Firm handling of cash and collections is reduced.
- Customers may appreciate the automatic bill-paying feature of pre-authorized checks.

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Pre-Authorized Debit/Credit Cards

Customers authorize charges to debit/credit card in advance for payment of their obligations.

- Process similar to pre-authorized checks, but bank/ card issuer not involved in pre- authorization.
- Advantages similar to pre-authorized checks.

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Concentration Banking

Concentration Banking: Accelerates the flow of funds from multiple local banks to a firm's primary bank by regular, usually automatic, transfer of funds.

Concentration banking advantages:

- Cash available sooner to use firm-wide.
- Better control of firm-wide cash.
- Arrangements are possible for aggregated excess cash to be temporarily invested.

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Depository Transfer Checks

Depository Transfer Checks: Transfers funds between a firm's accounts

- Also called official bank checks.
- Check is unsigned, non-negotiable, and payable only to an account of the firm.

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Depository Transfer Checks

Example:

- Firm makes a local bank deposit.
- Simultaneously it writes a depository transfer check payable to the firm's account at another bank.
- Check moves the funds from the local bank to the alternate bank.

Depository transfer checks can be used in conjunction with lock-box arrangements and/or with concentration banking.

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Wire Transfers

Wire Transfers: An electronic means of transferring funds.

- Relatively expensive method of transferring funds
- Generally provides:
 - Speed of transfer
 - Security of funds

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Deferring Cash Outflows

Deferring cash outflows involves increasing the time between when a firm receives a resource or benefit and when cash is reduced to pay the related obligation

- Firms seek to increase outgoing float; that is, cash going out.
- Firms may use a number of methods to increase outgoing float.

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Purchases and Payment Processes Management

Management of purchases and payment processes is fundamental and includes:

- Establishing and using charge accounts
- Selecting suppliers that provide generous payment terms
- Pay bills only when due, except to take advantage of discounts
- “Stretch” payments by making payments after the stated due date, but within an acceptable time customary in industry

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Remote Banking

Remote Banking: Increases float on checks used to pay obligations by establishing checking accounts in remote locations and making payments by checks written on those accounts.

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Remote Banking

Theoretically, checks written on those accounts take longer to process against the firm's account.

Practically, electronic processing and banking requirements have pretty much eliminated the usefulness of remote banking for delaying account reduction for any significant period of time.

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Zero-Balance Accounts

Zero-Balance Account: By agreement with its bank, a firm will have an account with a zero balance.

- Checks are written on an account with no balance.
- Checks are processed by the bank, resulting in an overdrawn account.
- Bank transfers funds from another firm account to again zero out the account daily.

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Zero-Balance Accounts

Zero-Balance Account (by deposit): A firm deposits into an account an amount exactly equal to checks written on that account, so the account will always have a reconciled balance of zero.

- Firm determines the amount paid from an account (e.g., payroll).
- It deposits in that account only the amount needed to cover the payments from the account.
- The account has a zero real balance.

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Zero-Balance Account

Advantages:

- Near elimination of excess cash balances in these accounts
- Reduced administration, including:
 - Monitoring
 - Reconciling

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Payment Through Draft

Payment Through Draft: A firm uses a legal instrument—a **draft**—which is like a check, but drawn on an account of issuing bank or another bank, not the firm's account.

- Drafts are sold to customers for a fee.
- Customer then has a check-like instrument that is guaranteed to be paid when presented.

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Payment Through Draft

Common forms of drafts include:

- Bank draft
- Cashier's check
- Certified check
- Money order

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Payment Through Draft

Bank Draft: An order to pay drawn by a bank on itself or on a correspondent bank with which the issuing bank has an account.

- Used by banks dealing with other banks
- “Sold” by banks to its customers for a fee
 - Individual basis—A single draft for a specified amount
 - Automatic basis—Recurring drafts for a fixed amount issued periodically and charged to a customer's account

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Payment Through Draft

Cashier's Check: One-time order to pay drawn on the issuing bank.

- Customer pays for the amount of check plus a fee.
- Bank guarantees the check to be paid when presented.
 - Bank already collected amount of check (plus the fee).

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Payment Through Draft

Certified Check: Order to pay drawn on a depositor's account that is certified to be paid by the bank.

- Bank withholds the amount of the check from the writer's account.
- Check becomes obligation of the bank.

Money Order: Like a certified check.

- Sold by a non-bank institution (e.g., Post Office or Western Union)
- Usually limited in amount for each order

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Payment Through Draft

Advantages:

- Assures the instrument will be honored at stated value
- May not require having a checking account or disclosure of bank account information
- Can be automated to facilitate recurring payments

Disadvantage:

- Associated fee may be more costly than other forms of payment.

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Positive Pay System

Positive pay system process:

- Entity sends its bank an electronic file of checks written on its account with bank.
- Bank compares presented checks with information on the electronic file.
- If elements match, the check is paid.

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Positive Pay System

- If elements do not match:
 - Issuing firm decides whether or not to approve.
 - If not approved, the check is returned through the banking system.

Positive pay system advantages:

- Detects unauthorized or altered checks
- Prevents inappropriate payment from the account.

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Electronic Funds Transfers

Electronic Funds Transfers (EFTs): Funds are transferred electronically.

- Transfer may be for a single transaction, but most commonly for a file of multiple transactions
- Firm transmits file electronically to its bank
- Bank reduces firm's account and forwards payments through the Automated Clearing House (ACH)
- ACH routes payments to individual recipient accounts in various banks

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Electronic Funds Transfers

Advantages:

- Drastically reduced float—payments can be initiated “at the last minute” and still be timely.
- Administration can be automated and integrated with the firm's accounting system.
- Very low per-transaction fee cost.

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Short-Term Securities Management



Short-Term Investment Definition

Short-term investments are investments to be held one year or less.

- Commonly short-term investments are used for temporary excess cash.
- Investments must be made prudently because the funds may be needed in the near term.

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Short-Term Investment Criteria

Criteria for short-term investment include:

- Safety of principal—Little risk of default by the issuer
- Price stability—Not subject to market declines that would result in a significant loss if sold
- Marketability/Liquidity—Have a ready market for converting to cash
- Other possible criteria—Taxability, diversification, and cost of administration

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Short-Term Investment Opportunities

Major short-term investment opportunities we cover are:

- U.S. Treasury Bills
- Federal agency securities
- Negotiable certificates of deposit
- Bankers' acceptances
- Commercial paper
- Repurchase agreements

The market for these securities is called the **Money Market**.

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Short-Term Investment Opportunities

U.S. Treasury Bills: Direct obligations of the U.S. government; they:

- Are virtually risk free
- Come in maturities of 91, 181, and 365 days
- Are available periodically through the Federal Reserve Banks or continuously in the secondary market
- Offer safety of principal, marketability, and, if held to their short maturity, price stability

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Short-Term Investment Opportunities

Federal Agency Securities: Securities issued by and obligation of the individual federal agencies.

- Examples: Federal National Mortgage Association (Fannie Mae), Federal Home Loan Bank, etc.
- Securities are the responsibility of the issuing agency, not the U.S. Treasury, and are not backed by the Federal Government.
- They have a slightly higher risk than U.S. Treasury obligations and pay a slightly higher return.

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Short-Term Investment Opportunities

Negotiable Certificates of Deposit (CDs):

Securities issued by a bank in return for a fixed time deposit with bank.

- Negotiable means they can be bought and sold in the secondary market
- They offer high safety of principal and relative price stability
- They are somewhat less marketable than federal securities

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Short-Term Investment Opportunities

Bankers' Acceptances: A draft (or order to pay) drawn on a bank by a firm with an account at the bank. If the bank accepts the draft, it becomes a negotiable instrument available for investment; they:

- Sometimes are used in financing foreign transactions
- Are more risky and less marketable than federal securities
- Pay a higher yield than federal securities

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Commercial Paper

Commercial paper is short-term, unsecured promissory notes issued by large, established firms with high credit ratings; they:

- Are available in various denominations with maturities of a few days up to 270 days
- Are less marketable than some other short-term investments
- Provide a greater return than some other short-term investments

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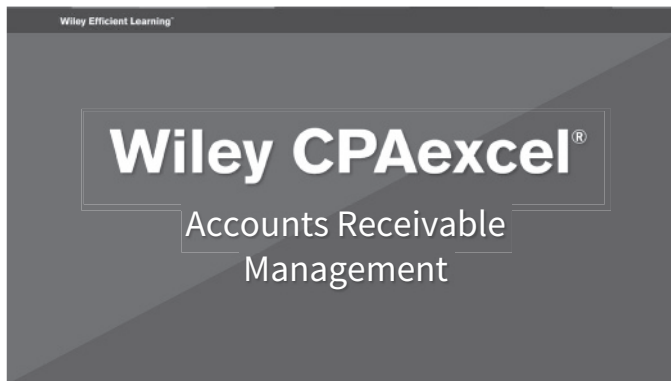
Repurchase Agreements

Repurchase agreements (repos) are securities issued for loans with a simultaneous commitment by the buyer to resell the loan security to the issuer at the original contract price plus an agreed interest for period outstanding; they:

- Are usually for large amounts, and
- Can be for any agreed length of time
- Advantages:
 - Can be for as short as one day
 - Risk of market price declines is avoided

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Accounts Receivable Management



Accounts Receivable Management Defined

Accounts Receivable management is concerned with:

- Conditions leading to the recognition of receivables, and
- Process that results in elimination (e.g., collection) of receivables

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Accounts Receivable Management Defined

Accounts Receivable management process involves the following activities:

- Establishing general terms of credit
- Determining customer creditworthiness and setting credit limits, and
- Collecting Accounts Receivable

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General Terms of Credit

Firms selling on credit must establish general terms under which credit will be granted.

- The terms of credit will be influenced by terms common in its industry.

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General Terms of Credit

General terms of credit decisions include:

- Total credit period, that is, the maximum period for which credit may be extended
- Discount to be offered for early payment, if any
- Penalty for late payment, and
- Nature of credit sales documentation, if any

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Determining Customer Creditworthiness

For each customer the firm must determine whether or not to grant credit and, if so, in what amount

- Objective: Maximize profits, not minimize credit losses
- If the credit policy is too strict:
 - It reduces uncollectible accounts, **but**
 - May result in not making credit sales that would be collected

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Setting Customer Credit Limits

There are two major approaches to determining whether or not to grant credit and, if so, setting credit limits:

- Use credit-rating service—Obtain and use a rating report from a credit agency (Equifax, Experian, Transunion, Dun & Bradstreet, etc.)
- Do financial analysis—Undertake an analysis of the prospective credit client
 - Usually done by large firms or in special circumstances

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Collecting Accounts Receivable

- When sales are made on account, collection of accounts receivable has to be managed
- Recognize:
 - Some sales on account will ultimately prove uncollectible.
 - The objective is to keep post-sales losses to a minimum.

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AR Management Process

Accounts Receivable management process includes:

- Monitoring AR continuously
- At the **aggregate level** use averages and ratios, including:
 - Average collection period
 - Days' sales in accounts receivable
 - Accounts receivable turnover
 - Accounts receivable to current or total assets
 - Bad debt to sales

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AR Management Process

- At the individual account level use aging of accounts receivable
 - An aging of accounts receivable shows for each credit customer the amount owed and how long it has been due
 - Typically, amounts due would be grouped by:
 - Not yet due
 - 1–30 days overdue
 - 30–60 days overdue
 - Greater than 60 days overdue

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AR Management Process

- When overdue accounts are identified, the firm should take prompt collection action.
 - Use prompt past due billings.
 - Send dunning letters with increasingly serious demands.
 - Ultimately, use a collection agency.
- Drastic collection actions have financial and goodwill costs.
 - Deciding each case on an individual basis may be appropriate.

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Inventory Management



Inventory Management Risk–Reward Tradeoff

There is a risk–reward tradeoff in managing inventory:

- Under-investing in inventory to save costs, risks incurring shortages
- Over-investing in inventory to provide “cushion,” risks incurring excessive costs

The inventory management objective is to neither under-invest nor over-invest in inventory.

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Inventory Management Systems

There are two general approaches (systems) of inventory management in U.S.:

- Traditional materials requirement planning (MRP) system
- Just-in-time (JIT) Inventory system

Traditional materials requirement planning (MRP) system.

- Predominant in U.S. from 1960s to advent of just-in-time inventory system

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MRP Inventory System

An MRP system is characterized by:

- Supply push—Goods are produced in anticipation of their sale.
- The use of inventory buffers—Inventory is maintained at every level as buffers against unexpected demand.
- Production is based on long set-up time and long production runs; an inflexible system.

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MRP Inventory System

An MRP system is characterized by:

- Impersonal relationships with suppliers; purchases are based on lowest bid.
- Quality standards set at an *acceptable* level; they allow for certain defects.
- Use of traditional cost accounting; the emphasis is on job order and processing cost approaches.

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Inventory Management Systems

Just-in-time inventory (JIT) system:

- Originated with Toyota.
- System is based on obtaining (on the supply side) and delivering (on the sell side) inventory just as and only when it is needed.

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Just-in-Time Inventory (JIT) System

A JIT inventory system is characterized by:

- Demand pull—Goods are produced only when and as needed by the end user.
- Inventory reductions—Production and purchasing occur only as needed, therefore inventories are reduced or eliminated.
- Production is in work centers (or cells) where workers operate multiple pieces of equipment or robotics are used.

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Just-in-Time Inventory (JIT) System

A JIT inventory system is characterized by:

- Close working relationships with a limited number of suppliers located physically close to production facilities
- Quality being critical throughout the system, including inputs to the production process
- Uses simplified cost accounting with fewer accounts; more items are considered direct cost, thus reducing allocations

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Just-in-Time Inventory Benefits

Just-in-time inventory systems and related production processes provide a number of financial benefits:

- Reduced investment in inventory
- Lower cost of inventory transportation, warehousing, insurance, property taxes and related costs
- Reduced lead time in replenishing production inputs
- Less complex and more relevant accounting and performance measures

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Just-in-Time Inventory System

Despite its benefits, JIT inventory cannot be used by every firm and will not be appropriate for all processes of some firms.

Whichever system is used (MRP or JIT), a firm will be more or less concerned with:

- The economic order quantity, and
- The reorder point for its inventory

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Inventory Economic Order Quantity

Inventory **ordering** cost and inventory **carrying** cost has a trade-off:

- Larger the quantity ordered, the lower per unit order cost
- Larger the quantity ordered, the higher the carrying cost

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Inventory Economic Order Quantity

Total inventory administrative cost = Total **order** costs + Total **carrying** costs

The economic order quantity (EOQ) model determines the order size that minimizes total inventory administrative costs.

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Economic Order Quantity Formula

Economic order quantity formula derived:

- Total **order** cost = Number of orders × Per order cost
- or = $(\text{Total units} / \text{Order size Quantity}) \times \text{Per Order cost}$
- or = $(T/Q) \times O$

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Economic Order Quantity Formula

Economic order quantity formula derived:

- Total **carrying** cost = Average inventory × Per unit carrying cost
- or = $(\text{Order size Quantity} / 2) \times \text{Per unit Carrying cost}$
- or = $(Q/2) \times C$

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Economic Order Quantity Formula

Economic order quantity (EOQ) formula derived:

Total Cost (TC) = $[(T/Q) \times O] + [(Q/2) \times C]$, or

- Rearranged $(TC) = \frac{T \times O}{Q} + \frac{Q \times C}{2}$, or
- Rearranged $EOQ = \sqrt{2 TO/C}$

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Economic Order Quantity Formula

- Example:
 - T = Total demand = 10,000 Units
 - O = Per order cost = \$100.00
 - C = Per unit carrying cost = \$2.00
 - $EOQ = \sqrt{2 TO/C}$
 - $EOQ = \sqrt{2 \times 10,000 \times 100/2} =$
 - $EOQ = \sqrt{2,000,000/2}$
 - $EOQ = \sqrt{1,000,000} = 1,000 = EOQ$
 - Optimum order quantity = 1,000 units

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Economic Order Quantity Assumptions

Assumptions inherent in the economic order quantity (EOQ) model:

- Demand is constant during the period.
- Unit cost and carrying costs are constant during the period.
- Delivery is instantaneous.

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Inventory Reorder Point

Reorder point objective is to determine the on-hand inventory quantity at which goods should be reordered.

Reorder point formula:

Reorder point = Delivery time stock + Safety stock

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Inventory Reorder Point Illustration

Reorder point example:

- Annual use equally over 50 weeks = 300,000 units
- Delivery time = 2 weeks
- Safety stock = 1,000 units
- Weekly usage = 300,000 units/50 weeks = 6,000 units/wk.

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Inventory Reorder Point Illustration

Reorder point example:

- Reorder point (RP) = Delivery time stock + Safety stock
- $RP = 6,000/\text{wk.} \times 2 \text{ wks.} = 12,000 \text{ units} + 1,000 \text{ units safety stock} = 13,000 \text{ units} = \text{Reorder point}$
- Inventory should be reordered when it drops to 13,000 units on-hand.

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Current Liabilities Management

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Current Liabilities Management

Current Liabilities Summary

Current liabilities defined:

- Obligations due within one year or less

Current liabilities provide short-term financing.

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Current Liabilities Summary

Management guidelines for short-term liabilities:

- Short-term liabilities should be used to finance assets which generate cash in the short-term; the principle of self-liquidating debt.
- Some amount of short-term liabilities provide a permanent amount of financing.
- Short-term liabilities normally do not require collateral or impose restrictive covenants.

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Current Liabilities Summary

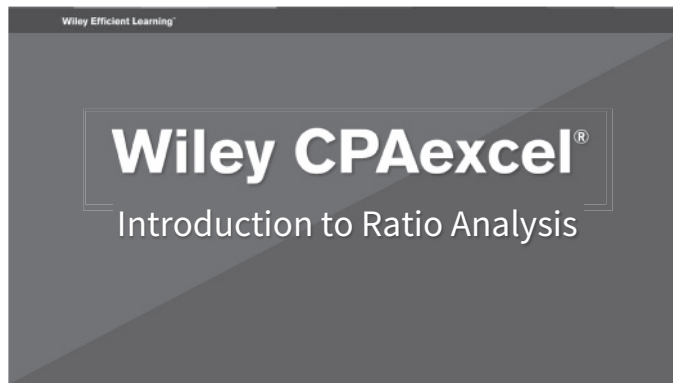
Management guidelines for short-term liabilities:

- Discounts offered for early payment of trade accounts payable are usually significant and should be taken if possible.
- If current liabilities require a compensating balance, the effective cost is greater than the stated cost.
- A line of credit, revolving credit and letter of credit provide stand-by financing.

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Ratios and Measures for Working Capital Management

Introduction to Ratio Analysis



Ratio Analysis Defined

Ratio analysis and related measurements involve the development of quantitative relationships between various elements of a firm's financial and other information.

These ratios and measures:

- Enable comparisons over time for a firm
- Enable comparisons across firms, and
- Facilitate identifying financial strengths and weaknesses of a firm

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Ratio Analysis Helpful Hints

Helpful hints for understanding and answering ratio-related questions on the exam:

- Name given to ratios and other measures usually indicates the elements to use in the analysis
- Example:
- Debt to equity ratio =
Total debt (liabilities) ÷ Owners' equity

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Ratio Analysis Helpful Hints

Helpful hints for understanding and answering ratio-related questions:

- Name given to ratios also frequently indicates the quantitative function to be performed
 - Terms *to* and *on* indicate to divide the first item described by the second item described
 - Examples:
 - Debt to equity ratio = Divide debt by equity
 - Return on assets = Divide net income (return) by assets

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Ratio Analysis Helpful Hints

Helpful hints for understanding and answering ratio-related questions:

- When using balance sheet (B/S) value(s) with income statement (I/S) value(s), you have to use the **average** for the balance sheet value(s)
 - I/S = for period; B/S = for point in time
 - Balance sheet = average beginning and ending values

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Ratio Analysis Helpful Hints

When using balance sheet (B/S) value(s) with income statement (I/S) value(s), use average for balance sheet value(s).

Example:

Accounts Receivable turnover uses:

Credit Sales (I/S) and Accounts Receivable (B/S)
(Net) Credit sales (I/S)

Accounts Receivable turnover = $\frac{\text{Average Accounts Receivable (B/S)}}{(\text{Beginning} + \text{Ending} / 2)}$

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Ratio and Measure Types

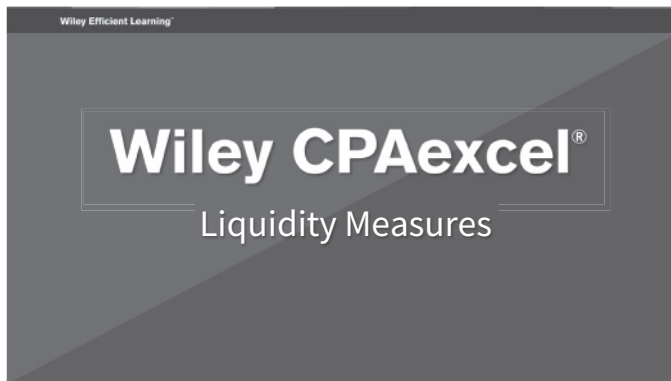
Different ratios and measures are used for different purposes.

Types of measures covered for financial management purposes:

- Liquidity or solvency measures
- Operational activity measures
- Profitability measures
- Equity or investment leverage measures

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Liquidity Measures



Liquidity Measures Defined and Identified

Liquidity measures (also called solvency measures) assess the ability of a firm to pay its obligations as they become due.

- These measures are particularly appropriate for management of working capital

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Liquidity Measures Defined and Identified

Liquidity measures include:

- Working capital (WC)—Measures extent to which current assets exceeds current liabilities
 - Formula: $WC = \text{Current assets} - \text{Current liabilities}$
- Working capital ratio—Measures the number of times current assets cover current liabilities
 - Formula: $WC \text{ ratio} = \text{Current assets} \div \text{Current liabilities}$

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Liquidity Measures Defined and Identified

Liquidity measures include:

- Acid test ratio (ATR) (also called quick ratio)—Measures the number of times **highly liquid** assets cover current liabilities
- Formula: $ATR = (\text{Cash} + \text{Receivables} + \text{Marketable securities}) \div \text{Current liabilities}$
- Note: Inventory is excluded from the numerator.
- ATR is more conservative than the WC ratio.

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Liquidity Measures Identified

Liquidity measures include:

- Defensive interval ratio—Measures the number of times highly liquid assets cover average daily use of cash
- Formula: $\text{Defensive interval ratio} = (\text{Cash} + \text{Receivables} + \text{Marketable securities}) \div \text{Average daily cash payments}$
- Note: The numerator is the same used for the acid test ratio.

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Liquidity Measures Identified

Liquidity measures include:

- Times interest earned (TIE)—Measures the number of times current earnings cover interest payments for the period
- Formula: $TIE = (\text{Net income} + \text{Interest expense} + \text{Income tax expense}) \div \text{Interest expense}$
- Interest expense and income tax expense are added back to net income because they were subtracted in getting net income.
- Since you are dividing by interest expense, you want income before that is deducted.

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Liquidity Measures Identified

Liquidity measures include:

- Times preferred dividends earned—
Measures the number of times current earnings cover preferred dividends for the period
- Formula: Times preferred dividends earned =
$$\text{Net income} \div \text{Annual preferred dividend obligation}$$

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Operational Activity Measures

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Operational Activity Measures

Operational Activity Measures Defined and Identified

Operational activity measures assess the efficiency of an entity’s operations in different areas.

- Operational activity measures for Accounts Receivable:
 - Accounts Receivable Turnover—Measures the number of times that Accounts Receivable are incurred and collected during a period

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Operational Activity Measures Identified

Formula:

- Accounts receivable turnover = $\frac{\text{Net credit sales}}{\text{Average accounts receivable (Beginning + Ending)/2}}$
- Indicates quality of credit policies and efficiency of accounts receivable collection

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Operational Activity Measures Identified

Operational activity measures for accounts receivable:

- Number of days' sales in average receivables—Measures the average number of days required to collect receivables
- Can be measured using 360 days, 365 days, or other

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Operational Activity Measures Identified

Formula:

Number of days' sales in average receivables =

$$\frac{360 \text{ (or other days)}}{\text{Accounts receivable turnover}}$$

- Numerator could be other number of days in year, as decided by the firm
- Measure also reflects average age of receivables

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Operational Activity Measures Identified

Operational activity measures for inventory:

- Inventory turnover—Measures the number of times inventory is acquired and sold during a period
 - Uses: Inventory and cost of goods sold
 - What do you notice about these measures?
 - Uses B/S item (Inventory) and I/S item (COGS)
 - Use average of Inventory

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Operational Activity Measures Identified

Formula:

- Inventory turnover =

$$\frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

$$(\text{Beginning} + \text{Ending}/2)$$
- Helps identify overstocking or understocking of inventory and obsolete inventory

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Operational Activity Measures Identified

Operational activity measures for inventory:

- Number of days' supply in inventory—
Measures the number of days inventory is held before it is sold or used.

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Operational Activity Measures Identified

Formula:

Number of days' supply in inventory =

$$\frac{360 \text{ (or other days)}}{\text{Inventory turnover}}$$

- Can be used to assess efficiency of general inventory management

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Operational Activity Measures Identified

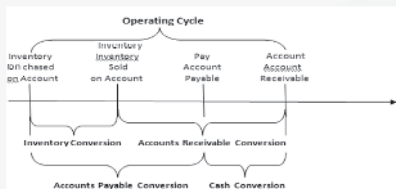
Operational activity measures for accounts receivable, inventory and accounts payable:

- Operating (Working Capital) cycle length—Measures average length of time to acquire inventory, convert inventory to accounts receivable, and collect receivables.
- Cash conversion cycle length—Measures average length of time from expenditure of cash for inventory to the collection of cash from accounts receivable; cash-to-cash.

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Operational Activity Measures Identified

Operational activity measure—Operating Cycle



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Operational Activity Measures Identified

Formula: Operating cycle length (days) =
Inventory conversion period
+ Accounts receivable conversion period

OR

Operating cycle length (days) =
Number of days' supply in inventory
+ Number of days' sales in average
receivables

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Operational Activity Measures Identified

Operating cycle length encompasses:

- Purchase Lead Time—Time from order until goods received
- Production Time—Time to convert inputs to final product
- Sales Time—Time from goods being available until sale
- Delivery Time—Time from sale to delivery to customer
- Collection Time—Time from sale on account until collection

Reduction in any of these times will reduce operating cycle

Reduced operating cycle reflects more efficient performance

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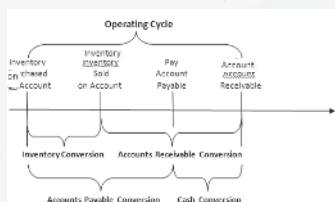
Operational Activity Measures Identified

- Examples:
- Reducing Inventory Conversion Cycle—Apply:
 - Just-in-time inventory concepts
 - Supply chain management
- Reducing Accounts Receivable Conversion Cycle—Use:
 - Appropriate credit policies
 - Timely collection actions

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Operational Activity Measures Identified

Cash Conversion Cycle: Measures average length of time from payment of cash for inventory until collection of cash from accounts receivable; cash-to-cash.



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Operational Activity Measures Identified

Formula: Cash conversion cycle =

Inventory Conversion
+ Accounts Receivable Conversion
– Accounts Payable Conversion

Cash conversion cycle (days) =

Number of days' supply in inventory
+ Number of days' sales in average
receivables
– Number of days' purchases in average
payables

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Operational Activity Measures Identified

Cash conversion cycle:

- Measures efficiency of use of working capital items (accounts receivable, inventory and accounts payable)
- Shorter cycle = more efficient the use of working capital
- To reduce cash conversion cycle:
 - Reduce inventory conversion and accounts receivable conversion cycles (as described above)
 - Increase accounts payable conversion cycle

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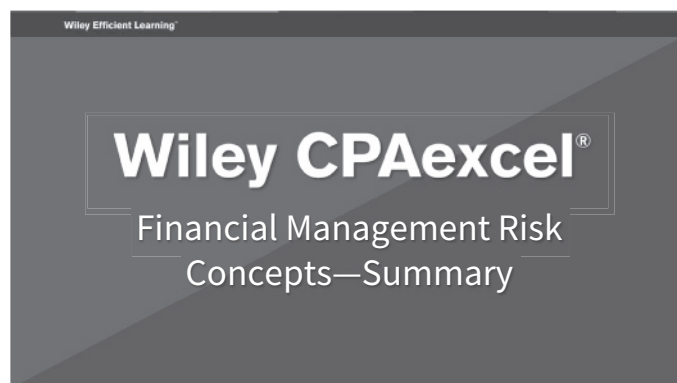
Operational Activity Measures Identified

Cash conversion cycle:

- Can be negative (rare)
 - Occurs when payment of account payable for inventory acquired occurs after collection of account receivable for sale of inventory
 - Accounts payable conversion cycle is greater than the operating cycle

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Financial Management Risk Concepts—Summary



Risks Defined and Identified

Risk: Possibility of loss or other unfavorable outcome that results from uncertainty inherent in future events.

- Businesses face many identifiable risks

Risks include:

- Business risk—The broad macro-risk a firm faces largely as a result of the relationship between the nature of the firm and the nature of its environment

Risks Identified

Factors related to nature of firm include its:

- Products and services
- Cost structure
- Financial structure
- Other firm specific factors

Risks Identified

Factors related to nature of environment include:

- General economic conditions
- Competition
- Customer demand
- Technology
- Other firm-specific environmental factors

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Business Risks Classifications

Business risks are classified into two types:

- Diversifiable risk (also unsystematic or firm-specific)—Elements of risk that can be eliminated through diversification of investments
 - Diverse projects
 - Diverse investment portfolio
 - Diverse locations
 - And the like

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Business Risks Classifications

Business risks are classified into two types:

- Non-diversifiable risk (systematic or market-related risk)—Elements of risk that cannot be eliminated through diversification of investments
 - Non-diversifiable risk is related to general economic and political factors

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Business Risk Measurement

General business risk is measured by the expected variability in a firm's earnings before interest and taxes (EBIT)

- EBIT = **E**arnings **b**efore **i**nterest and **t**axes
- EBIT—Measures the results of a firm's operating activities, except debt financing
- The greater the variability in EBIT, the greater the perceived business risk
 - *beta* is a specific measure of how variability in a firm's results compare to variability in a benchmark

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Risks Identified

Financial Risk: Common shareholders' risk that results from the use of debt financing and preferred stock which requires payment **before** common shareholders receive a return on investment.

Default Risk: Risk that the issuer of a security will not be able to make future interest and/or principal payments; the risk that the issuer may default on its obligation.

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Risks Identified

Interest Rate Risk: Risk that increases in market rate of interest will decrease the value of outstanding debt.

- There is an inverse relationship between changes in the general interest rate and changes in the market value of existing debt.

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Risks Identified

Inflationary (also Purchasing Power) Risk: Risk that a rise in general price levels (inflation) will result in a reduction in the purchasing power of a fixed sum of money.

- For example, future cash flows from a project would lose purchasing power.

Liquidity (also Marketability) Risk: Risk that an asset cannot be readily sold at fair value for cash.

- This would apply, for example, for an investment with a “thin” market.

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Risks Identified

Political Risk: Risk associated with operations in a foreign country that has different political, governmental, cultural, ethical, market structure, or other socio-political elements than a firm’s domestic market.

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Risks Identified

Currency Exchange Risk: Risk associated with changes in exchange rates between two currencies.

Three subtypes:

1. Foreign currency transactions: Risk that transactions to be settled in a foreign currency will lose dollar value as a result of unfavorable changes in the exchange rate between the dollar and the foreign currency

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Risks Identified

2. Foreign currency translations: Risk that the dollar value of translated financial statements of direct foreign investments will lose value from unfavorable changes in the exchange rate between the dollar and the foreign currency of the investment

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Risks Identified

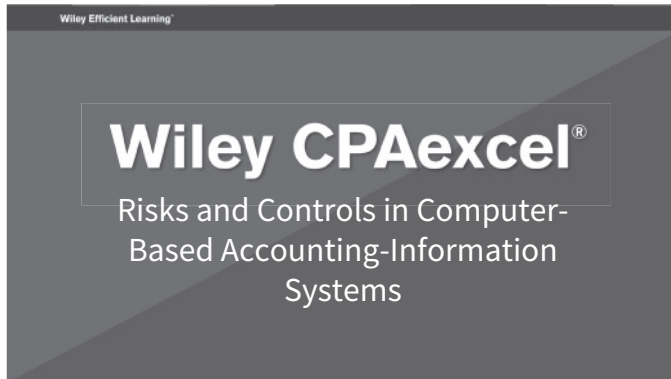
3. Foreign currency economic risk: Risk that changes in exchange rates will make future international transactions less financially viable
 - Dollar value of foreign currency revenues may be reduced to unacceptable level
 - Dollar cost of foreign currency expenses may be increased to unacceptable level

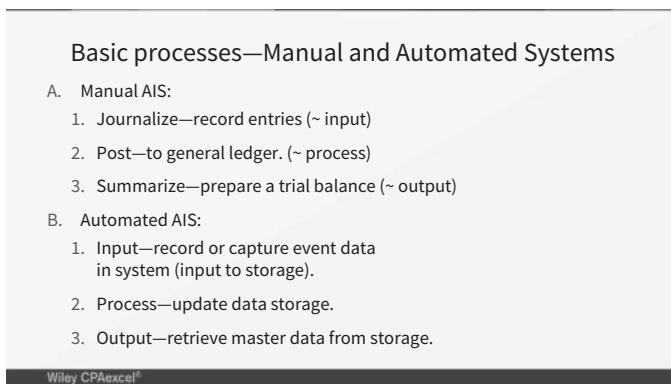
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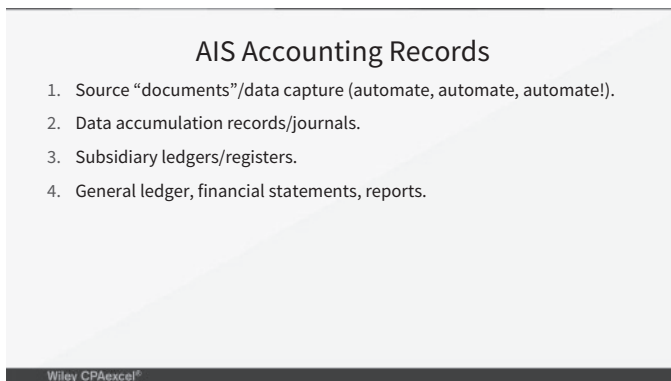
Information Technology

Information Technology Governance

Risks and Controls in Computer-Based Accounting-Information Systems







The Least Predictable Element in Most Accounting Systems

Hardware
Software
Middleware
Malware
People
Procedures
Network controls



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Elements of Accounting Systems

Five elements: people, procedures, hardware, software, and data
People + procedures ("manual" controls still relevant)
Automated or programmed controls critical and increasingly important

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What is Manual?

Note the multiple meanings of "manual"

- Historically: An AIS with no computer
- Now: Instructions for users
- In large organizations: controls often include: user procedures manual, operations manual
 - Useful in training and insuring control compliance
 - What to do when automated systems fail (reboots + restarts)

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Manual vs. Computer System Controls

Potential differences

1. Segregation of duties
2. Audit trail
3. Transaction processing
4. Computer initiated transactions
5. Risk of errors and defalcations
6. Management review



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Manual System Controls

Segregation of duties	Possible in medium to large organizations
Audit trail	<i>Physical (paper)</i> trail
Transaction processing	<i>More</i> clerical errors
Computer-initiated transactions	None — Less efficient
Risk of errors and defalcations	1. No remote access 2. Paper (not electronic) records 3. Manual processes 4. Separate functions
Management review	Isolated data

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Computer System Controls

Segregation of duties	1. Combine previously separate functions 2. Include compensating (automated) controls
Disappearing audit trail	<i>Electronic</i> audit trails
Uniform transaction processing	Potential for "systemic" (logic) errors
Computer-initiated transactions	Increase efficiency
Changed risk of errors and defalcations	1. Remote access risk 2. Data concentration 3. Less observation 4. Manipulation of or errors in application programs
Potential for increased management review	1. Greater data accessibility 2. Embedded controls

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Risks in Computer-Based Systems

Systems, programs, and people (FUNI)

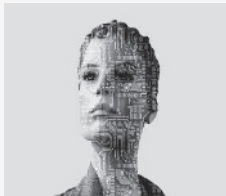
- Reliance on **f**aulty systems or programs (F)
- **U**nauthorized changes in master files, systems, or programs (U)
- Failure to make **n**eeded changes (N)
- Inappropriate **i**ntervention (by people) (I)

Data goals (in a future lesson)

- *security, availability, processing integrity, confidentiality, privacy*

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Lesson Quiz: Understanding



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Quiz: Understanding

Do automated systems increase or decrease the potential for data analytics compared with manual accounting systems?

- Increase—designed to include data and text analytic subsystems (e.g., expert systems, DSS, executive support systems)

How does the audit trail differ in an automated accounting system compared to a manual one?

- Automated systems → audit trails often imaged or other electronic forms. Manual systems → paper.

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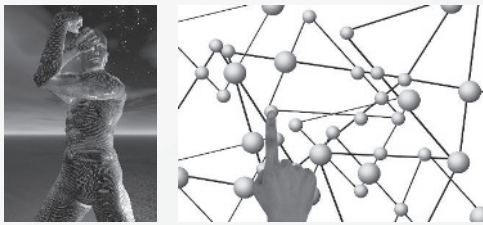
Quiz: Understanding

How does segregation of duties differ in an automated accounting system compared to a manual?

- Segregated functions often combined in automated systems, automated processes are compensating controls.

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Lesson Quiz: Application



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Quiz: Application

Because of the aging population and the quality of its products, sales at Dorian Gray Anti-Aging Cosmetics are growing at ~ 20% per year. Mr. Gray is considering moving away from a simple, one-person accounting system to a fully automated ERP system. What control issues should he consider in relation to such a move?

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Answer

Easy part—Discuss controls in computer system (see earlier slide)

Note the risks in this context:

- Rapid growth
- Start-up business—how competent/knowledge are they regarding AIS issues
- Risk of rapid changes without proper documentation (importance of change controls)

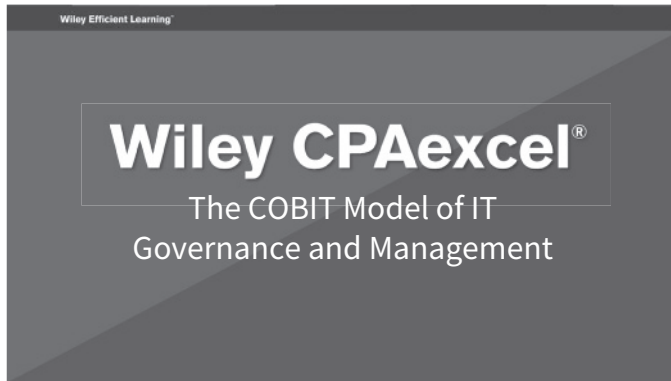
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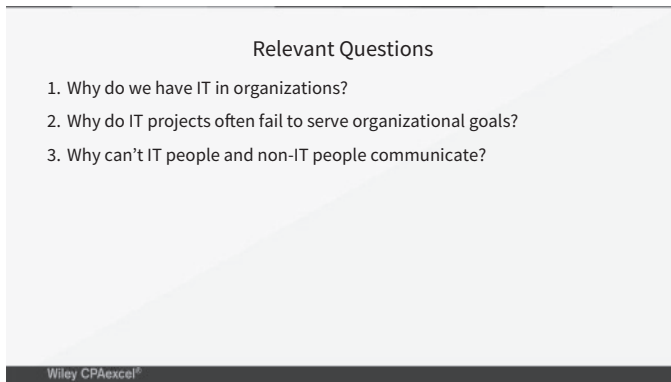
Computer System Controls

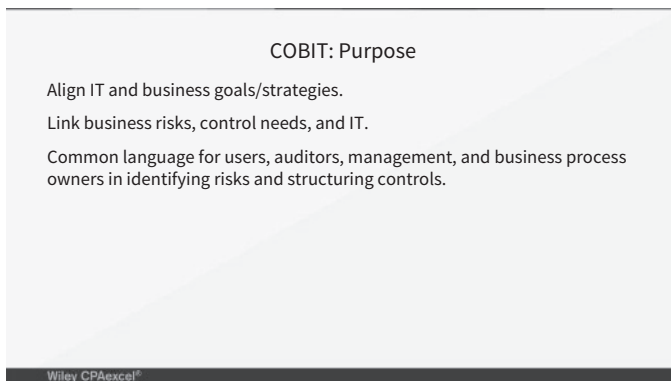
Segregation of duties	1. Combine previously separate functions 2. Include compensating (automated) controls
Disappearing audit trail	Electronic audit trails
Uniform transaction processing	Potential for "systemic" (logic) errors
Computer-initiated transactions	Increase efficiency
Changed risk of errors and defalcations	1. Remote access risk 2. Data concentration 3. Less observation 4. Manipulation of or errors in application programs
Potential for increased management review	1. Greater data accessibility 2. Embedded controls

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The COBIT Model of IT Governance and Management







COBIT: Purpose

Framework—how much IT and IT security must management invest in?

- IT security and control
- Auditing and oversight

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COBIT Framework Definition



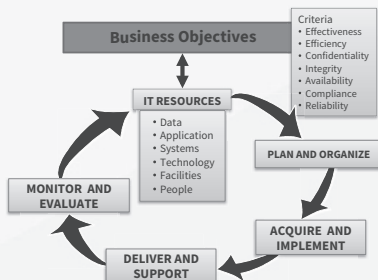
“To provide the information that the organization needs to achieve its objectives, IT resources need to be managed by a set of naturally grouped processes.”

WHY

Process orientation to exercise responsibilities, achieve goals, and manage risks.

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Basic COBIT Framework



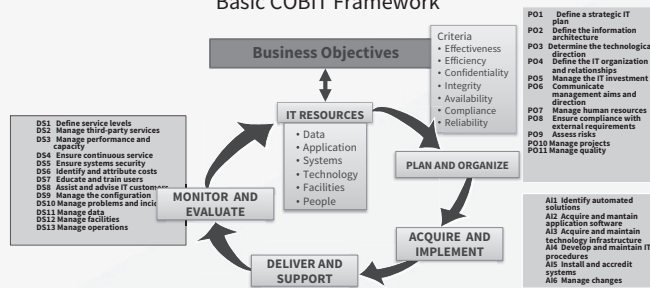
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Full COBIT Model

34 activities in four domains

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Basic COBIT Framework



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COBIT Framework

Information (seven desired attributes)

1. Effective
2. Efficient
3. Confidential
4. Integrity
5. Available
6. Compliant
7. Reliable

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Control Objectives for Information and Related Technology (COBIT) Framework

- Business Processes
- Planning and Organization
- Acquisition and Implementation
- Delivery and Support
- Monitoring

Note: Similar to systems development lifecycle (in a later lesson).

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Control Objectives for Information and Related Technology (COBIT) Framework

IT Resources:

- Data
- Application systems
- Technology
- Facilities
- People

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COBIT and COSO

Both concerned with monitoring of organizational processes.

Focus:

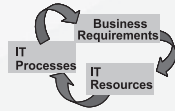
- COSO: organizational controls and processes
- COBIT: IT controls and processes

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Process Orientation—Monitor and Evaluate

Description:

- Regularly assess IT processes: quality and compliance.
- Includes management oversight of control process and independent assurance.

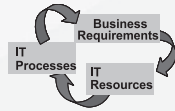


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Process Orientation—Monitor and Evaluate

Topics:

- Assessment over time, delivering assurance
- Management's oversight of the control system
- Performance measurement

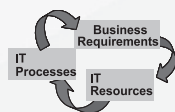


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Process Orientation—Monitor and Evaluate

Questions

- Can IT's performance be measured and problems detected and corrected?
- Need (additional) independent assurance in critical areas?



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Process Orientation—Monitor and Evaluate

- M1 Monitor the process.
- M2 Assess internal control adequacy.
- M3 Obtain independent assurance.
- M4 Provide for independent audit.

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Lesson Quiz: Understanding



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Quiz: Understanding

According to the COBIT model, identify five physical resources that, together, comprise an IT system.

1. People
2. Applications
3. Technology
4. Facilities
5. Data

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Quiz: Understanding

According to the COBIT model, what are the seven desirable properties of information?

1. Effectiveness
2. Efficiency
3. Confidentiality
4. Integrity
5. Availability
6. Compliance
7. Reliability

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Quiz: Understanding

According to the COBIT model, what are the four IT domains?

1. Planning and organization
2. Acquisition and implementation
3. Delivery and support
4. Monitoring

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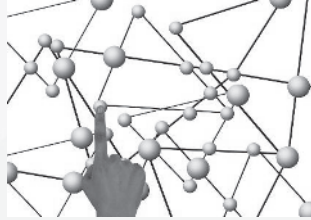
Quiz: Understanding

What are the three major components of the COBIT model?

1. Domains and processes
2. Information criteria
3. IT resources

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Lesson Quiz: Application



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Lesson Quiz: Application

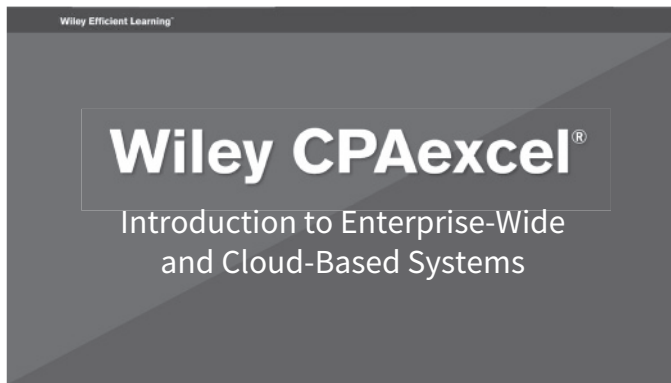
“Call me Ishmael!” Seafood Products has struggled to invest well and wisely in IT and AIS technology. Captain Ahad Pequod, IT Chief Technology Officer, is pondering whether the adoption of a IT control model or framework might be useful in guiding future investments. Explain to Captain Pequod how the COBIT framework may be useful in guiding IT strategy.

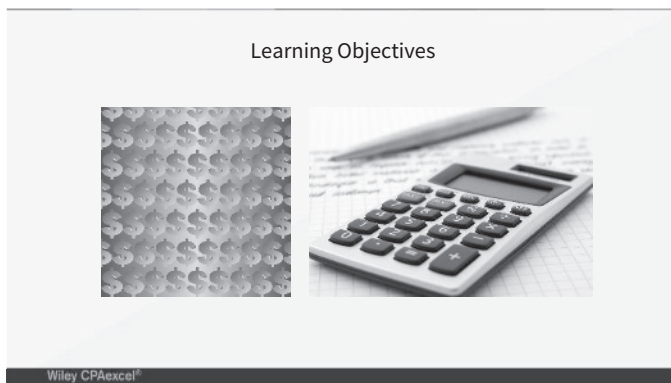
1. Widely used international standard for identifying best practices in IT security and control.
2. Provides IT governance model,
3. Guides investments in IT,
4. Helps deliver value from IT processes,
5. Aids in understanding and managing IT risks.

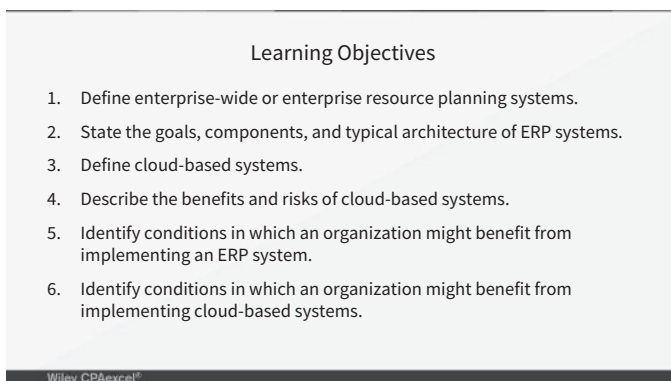
The lessons about COBIT standards, frameworks, and thought papers are based on documents from the Information Systems Audit and Control Association ("ISACA"), <https://www.isaca.org/Pages/default.aspx>, © 2016, Information Systems Audit and Control Association ("ISACA"). All rights reserved. Used with permission.

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Introduction to Enterprise-Wide and Cloud-Based Systems







ERP Systems

The Promise

2000–2001 Whirlpool, re-engineered supply chain, installed ERP

Results:

- 20% ↓ finished-goods inventory
- 5% ↓ freight and warehouse costs
- ↑ product availability

And The Peril

1996–1999, Hershey's transitioned to new ERP system

1998–1999 results:

19% ↓ profit

29% ↑ inventory

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Market for ERP software

SAP (~ 25% market share)

Oracle (~ 12%)

Sage, Infor, Microsoft (~ 6% each)

others (~ 45%)

Source: Gartner, 2012 data

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ERPs: Introduction

Goal: *Integrate* management support, knowledge work support, and operational support..... ***into one system***

Management Support:
Exec Information Systems
Decision Support Systems
Management Reporting Systems

Support of Knowledge Work:
Professional Support Systems
Office information Systems
Knowledge Management Systems

Operational Support:
Transaction Processing Systems

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ERPs: Introduction

Goals:

- **Integration:** Integrate all data into 1 database with user-defined views
- **Cost savings:** ↓ system maintenance costs (only one system to maintain)
- **Employee empowerment:** Improves communication and decision making by ↑ information availability
- **“Best practices”:** Include most successful business processes of an industry

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Example: Integrate Business Functionality

When purchasing equipment the ERP will, more or less simultaneously:

- Provide an electronic order form
- Apply business rules
- Route the order for approvals
- Send the order to a buyer
- Connect to the vendor
- Use data to receive goods, project funding requirements, compare to budget, and analyze vendor performance

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ERP Systems: Architecture

Typically = client/server network configuration

Current ERPs usually Internet- and intranet- based

2- or 3-tier architecture

- 3-tier separates application and database functions (needed in large or complex systems)

Example of ERP Architecture



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ERP Systems: Components

Typically purchased in modules

- E.g., ERP modules: Sales, Logistics, Planning, Financial Reporting
- Called choosing “**best of breed**” components
- Requires building “bridges” between systems

Online transaction processing system (OLTP):

- Include **core business functions**: sales, production, purchasing, payroll, financial reporting, etc.

Online analytical processing system (OLAP):

- **Data warehouse** and **data mining capabilities** within ERP

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Cloud Service Providers - Vendors (Consumer and Business)

5% market share:

- Amazon ([AWS](#))
- Google
- Microsoft
- IBM

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Cloud Deployment Models

Public Clouds:

- Available to public or large industry group
- Owned by an organization selling cloud services (google, IBM, Microsoft)

Private Clouds:

- For one organization
- May be outsourced; on or off site

Community Clouds:

- Shared by common users for one organization (e.g., municipal governments, an industry association, related to compliance requirements)

Hybrid Clouds:

- Two (or more) of the above with partitions between types of services

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Cloud Deployment Models

Community Clouds:

- Available to members of a community (e.g., Google apps for government)

Hybrid Clouds:

- Composition of the above three models

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Cloud-Based Systems and Storage: Benefits

1. Universal access—System data is available at any site with Internet access
2. \$ ↓—Eliminate multiple systems, pay-for-use “demand” pricing, no or low fixed costs
3. Scalability—Grow with organization
4. Outsourcing and economies of scale—Outsource to provider with lower costs
5. Enterprise-wide integration—Synergies with ERP
6. Deployment speed – outsourcing often MUCH faster than insourcing

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Cloud-Based Systems and Storage: Risks

1. Data loss—All eggs in one basket ↑ risk of data loss and outages.
A common problem.
2. ↑ system penetration risk, E.g., Target case
3. In the vendor you trust
 - and when the vendor fails... ([Amazon, spring 2011](#))
4. Your roommate may suck..... Data stored in community and public clouds more vulnerable to actions by other tenants.
5. Are we a “target” (ha ha)? Storing data with a high-profile cloud service provider can make one a high profile target for cyber-attackers.

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Summary

You've looked at clouds from both sides now.... And you better know clouds (sorry Joni!!)

Despite risks, many organizations moving primary storage to cloud-based systems.

Joining ERP + cloud-based systems can creates strong synergies

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Lesson Quiz: Understanding



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Quiz: Understanding

What are enterprise resource planning systems (ERPs)?

What is a cloud-based system?

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Quiz: Understanding

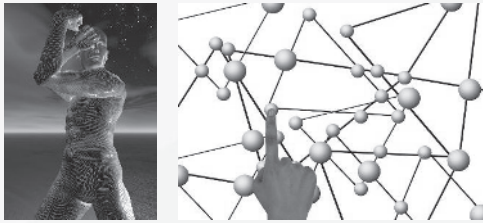
Define "Infrastructure as a Service (IaaS)."

Define "Platform as a Service (PaaS)."

Define "scalability."

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Lesson Quiz: Application



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Lesson Quiz: Application

"Hester Prynne 'A' #1 sewing and alterations" is considering moving to a cloud-based computing environment. Hester Prynne has a low "appetite" for risk. Hence, the CEO, Roger Chillingworth, wants to minimize the risks in the AIS related to data and processing. Please explain the most important risks of cloud-computing to Master (CEO) Chillingworth.

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Learning Objectives: Summary



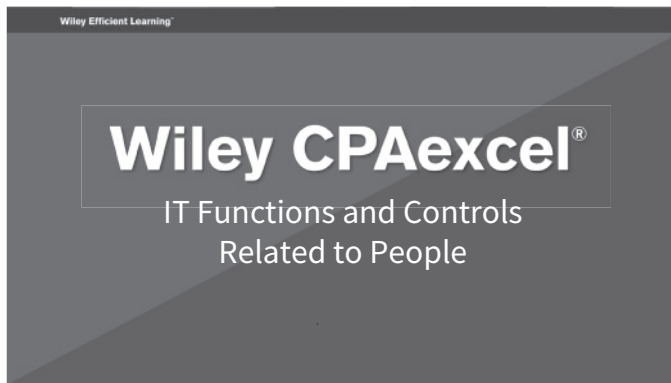
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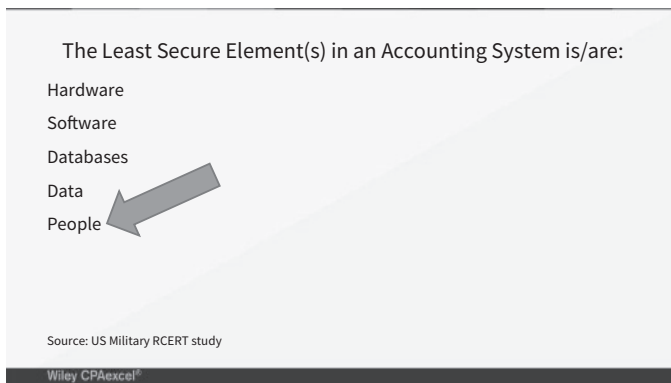
Learning Objectives

1. Define enterprise-wide or enterprise resource planning systems.
2. State the goals, components, and typical architecture of ERP systems.
3. Define cloud-based systems.
4. Describe the benefits and risks of cloud-based systems.
5. Identify conditions in which an organization might benefit from implementing an ERP system.
6. Identify conditions in which an organization might benefit from implementing cloud-based systems.

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IT Functions and Controls Related to People







What Does an IT Department Do?

Well, what does the organization do? E.g., retail, engineering, public accounting

Common functions:

- Build applications
- Support the delivery of IT services in the organization
- Manage databases, data stores and data archives
- Manage networks and communication resources

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IT Department Segregation of Duties

What does an IT department do?

Special case of general principles of segregation of duties.

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Chief Information Officer (CIO)

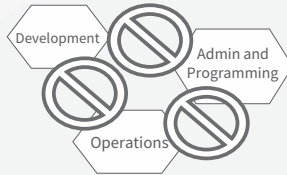
- Oversees IT Department
- In some organizations, vice president of information technology or chief technology officer (CTO)
- Generally reports to the chief executive officer (CEO)
- Responsible for existing and future systems
- Accountable for organization's hardware and software operations

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IT Department Structure

Three important functions
(segregate):

1. Applications Development
2. Systems Administration and Programming
3. Computer Operations



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IT Department Structure—Roles

Three important functions (segregate):

Applications Development

- **Safeguard assets** (applications in development)

Systems Administration and Programming

- Grant **authorization** (access)

Computer Operations

- **Execute** events, safeguard archived IP

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IT Department Structure: Applications Development

Create and maintain applications

- For safety, done in a test environment
- Use “nonlive” copies of programs



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IT Department Structure: Applications Development

Create and maintain applications.

- After testing and approval, put into “live” use
- Duty = safeguarding (future) “assets”: application programs and systems in development

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IT Department Structure: Applications Development

Roles:

Systems **analysts**:

- Analyze and design new systems.
- Lead teams of programmers.
- Partner with end users to define problems and solutions.

Application programmers:

- Write application programs (previous slide).

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IT Department Structure: Systems Administration and Systems Programming

Maintain computer hardware and computing infrastructure.

Grant access to system resources.

Roles: System **administrators** (e.g., database administrator, network administrator, web administrator)

- Duty = authorize events (access).

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IT Department Structure: Systems Administration and Systems Programming

Roles

System programmers:

- Maintain operating systems and related hardware (e.g., new software and hardware releases).
- Segregation of duties: No access to application programs or data files.



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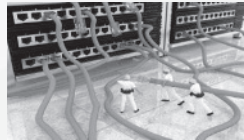
IT Department Structure: Computer Operations

Day-to-day operations of systems

Examples: batch input, data conversion, scheduling computer activities, run programs, printing and/or distributing output, system backup.

Role: execute events

Note: these jobs are disappearing due to automation of processes and controls.



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IT Department Structure: Computer Operations

Segregated duties within computer operations:

1. **Data control (clerk):** Control document flows, schedule batches for data entry and editing, reconcile control totals (reconciling + authorizing function).
2. **Computer operators:** Operate the (mainframe) computer, load program and data files, run programs (execute transactions).
3. **File librarian:** Maintain files and data that are not online in file library, check files in and out to support scheduled jobs. Should not have access to operating equipment or data outside of library (safeguard: archived assets).

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SoD software

Software identifies roles and creates matrix (i.e., rows by columns) of needed segregations.
A semi-automated process that is driven by ~ a large, complex spreadsheet.

Summary: Roles and Privileges

Role	Live system	Application Programming	Systems Programming
Data control and file librarian (archive software)	No	No	No
Computer operators (live programs + data)	Yes	No	No
Systems programmers (live systems)	Yes	No	Yes
Application programmers, system analyst, data administrator (future software)	No	Yes	No

IT Personnel Policies and Procedures

Competent, loyal, high-integrity IT employees are critical
Hiring practices: Detailed employment applications, in-depth interviews, background and criminal checks.



IT Personnel Policies and Procedures

Users = weakest security element

Entity must communicate evolving threats and risks

Monitor their security compliance

Targeted security education



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IT Personnel Policies and Procedures

Evaluation:

Regularly, clear feedback and guidance

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IT Personnel Policies and Procedures

Termination:

Clearly specified procedures especially for some involuntary terminations.

Involuntary terminations: disable username and keycard before notification. Escort terminated employee from building.

E.g., Employee firing paybacks at Prudential



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Lesson Quiz: Understanding



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Quiz: Understanding

What are the duties of the file librarian?

- The file librarian is responsible for controlling IT-related files, checking them in and out only as necessary to support scheduled jobs. The librarian should not have access to live operating equipment or data.

Describe the responsibilities of the computer operations department.

- Responsible for the day-to-day operations of the computer system

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Quiz: Understanding

Department that develops new systems?

- Applications development

List the three main functional areas within an information technology (IT) department.

1. Applications development
2. Systems administration and programming
3. Computer operations

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Quiz: Understanding

What do application programmers do?

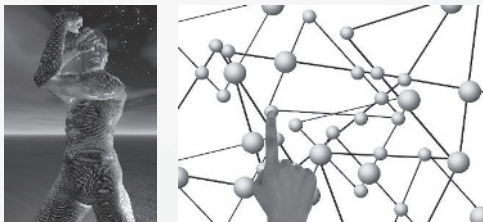
- They work under the direction of the systems analyst to write the actual programs that process data and produce reports.

Who should have access to computer operations ("live data")?

- Computer operators (and systems programmers, though their access should be limited to times when they need to update systems hardware or software).

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Lesson Quiz: Application



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Lesson Quiz: Application

Ebenezer Scrooge's Christmas Fun House develops many of its own systems in-house since the company prefers "to not rely on the kindness of strangers." Although he has little experience in IT, Tiny Tim Marley has taken over the CIO position, after it was confirmed that Jacob Marley was dead. In a meeting, he asks you to explain the different roles of applications versus systems programs since his preference is, for efficiency, to "just let programmers be programmers."

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Lesson Quiz: Application

You must communicate to this client that the CIO is unqualified for his position.

Application programmers

- Work under the direction of systems analyst
- Write programs
- Work in a test environment
- Must not have access to live copies of program or archived software

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Lesson Quiz: Application

You must communicate to this client that the CIO is unqualified for his position.

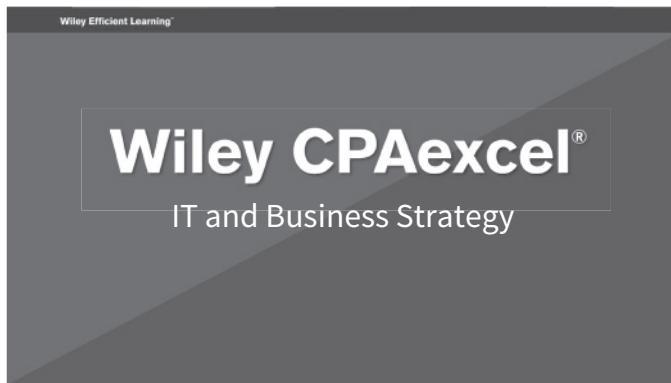
System programmers

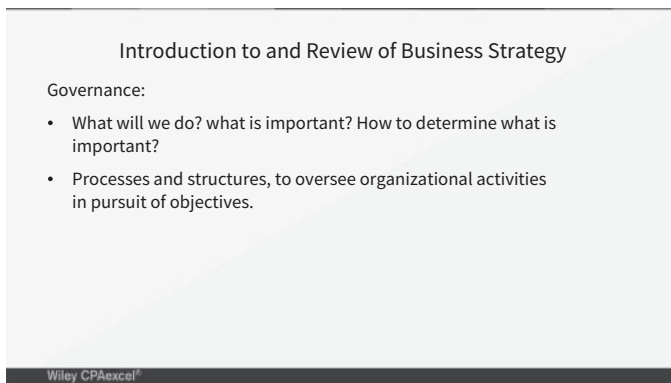
- Maintain systems and hardware
- Must not have access to programs under development or archived software

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Role of Information and Technology in Business

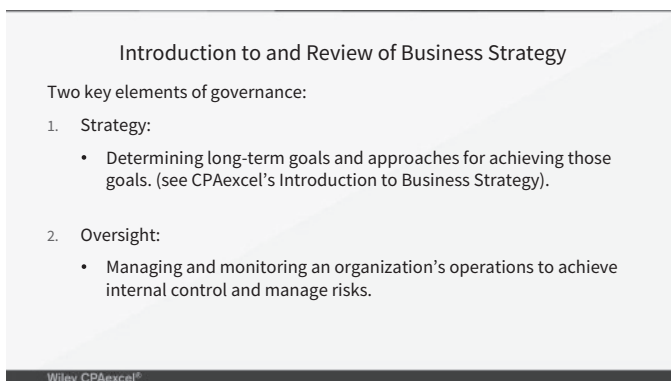
IT and Business Strategy





Governance:

- What will we do? what is important? How to determine what is important?
- Processes and structures, to oversee organizational activities in pursuit of objectives.



Two key elements of governance:

1. Strategy:
 - Determining long-term goals and approaches for achieving those goals. (see CPAexcel's Introduction to Business Strategy).
2. Oversight:
 - Managing and monitoring an organization's operations to achieve internal control and manage risks.

The Problem of IT and Business Strategy

The problem: Integrating IT investments into business strategy.

- Lack of IT strategic focus—many IT investments are “bottom up.”
- Lack of strategic investment—over-investment in existing businesses and inadequate investment in “transformative” technologies.
- Inadequate Scope and Agility—IT investments in business units, inadequately scaled to meet changing business needs.

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Changing Role of IT in business strategy

Increasing IT investments due to:

- Digitization (i.e., moving data to electronic form).
- Globalization (i.e., integration of cultures and economies due to digitization) have made IT investments central to many businesses’ strategy.

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The Changing Role of IT in Business Strategy

Basic strategies (See CPAexcel lesson on “Generic Strategies”):

- Product differentiation, setting your product apart from competitors’ by offering one that’s faster, has enhanced features, etc.
- Cost leadership, offering a cheaper product than competitors. The low cost possible by operating efficiencies.

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IT and Product Differentiation Strategy

Internet can create product differentiation by being a distribution channel, e.g., eBay.

Information on the internet can be changed quickly (vs. sales by mailed catalogues). Because of this product life cycles are shorter and product evolution is faster. These changes can be used to create differentiation.

Advanced technologies (i.e., lasers, 3D printers) can improve product quality.

Digitized products (e.g., books, music) can increase quality and reduce costs!

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IT and Cost Leadership Strategy

Use advanced technologies to reduce costs and improve production and delivery systems (e.g., Walmart).

The internet is almost everywhere, hence → intense price competition can result.

Many companies shifting away from low-cost towards a product-differentiation strategy.

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Conclusion

Integrating Business Strategy, Risk Management and IT Investment:

- Many companies struggle to integrate strategic planning, risk management, and IT investment.
- Integration of these functions is critical to effective and efficient governance.
- These activities should be managed using a comprehensive, overarching, integrated approach.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Governance"

- Processes and structures, to oversee the activities of the organization in pursuit of organizational objectives.

Define "Oversight"

- Process of managing and monitoring an organization's operations to achieve internal control and effectively manage risks.

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Lesson Quiz: Understanding

Define "Digitization"

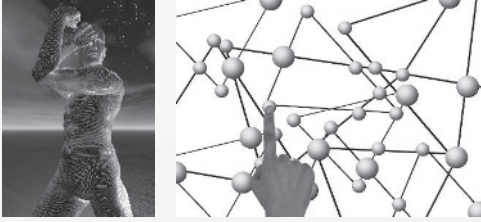
- Movement of data to electronic form.

Define "Product Differentiation"

- Setting your product apart from your competitors.'

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Lesson Quiz: Application



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Lesson Quiz: Application

Kentucky Fried Possum has invested heavily in IT over the past 5 years but has consistently earned lower returns on these investments than it expected. The Company's CEO, "The Kernel," asks you why this might be true.

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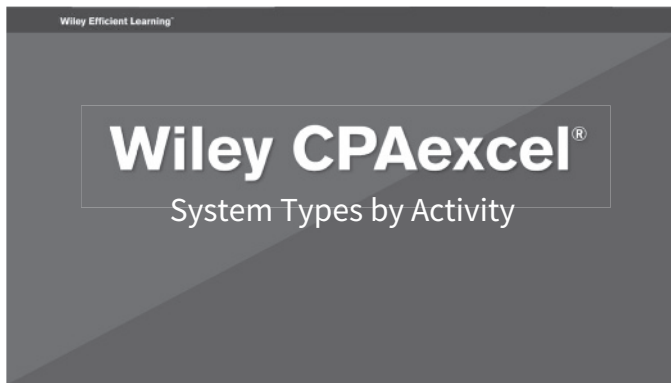
Lesson Quiz: Application

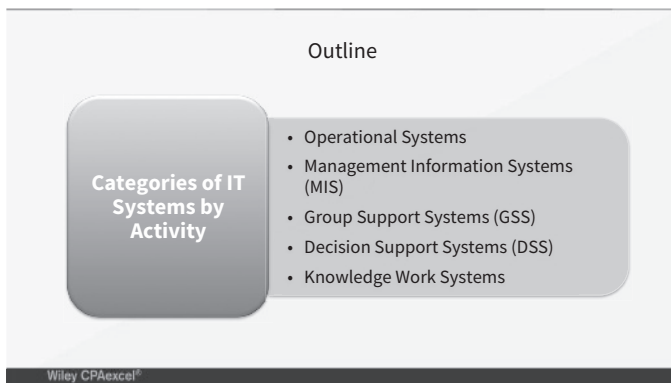
A problem shared by many businesses. Common problems with IT investments include:

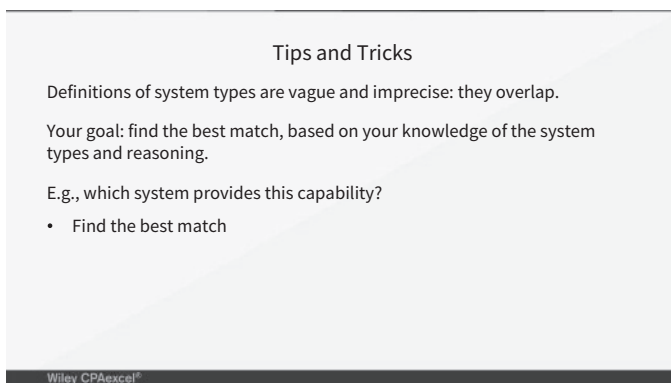
- Lack of IT strategic focus—many IT investments are "bottom up."
- Lack of strategic investment—over-investment in existing businesses and inadequate investment in "transformative" technologies.
- Inadequate scope and agility—IT investments in business units, inadequately scaled to meet changing business needs.

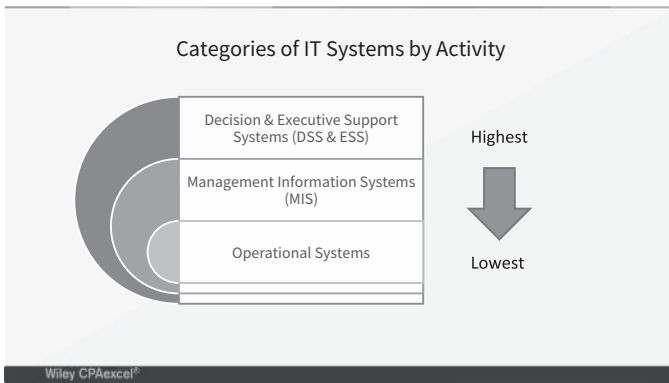
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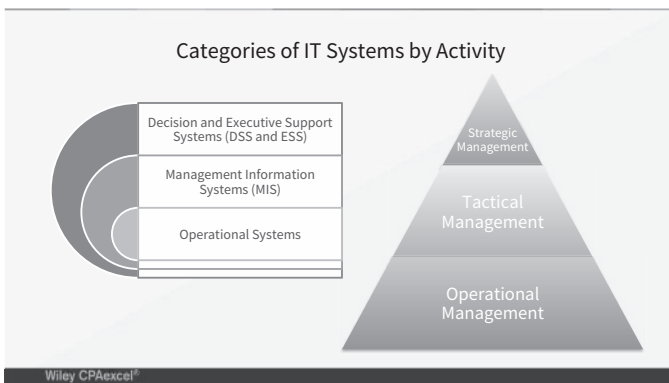
System Types by Activity

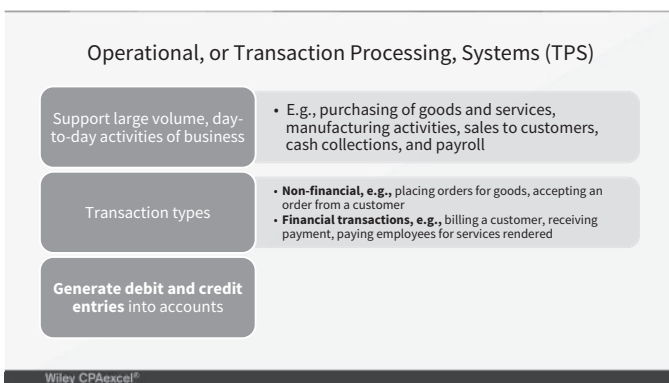












Knowledge Management (KM) Systems

Components:

- Knowledge base (or knowledgebase): knowledge database; provides means to collect, organize, and develop relations among information

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Management Information Systems (MIS)

Support routine, day-to-day, lower level management

- Primarily synthesize data from TPSs, i.e., **internal data**
- Tasks: **structured problems**

Compare planning information (budgets, forecasts, etc.) data with outcomes

- Presented in periodic management reports
- Summary reports, variance reports, exception reports

E.g., **Accounting Information Systems (AIS)**

- A subset of **MIS**



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Decision Support Systems (DSS)

Support mid- and upper-level management

Tasks: manage non-routine problems and long-range planning

Often integrate external (market-level) with TPS data

Include significant analytical and statistical capabilities



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Decision Support Systems (DSS)

Types and examples:

- Data driven: process large amounts of data to find relations and patterns
 - Examples: data warehousing and data mining
- Model driven:
 - Use models to forecast outcomes
 - Model-driven analytics



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DSS Examples Used by Audit Firms

Client risk assessment

Client acceptance and retention

Internal control documentation and testing

Compute audit sample size

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Group Support Systems (GSS)

Facilitate group collaboration

May include functions such as calendars, meeting scheduling, and document sharing.

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Executive Support Systems (ESS) or Strategic Support Systems (SSS)

Similar to DSS

- Support forecasting and long-range, strategic decisions
- Greater use of external data
- “DSS for dummies”???
- Can be ad hoc, i.e., for a specific purpose, e.g., monitoring competitor pricing

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Lesson Quiz: Understanding



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Quiz: Understanding

What are operational systems?

- Support day-to-day activities of business
- Also known as transaction processing systems (TPS)

Define “management information systems.”

- Support routine management problems
- Analysis of data from transaction processing systems

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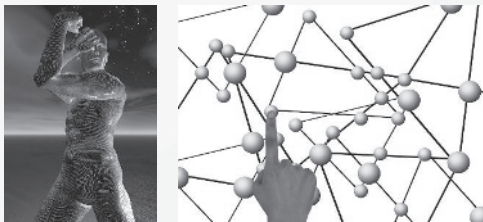
Quiz: Understanding

What are decision support systems (DSSs)?

- Support mid-and upper-level management
- Focus: non-routine problems and long-range planning
- Frequently include external data
- Often include significant analytical and statistical capabilities

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Lesson Quiz: Application



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Lesson Quiz: Application

Bathsheba Everdene, CEO of The Madding Crowd Theatre Company wants help in forecasting demand for theatre productions. She and the other senior executives in the company don't want to learn a bunch of computer commands or code to use this system. As envisioned, the system will largely conduct analytics of external data and present it to the executives. What type of system would you propose to Ms. Everdene?

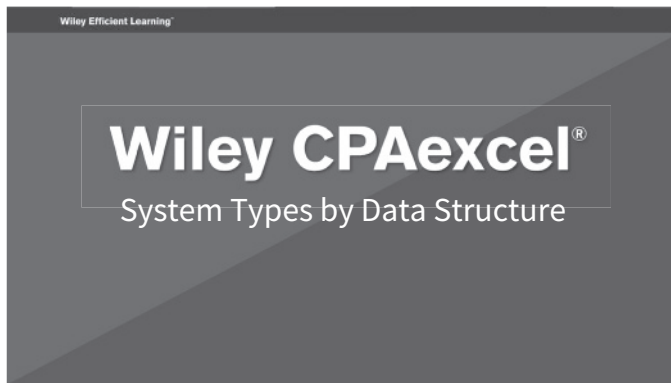
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Lesson Quiz: Application

- This is an ESS
- Supports forecasting and long-range, strategic decisions
- Analytics of external data
- Simple, easy-to-use interface or “dashboard”
- Can be ad hoc, i.e., for a specific purpose, e.g., monitoring competitor pricing

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System Types by Data Structure



Flat File Systems

Early IT systems

Separate programs and data sets

- Each application has separate data and programs
 - Data sharing across applications through separate programs
 - Select data records from one application and reformat for other application. (the horror, the horror.... ☹)

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Flat File Systems

Problems:

- High data redundancy
- Poor cross-functional availability and reporting (e.g., across applications)

For CPA exam purposes: flat-file systems are bad (antiquated)

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Database Systems

Pool data into logically related files (the database)

MIS always implemented in a database environment

For CPA exam, database systems are **good**

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Knowledge Management (KM) Systems

Components:

- Knowledge base (or knowledgebase): knowledge database
 - Means to collect, organize, and develop relations among information

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Data Warehouses and Mining

System to collect, organize, integrate, and store entity-wide data

Easy access to large quantities of varied data from across the organization

Data mining = exploration, aggregation, and analysis of data in the data warehouse using analytical tools and exploratory techniques

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Data Warehousing

Relational database of archived operational transactions + other data

Often incorporated in a data-driven DSS (decision support system)

May include external data

- E.g., economic indicators, stock prices, exchange rates, market share, political stability of a country, weather conditions



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Data Warehousing

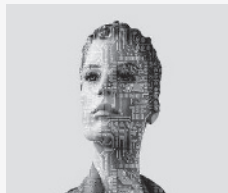
Drill Down: Move from summary to detailed information

Slicing and Dicing: View data in multiple ways



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Lesson Quiz: Understanding



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Quiz: Understanding

Describe a flat file system.

- Used in early (pre-ERP) systems
- Characterized by independent programs and data sets
- High data redundancy, poor analytic capabilities
- Difficult to achieve cross-functional reporting

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Quiz: Understanding

Define "drill down."

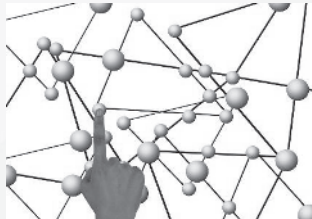
- Associated with data warehouses
- Ability to move from summary to granular information

Define "slicing and dicing" in data warehouses.

- Ability to view data in multiple dimensions
- E.g., sale of printers by product, by region, by time period, by company, etc.

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Lesson Quiz: Application



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Lesson Quiz: Application

Uriah Heep is the CEO of Blundeston Financial Services, an investment banking company based in Boston. The company has grown from a small number of clients that the Heep-ster (Mr. Heep's nickname) invested many years ago to a large, multi-product financial services company. To date, however, all of the company's files are maintained as flat files.

The Heep-ster asks you whether remaking the AIS away from flat files to a relational database system is worth the very high costs?

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Lesson Quiz: Application

Yes, this is worth the cost.

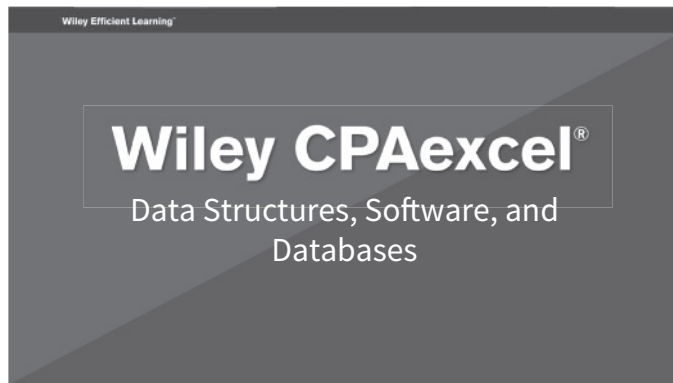
It is difficult to imagine a financial services company keeping clients if it could not answer the questions and queries that are central to database systems.

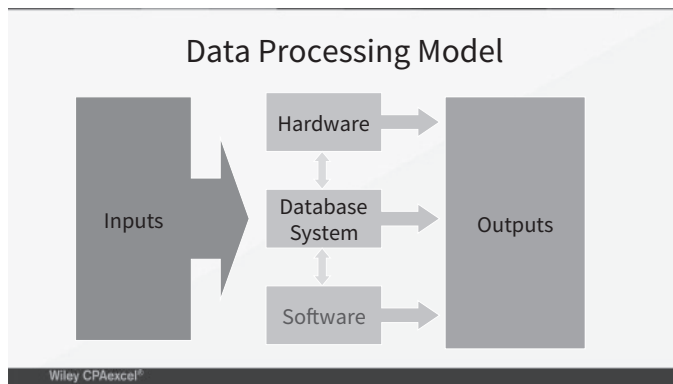
The cost is likely to be small compared to business failure, which is likely if the business doesn't convert.

Flat files include data redundancies, inability to answer basic queries, and extremely limited analytic capabilities.

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Data Structures, Software, and Databases





Which Problem Can You Solve Faster?

Math problem #1: 2^{50}

Math problem #2: $100,000 \times 10,000$

Which problem can a computer solve faster?

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Words for Nerds: Data Elements and Relations

Computer Data:

- To the computer, there are only groupings of 0, 1

Bit (binary digit):

- 0, 1 (“Just a little bit...”)

Byte:

- Logical grouping of bits (can be 2^n power: e.g., 8, 16, 32, or 64 bit bytes)
- E.g., the character “R” = 1010010



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Data Elements and Relations

More about bits and bytes



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Computer Cheers—Limitations

Incapable of the cheer:

Two, four, six, eight!

Who do we appreciate!

Computer cheer:

One, zero!

Who's our hero!

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Words for Nerds: Data Elements and Relations

Field (Attribute):

- A logical group of bytes
- Identify a characteristic or attribute of an entity (invoice, customer, product, etc.); e.g., name, address, customer number
- In databases, fields are also known as “attributes”



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Words for Nerds: Data Elements and Relations

Record:

- A group of related fields (or attributes)
- Describe an example of an entity (a specific invoice, a particular customer, an individual product)



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Words for Nerds: Data Elements and Relations

File (Table):

- Collection of related records for multiple entities (an Invoice file, a customer file, a product file)

Database: a set of logically related files

- More about databases later



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Data Elements and Relations

Exam Hint: Except for “file” the words get longer as the units get bigger....

- Bit (**3** characters)
- Byte (**4** characters)
- Field (**5** characters)
- Record (**6** characters)
- File (**4** characters)
- Database (**8** characters)



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How Much is That?

Bit = (2^0) 0 or 1

Byte = (2^3) 8 bits

Kilobyte (KB) = (2^{10}) 1,024 bytes

Megabyte (MB) = (2^{20}) 1,024 Kilobytes

- **4** books (200 pages or 240,000 characters)

Gigabyte (GB) = (2^{30}) 1,073,741,824 bytes

- **1** 650MB drive



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Types of Software

1. Systems software:

- Programs that run computer and support system management (operating system is most important)

2. Programming languages:

- Used to create applications
- Now, most are “third” or “fourth generation” languages, many are object-oriented programming languages (OOPL) (e.g., Java)
- all must be converted to “first generation” language, i.e., 0s and 1s (from source to object code)

3. Application software:

- End-user programs that you know and love

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Operating System

Interface between user and hardware

Defines what commands can be issued and how (e.g., typing in a command, pointing and clicking).

Controls all input and output to main memory, assigns workspace to applications, schedules jobs, execute user commands, manages system resources.

E.g., Microsoft Windows, Unix/Linux, Mac OS X

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Application Software

Do what end-users want

Categories:

- General (e.g., word processors, spreadsheets, databases)
- Specific (e.g., a marketing information system for a clothing designer)

Runs on specific operating system and hardware environment

- E.g., software for Mac OS will not run in Windows

Development:

- May be purchased “off the shelf” (general)
- Developed (internally or externally) (specific)

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Database Management System (DBMS)

“Middle-ware” program (i.e., between the application software and operating system)

Manages the database

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DBMS and Database Languages

DBMS uses three special languages to accomplish these objectives:

1. Data definition language (DDL):

- User can define **tables and fields** and **relations among the tables**
- Uses **meta-data** to define the database elements
- Example commands: CREATE, DROP, ALTER (of fields and tables)

2. Data manipulation language (DML):

- User can add delete or update **records**
- Example commands: UPDATE, INSERT, DELETE (of records)

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DBMS and Database Languages

DBMS uses three special languages to accomplish these objectives:

3. Data query language (DQL)

- User can extract information
- Most relational databases use structured query language (SQL) to extract data (text approach)
- Query-By-Example (QBE): graphic interface with “drag and drop” fields to create query (graphic approach)

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Database Controls—DBMS Includes

- No collisions - Concurrent access management
- No hackers or creepers - Access controls
- Data definition standards, data element standards
- Backup and recovery procedures
- Update privileges
- Data elements and relationship controls

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Lesson Quiz: Understanding



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Quiz: Understanding

Define "operating system."

- The interface between the user and the computer hardware.

Define "systems software."

- The programs that run the computer and support system management operations.

Define "file."

- A collection of records for one specific entity (an Invoice File, a Customer File, a Product File). In a relational database environment, files are also known as tables.

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Quiz: Understanding

Define "byte."

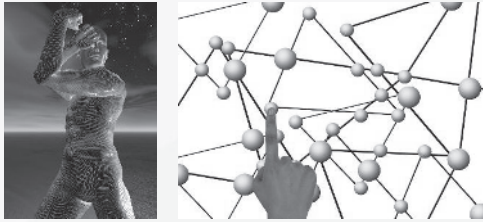
- A group of (usually) eight bits represent alphabetic, numeric, and other characters (3, g, X, ?, etc.). Several coding systems assign bytes to characters (e.g., ASCII and EBCDIC). These systems define the sequence of zeros and 1s that represent each character.

Define "bit" (binary digit).

- On or off. 0 or 1; the smallest piece of information that can be represented in a computer system.

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Lesson Quiz: Application



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Lesson Quiz: Application

Monroe Starr is the CFO of Last Tycoon Enterprise. Last Tycoon is primarily a publisher of classic books (fiction and nonfiction). Mr. Starr is seeking your advice as he ponders whether to move some of the company's archives to cloud computing. The specific question that he asks you, however, is to explain the common elements of control found in any database management system written in a language that he (a non-IT person) can understand.

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Lesson Quiz: Application

Answer: cloud computing is a complex issue that is worthy of separate consideration.

The common elements of control found in any database management system.

1. No collisions—Concurrent access management
 - Multiple users can use the system and maintain record and file integrity
2. No hackers or creepers—Access controls
 - Restrict access to all tables and record to those who are authorized
3. Data definition standards, data element standards
 - E.g., Determine what must entered for each data element

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Lesson Quiz: Application

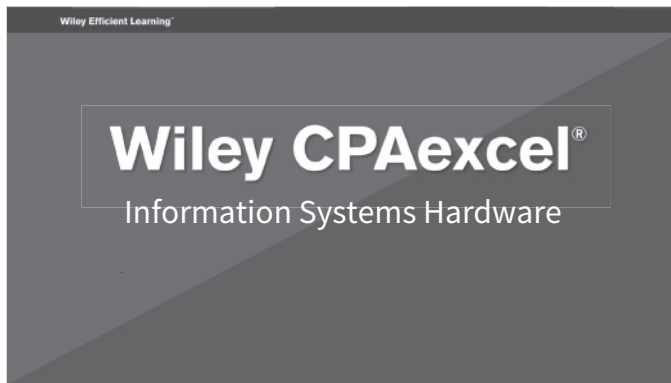
Answer: cloud computing is a complex issue that is worthy of separate consideration.

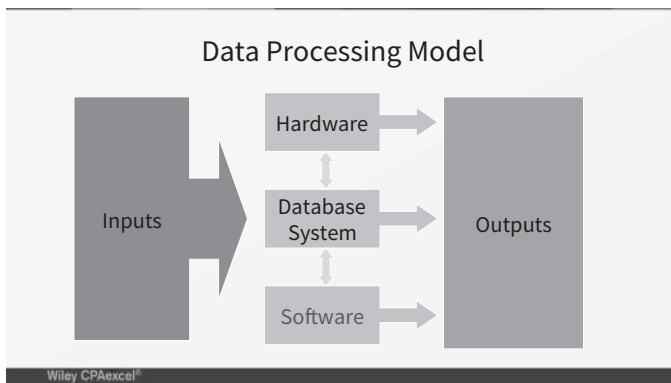
The common elements of control found in any database management system.

4. Backup and recovery procedures
 - How, when and by whom will the system be backed up?
5. Update privileges
 - A change control—who can change records and how can they change them
6. Data elements and relationship controls
 - Structure and relationships among the database elements

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Information Systems Hardware





Inputs and Outputs

Terminology

- Peripherals = input and output devices = I/O devices

Input devices instruct the CPU and supply data to be processed.

Examples:

- Keyboard, mouse, trackball
- Touch-screen technology
- Microphones and voice recognition technology
- Point of sale (POS) scanners

Inputs and Outputs

Output devices transfer data from the processing unit to other formats.

- Printers, plotters—paper output
- Monitors, flat panel displays, CRT (cathode ray tube) displays—visual output
- Speakers, voice output communication aids (VOCAs)—auditory output

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Central Processing Unit (CPU)

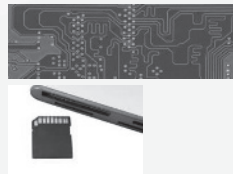
Control Unit: interprets program instructions

Arithmetic Logic Unit (ALU): performs arithmetic calculations

Primary storage (main memory): stores programs and data when in use.

Two parts:

1. Random access memory (RAM)—stores data temporarily
2. Read-only Memory (ROM)—permanently stores data needed by computer



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Secondary Storage I

Permanent storage for programs and data

May be online or offline:



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Secondary Storage I

Magnetic disks:

- Most common (e.g., the large storage iPods)
- Random access devices: data can be stored and retrieved in any order (very efficient)



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Secondary Storage I

Magnetic tape:

- Now mostly for archive storage (e.g., backup); never in online, real-time systems
- Slow and cheap



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Secondary Storage II

Optical disks:

Disk access device that is written and read by light instead of electrical impulses

- Laser (i.e., light) "burns" data on disk
- Random access storage
- Newer → Blu-ray
(> capacity, more precise)



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Secondary Storage II

Solid State Drives (SSDs) = Flash drives = USB, jump, thumb drives:

- Portable. Capacity 128 Megabytes to 20 gig (and increasing)
- Not really a drive; memory similar to RAM; random access storage



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Secondary Storage II

See lessons on cloud computing

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Types of Computer Systems (Big)

Supercomputers:

- Fastest available
- Parallel processing and **computer clusters** (connected computers)
- Calculation-intensive applications:
 - e.g., weather forecasting, climate research, biological, and physical simulations, cryptology.



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Types of Computer Systems (Big)

Mainframe computers:

- Used in many legacy (old) and ERP applications.
- Often used with microcomputers in networked systems with thousands of simultaneous users.
- Often used in systems with redundancy, e.g., credit card systems need high reliability and availability and fast response.
- Applications: input/output (I/O) intensive (transaction processing).

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Types of Computer Systems (Medium)

Server:

- A computer that provides resource on a computer network
- See lesson on networks for more information

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Types of Computer Systems (Smaller)

Personal Computers (PCs) or Workstations (Smaller):

- Used by individuals
- Sometimes called, in network systems, fat clients (or thick clients)

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Types of Computer Systems (Small)

Thin clients:

- In a network system, a computer with minimal capabilities that mostly uses resources on a server

Others:

- Laptop or tablet computer
- Mobile devices including smart phones, tablets, handheld devices, and wearable computing technologies (see lesson on HMDs)

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Lesson Quiz: Understanding



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Quiz: Understanding

What is computer hardware?

- Physical equipment of the computer system

What data are stored in random access memory (RAM)?

- Information in process

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Quiz: Understanding

What are solid state drives?

- Also called flash drives (also known as jump drives or thumb drives).
- Small, portable devices that store 500 megabytes to several gigabytes.
- Device contains no moving parts. Similar to the RAM.

Define "supercomputers." What is their purpose?

- Computers at the leading edge of processing capacity. Supercomputers are used for calculation-intensive scientific applications (e.g., weather forecasting and climate research). E.g., Deep Blue by IBM

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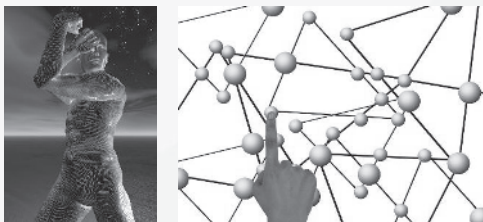
Quiz: Understanding

What is a mainframe computer?

- Computer used by commercial organizations to support mission-critical tasks.
- Input/output (I/O) intensive (i.e., a very large numbers of simple transactions). Frequently support thousands of users.

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Lesson Quiz: Application



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Lesson Quiz: Application

John Galt, Chief Innovation Officer and CEO of Atlas Slouches and Blockheads has a great idea. He proposes that the company adopt a “best of breed” approach to hardware and software. That is, use the best hardware and the best software regardless of company or design. Therefore, for example, he proposes using, for the core transaction processing of the company, the Apple iOS with Deep Blue, the supercomputer designed by IBM. Please comment on Mr. Galt’s idea.

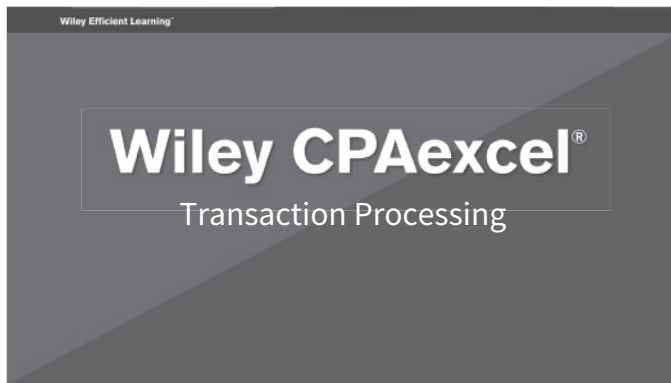
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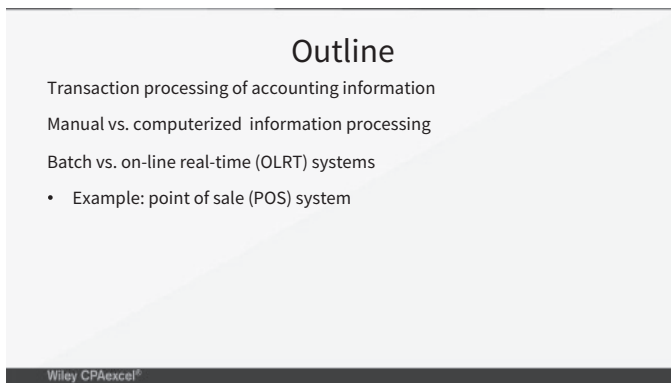
Lesson Quiz: Application

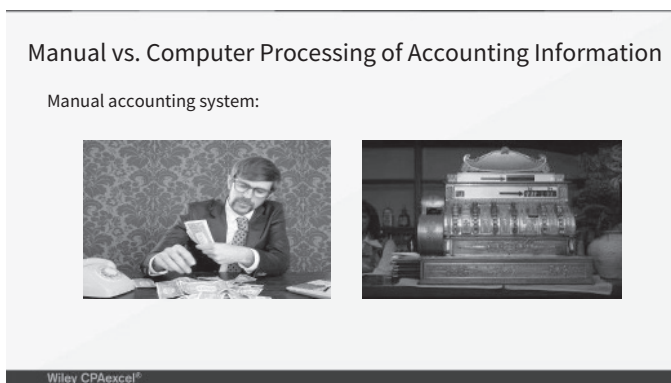
- This is a question that is better answered by a IT professional.
- Operating systems are designed to run on specific hardware and computers.
- It may be possible to “emulate” “foreign” software on hardware but it may not run as efficiently as “native” operating system software.
- It is likely to be very difficult and inefficient to try and run an Apple iOS on an IBM supercomputer.
- While there may be applications in which this is desirable it is not realistic as a core transaction processing system. Attempting to do so would be challenging and would yield dubious benefits.

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Transaction Processing







Manual Processing: Four Steps

1. **Enter** transaction on **source document**

Invoice: Due from
Bob G.
\$100

2. **Record** source document chronologically in a **journal**

Debit: Accounts Rec. \$100
Credit: Sales \$100

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Manual Processing: Four Steps

3. **Copy** to ledger(s) (master files)

Accts Receivable
Master File

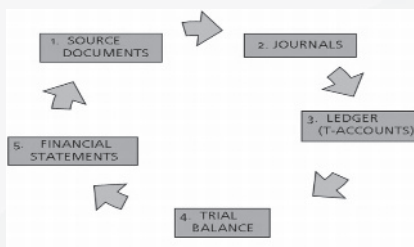
4. **Prepare** reports

Financial Statements
Cash: \$xxx,xxx
Accounts Receivable: \$xxx,xxx

Accts Receivable
Subsidiary
file: Bob G
Due: \$100

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Another View (Separating Trial Balance and Financial Statements)



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Manual Processing: General and Subsidiary Ledger Example

Subsidiary ledger balances equal general ledger accounting balance



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Manual Processing: Reports

Produce summarized account reports:

- From **general ledger** produce trial balance and financial statements
- From **subsidiary ledgers** produce additional reports (customer a/r balances, vendor a/p balances, etc.)



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Computerized Processing of Accounting Information

Difference: eliminate redundancy and post transactions to **many** systems simultaneously



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Automated Processing: Data Capture

Automated data capture equipment

- E.g., bar code readers

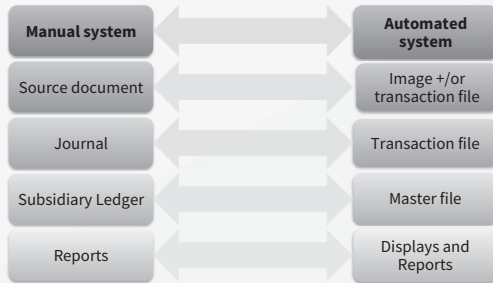
Increasingly rare: Manually record on document and enter into system

- Expensive and error-prone



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Manual to automated systems



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Automated Processing Methods: Overview

How does system capture data and update master file? Two primary methods:

1. Batch: Group transactions for processing
2. On-line, real-time (OLRT): Continuous, immediate processing

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Batch Processing

Group new transactions by type
(called "batches")

STEP 1

Process periodically (e.g., daily,
weekly, monthly)

Batch is sequential

STEP 2

Compute batch control total(s)



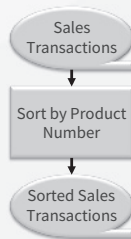
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Computerized Batch Processing: Master File Example

Example: Update inventory records

1st: Sort into inventory master file order

- Here: Product number

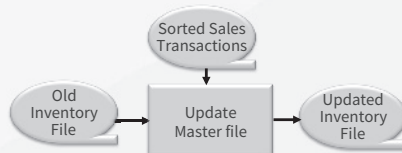


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Computerized Batch Processing: Master File Example

Update inventory records:

2nd: Update inventory master file (which is also sorted by product number)



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Batch Processing

Transaction and master files must be sorted on a common key:

- Called “sequential-access files” because the records are in sequence
- Alternative is “random-access files” (See lesson on hardware – storage devices)

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Batch Processing

When?

Sequential processing improves speed

- E.g., most master file records are updated each time

Low volume, periodic transactions

Transactions are independent or unimportant

Examples:

- Fixed asset updates, depreciation postings

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Batch Processing

Why not?

Not real time: delay between transaction and posting

System is always out of date

Delays error detection

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Batch Processing Controls: Introduction

Batch control totals—One or more batch control totals calculated for each batch.

- Compare batch control totals for batches
- Differences between the two control totals indicate an error

See lessons on input, processing, and output controls

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On-Line, Real-Time (OLRT) Processing

Continuous, immediate transaction processing.

Near simultaneous transaction entry and master files updating.

Each transaction completed (data capture, validation, and master file update) before following transaction.



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On-Line, Real-Time (OLRT) Processing

Requirements

- Random access storage devices (e.g., magnetic disk)
- Networked computer system or internet



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On-Line, Real-Time (OLRT) Processing

When?

- Most current accounting systems
- Need real-time data
- Want better customer service
- Interdependent data, high transaction volume (making batches impractical)

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On-Line, Real-Time (OLRT) Processing

Why not?

- \$ Cost (e.g., keep low-cost batch legacy system)
- Low priority (unimportant) system

Controls—discuss in later lessons

- More complex and integrated than in batch systems (updates happen everywhere at once)
- Automate where possible
- General IT controls very important

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Point-of-Sale (POS) System Technology

Scanners capture data from **product bar codes** (fast, accurate, cheap)

Computer system connected to, or integrated with, **electronic cash register**

POS systems or terminals **networked to central computer**

Central computer maintains databases of products, prices, sales, etc.



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Lesson Quiz: Understanding



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Quiz: Understanding

Why are there time lags in batch processing systems?

- Time lags are inherent part of batch processing
- There is always a time delay between transaction, recording, and master file update

What are point-of-sale (POS) systems?

- Combine online, real-time processing with automated data capture technology
- Highly accurate, reliable, and timely

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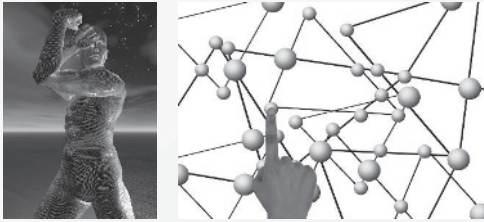
Quiz: Understanding

What is "online, real-time (OLRT) processing"?

- Continuous, immediate transaction processing method
- Transactions processed individually as they occur

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Lesson Quiz: Application



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Lesson Quiz: Application

Jane Eye-er is President and CEO of Thornfield Hall Optical Supply which is a manufacturer of custom lens and eye care products. The company, which is struggling to make profits, currently relies on mostly batch processing in its accounting system. The current system is ~ 10 years old and lacks many characteristics that seem to be present in competitors' systems. Ms. Eye-er ponders whether replacing these legacy systems with OLRT systems is worth the cost.

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Lesson Quiz: Application

What's the financial status of the company?

Replacing the core systems essential to survival?

Why do it?

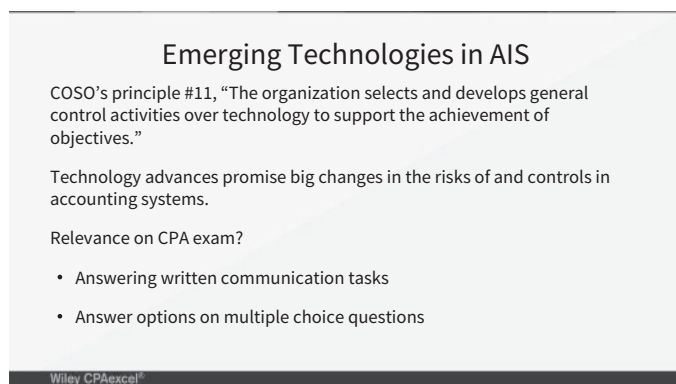
- Real-time data and analytics
- Better customer service (!)
- Consider also linking to supplier and customer systems (EDI?)

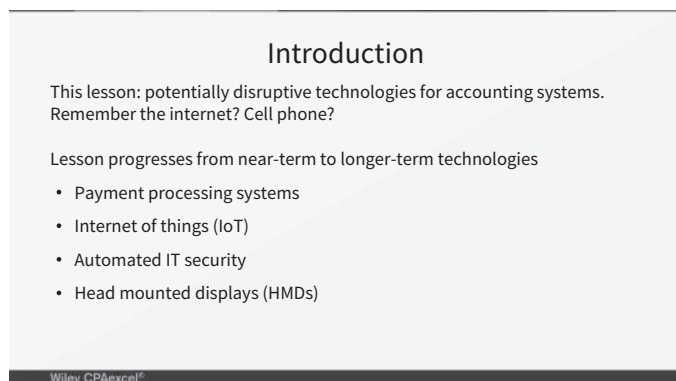
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Emerging Technology

Emerging Technologies in AIS







Emerging Payment Processing Systems

Historically payment services provided by financial institutions—expensive to sellers

- New vendors, and innovations in payment systems, i.e., systems for processing customers' payments for goods and services, increasingly important drivers of business success

Characteristics: easy to use, cheaper, seller friendly

Benefits: reduce costs, increase online sales

Example vendors / payment systems: Apple Pay, Samsung Pay, Walmart Pay, PayPal, Venmo, Amazon "One-Click" payments

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Emerging Payment Processing Systems

Goal: simplify payments for customers, reduce processing fees

- State of the market: many payment options, no clear market winner yet
- Strategies for simplifying payments
 - Reduce customer keystrokes and data entry
 - Payment data storage is a customer choice
 - "Make payment systems for dummies"
 - Market the payment systems—which methods do we accept?
 - Monitor check-out abandonment rates and reasons
 - Train employees in new systems and methods

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Internet of Things (IoT)

Wide-spread connection of electronic devices to Internet

- Gartner estimates by 2020 > 26 billion devices connected to internet
- Physical processes, e.g., consumer applications, manufacturing, mining, energy production, logistics and distribution
 - Receive real-time data from any electronic device

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Internet of Things (IoT)

Example applications

- Medicine and agriculture—real-time data feeds that monitor the status and condition of any living organism – e.g., Fitbit
- Insurance—sensory data on road conditions, weather, traffic, driver behavior, etc.
- Banking—monitor use and status of ATMs, physical security of offices and buildings
- Marketing—respond in real-time to customers' interests and physical proximity

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Internet of Things (IoT)

Business Goals

- Transform business processes and models
- Enable new products (e.g., Fitbit)
- New, advanced analytics—track emerging trends and interests
- New insight into production processes and customers

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Internet of Things (IoT)

Accounting Implications

- Automated information collection and data streaming for audits (internal and external) and tax engagements
- Real-time managerial accounting monitoring data
- New skill sets for CPAs—managing the IoT and the resulting “big data”
- Biggest change: Continuous auditing and monitoring of activities

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Internet of Things (IoT)

Risks

- Privacy, intrusive devices—previously unimagined data available about individuals and their behavior, e.g., medical and financial data
- Complexities of data ownership, availability, distribution, storage
- The creation and management of “big data”
- Legal and regulatory implications (e.g., HIPPA)

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Automated IT Security: Authentication

Everyone hates current user access security (i.e., authentication)

- Hundreds of passwords, don't write them down

Increasingly obsolete with recognition technologies that are accurate, cheap and readily available

The goal for user authentication: fully integrated, multi-factor security, automated systems

- Only “escalated” authentication is manual

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Automated IT Security: Authentication How?

IoT will increase use of automated security systems.

Authentication in these systems will use multiple identifiers

Identifiers may include:

- Biometrics, e.g., finger prints, iris scans, body scans, facial recognition, heart rhythm and rate
- Advanced analytics that identify system use patterns, e.g., typical login times, pressure and force on keyboard and mouse
- Objects, e.g., cell phones, key cards
- Knowledge (challenge questions)
- Contextual patterns of use that combine the above identifiers using artificial intelligence.

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Automated IT Security: Authentication

E.g., use data from Fitbit (e.g., heart rate) and keystroke pressure to authenticate

Prognosis and Risks:

- Risks are the inevitable failures and shake outs as vendors and users experiment with new authentication systems.
- Expected increasing waves of IT security automation that, in 10 to 20 years, result in near complete automation of integrated, multi-factor authentication systems.

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HMDs (Head Mounted Displays)

Twenty years ago—smart phones were toys for wealthy people

Some experts say, within 20 years, HMDs will similarly dominate the market for immersive communication technologies

Aircraft pilots have been wearing HMDs for many years

E.g., google glasses

Display devices worn on head (like glasses) or as part of helmet

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HMDs (Head Mounted Displays)

Include one or two small optical displays

Fully or partially “immersive”

- Provide augmented (partially) or virtual (fully) reality experiences that immerse the user in a digitized experience

Pokeman Go is “pre-augmented” technology, uses cell phone to (poorly) emulate augmented reality displays

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HMDs (Head Mounted Displays)

Risks:

- Digital distraction and information overload
- Really, really annoying to geezers/pre-mature deaths due to technology outrage?

The Future:

- Convenient and accessible real-time monitoring
- Less intrusive than “head-down” devices like smart phones.

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HMDs (Head Mounted Displays)

Implications for accounting

- Ubiquitous computing
- Real-time data streaming and alerts
- Continuous auditing and monitoring of human and nonhuman activity

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HMDs (Head Mounted Displays)

The Internet of Things → an important driver of HMD adoption and use.

Combining IoT with HMDs = greater flexibility of head movements, lower weight, and easier accessibility to critical visual information and real-time data streaming

- Example applications: monitoring productive processes, financial results, continuous monitoring of critical accounting applications including IT availability and real-time event streaming (e.g., hacks into an accounting system), document retrieval, virtual presence video calling

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Summary

Sources used in preparing this lesson: Gartner reports on
 Maverick* Research: Goodbye smart phones, hello HMDs
 Predicts 2016: Unexpected Implications Arising from the Internet of Things
 Predicts 2016: Identity and Access Management
 Payments Present New Strategic Implications
 Build an Effective Business Case for IAM
 Maverick* Research: The Death of Authentication
 Maverick* Research: Is It Time to Fire Your Security Team & Hire the Machines?

Retrieved from Gartner database

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

What is a Head Mounted Display (HMD)

- HMDs are display devices that are worn on the head (like glasses) or as a part of a helmet. They include one or two small optical displays.

Give examples of emerging payment processing system

- It is the processing system for Credit cards, Apple Pay, Samsung Pay, Walmart Pay, PayPal, Venmo, Amazon "One-Click" payments

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Lesson Quiz: Understanding

What are some of the advantages of the emerging payment system?

- A new system reduces costs and increase online sales, it is cheaper and seller and user friendly.

Define the internet of things (IoT)

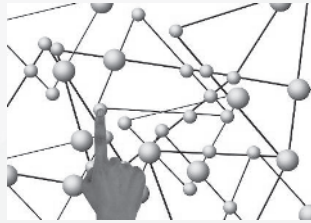
- Wide-spread connection of electronic devices to the Internet

What is an immersive display?

- Display in which user is immersed in an alternate reality
- provides additional information relative to a pure visual display (e.g., game, surgery, or industrial production applications)

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Lesson Quiz: Application



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Lesson Quiz: Application

Aragon Elessar is a partner in Aragon, Merry, Pippin, and the Ring, CPAs. Mr. Elessar asks you to provide him with an introduction as to how the Internet of Things may change business and accounting firms?

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Lesson Quiz: Application

- New skill sets for CPAs—managing the IoT and the resulting “big data”
- Widespread availability of sensors (e.g., trucks, animals, people, production processes, medical processes)
- Opportunities to consult with clients on business opportunities
- Automated information collection and data streaming for audits (internal and external) and tax engagements
- Real-time managerial accounting monitoring data
- Biggest change: Continuous auditing and monitoring of activities and processes
- Biggest challenges: managing big data and resulting privacy, confidentiality, and data quality issues

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What is Gamification?

- Apply video gaming principles, or badges and points, to engage users in learning
- Making learning fun again! Psychological principles based in graphics, design, images, motivation, and narrative (stories) to simulate actual scenarios
- Evidence: users learn and retain more from gamification than traditional learning (e.g., lectures)

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Gamification Examples

- CPA firms → gamification to reward employees for engaging in health and wellness activities.
- One large CPA firm (RSM) → gamification to simulate opportunities for employees to build client relationships and build firm’s brand
- A large bank → IT security and data privacy training provided by *True Office* to train employees in data privacy and compliance.

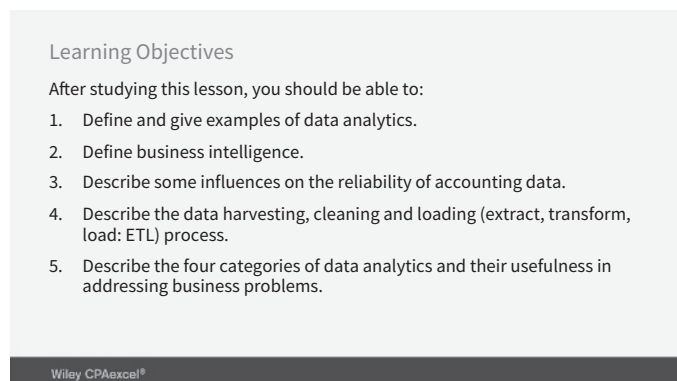
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Data

Data Analytics







What is Data Analytics?

“The science and art of discovering and analyzing patterns, identifying anomalies, and extracting other useful information in data...” for application to a business issue or problem (AICPA, 2018).



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What is Data Analytics?

Apply advanced technologies and models to accounting and auditing problems

- Emerging statistical and mathematical tools and models including visualization, regression, cluster analysis, network analysis, and machine learning techniques.
- Extend traditional analytical procedures to new (often large) data sets

Examples: Audit data analytics (ADA), risk analysis & fraud detection, KPIs (key performance indicators)

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What is Business Intelligence (BI)?

“Applications, infrastructure and tools, and best practices,

- that enable access to and analysis of information to improve and optimize decisions and performance.” (Gartner)

Tools – business intelligence software

- Microsoft Power BI & Tableau enable users to structure data for the creation of dashboards, worksheets and stories.

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Data Analytics Skills

An “analytics” mind-set, i.e., think critically and exercise informed professional judgments

Ask good questions, transform data, analyze, communicate with stakeholders

Data cleaning, structuring, and information display

Data visualization and data analytics software

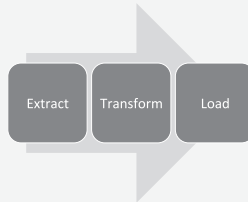
Use legacy (i.e., mature and declining use) tools such as Excel and Access to transition data for analysis using BI tools

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Data Analytics Processes—The ETL Process

Preparing data for analysis. Includes:

- Extract – get data from source. May be simple or complicated
- Transform – apply rules, functions (e.g., sort) and cleansing operations to data set.
- Load – move data to target system. May be simple or complicated



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Data Analytics Processes—The ETL Process

Ideally, ETL is automated

- Often increases accuracy and speed.
- For some big data, automation is only feasible solution.

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Data Reliability

Data analytics must be based on reliable (i.e., accurate, true and fair) data.

Influences on data reliability:

- Nature of data, e.g., numbers vs. words
- Source of the data, e.g., client's general ledger vs. data on insider stock trading
- Process, e.g., data from an audited accounting system vs. unreliable accounting system



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Integrating Data Analytics with Business Strategy

Organizations differ in extent:

- (1) of use of data analytics, and
- (2) the extent to which their data analytics use is driven by and consistent with their business strategies.

Data analytics is primarily a strategy, not a technology issue.



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Integrating Data Analytics with Business Strategy—Examples

Pre-analytics adoption organization

- Little use of analytics
- No existing or planned linkages between data analytics use and business strategy.

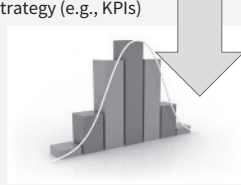


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Integrating Data Analytics with Business Strategy—Examples

Analytics driven organization,

- Well-established analytics strategy
- Overall business strategy drives analytics strategy (e.g., KPIs)



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Four Categories of Data Analytics

What is happening?

Why is it happening?

What is likely to happen?

How should we (re)act?



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What is happening? Descriptive Analytics

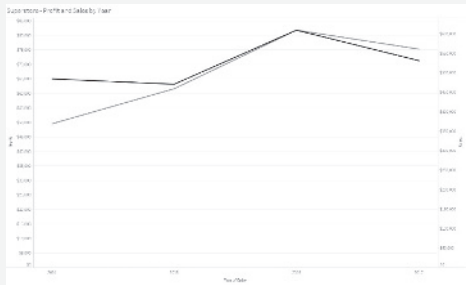
Examine past data

- Line chart to show daily stock price changes
- Scatterplot to show relationship between sales and profit

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What is happening? Descriptive Analytics

E.g., line chart to track changes in the relationship between sales and profitability over time



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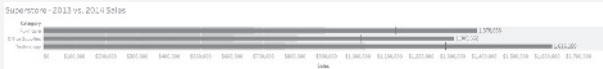
Why did it happen? Diagnostic Analytics

For example, variance analysis in managerial accounting attempts to determine why a difference between a budgeted and actual amount occurred (Lindell 2018, 1-9)

- Why are sales down in Peoria?
- Detailed analysis of production processes at a plant to determine why assembly costs have increased

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Why did it happen? Diagnostic Analytics



Is changing product mix related to higher sales in 2014 versus 2013?

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What is likely to happen? Predictive Analytics

Also called data mining

Relies on advanced statistical methods such as regression, cluster analysis, and pattern matching.

- For example, a nonprofit organization might use predictive analytics to understand which, of several possible mailings, donors are most likely to respond to, to maximize donor contributions
- What is the likely change in the cost of raw materials over the next 2 years?

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What is likely to happen? Predictive Analytics

Forecasting sales trends



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How should we act? Prescriptive Analytics

Apply advanced statistical methods to determine responses to business problems.

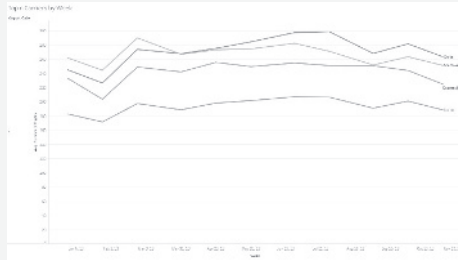
Methods include machine learning and neural network analyses.

E.g., airlines set seat prices using complex prescriptive models that consider hundreds of variables including route competition, amenities, customer rating, taxes, fuel consumption, seat assignment, and baggage load

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How should we act? Prescriptive Analytics

E.g., airline demand and supply analysis – top n carriers over time



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Data Analytic Applications in Accounting

Consider two applications of data analytics in accounting:

- Audit data analytics (ADA) "discovering and analyzing patterns, identifying anomalies, and extracting useful information in data ... for the purpose of planning or performing the audit." (AICPA 2018, p. iii).
- KPIs (key performance indicators) are critical measures to an organization's strategy (introduced in the CPAexcel ERM Communication and Reporting BEC lesson)



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Data Analytic Applications in Accounting—Audit Data Analytics (ADA)

Benefits of ADA:

- Improved understanding of an entity's operations and associated risks, including fraud risk
- Increased potential for detecting material misstatements
- Improved communications with audit stakeholders

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Data Analytic Applications in Accounting—Audit Data Analytics (ADA) (source: AICPA, 2018)

Example – auditing the 2015 financial statements of a small printer manufacturer to assess sales (revenue) for unexpected variations.

- Goals:
 - Determine the nature, timing, and extent of audit procedures related to sales
 - Determine if valuation issues exist in the printer inventory
- Expectation: Labor strike at the Michigan plant. Expect sales to decline in early 2015.

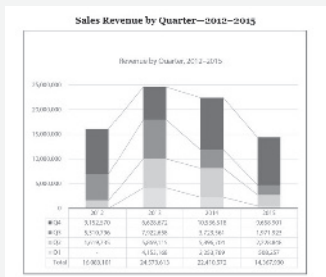
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Data Analytic Applications in Accounting—Audit Data Analytics (ADA)

Analysis - Auditor plots: (1) quarterly sales for the past four years (Exhibit 5), and (2) sales by year for each type of printer (Exhibit 6).

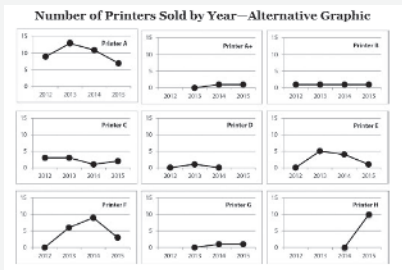
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Data Analytic Applications in Accounting—Audit Data Analytics (ADA)



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Data Analytic Applications in Accounting—Audit Data Analytics (ADA)



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Data Analytic Applications in Accounting—Audit Data Analytics (ADA)

A decline in sales in early 2015, as expected (see Exhibit 5), and strong seasonality in sales (as expected)

No large changes in sales for line of printers (Exhibit 6)

Conclusion: no significant areas of audit risk is evidenced in these analyses

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Data Analytic Applications in Accounting—KPIs

KPIs (key performance indicators) - critical measures from an organization's strategy (see ERM Communication and Reporting BEC lesson)

Example - a large international grocery chain's KPIs include

Investment in digital technologies, which they track as expected versus actual

Growth in digital sales, with a target rate of 3% per year

Growth in market share, target = 1% per year

Customer experience metrics

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Data Analytic Applications in Accounting—KPIs

Source: Harvested from social media and customer surveys and analyzed for “sentiment,” i.e., for the number of positive versus negative words in the harvested text

Customer contact metrics, i.e., “eyeballs” viewing online and print ads and promotions for the chain

Associate (i.e., employee) turnover and satisfaction

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Data Analytic Applications in Accounting—KPIs

Track metrics on dashboards

- Dashboards = interactive, real-time, online reports that aggregate and display KPIs for executives
 - Developed using Business Intelligence software (e.g., Power BI, Tableau)

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Sources for this Lesson

AICPA, 2018. *Guide to Audit Data Analytics*. John Wiley & Sons, 08/2018.

Gartner, 2018. IT Glossary, <https://www.gartner.com/it-glossary/?s=business+intelligence>, accessed: November 5, 2018.

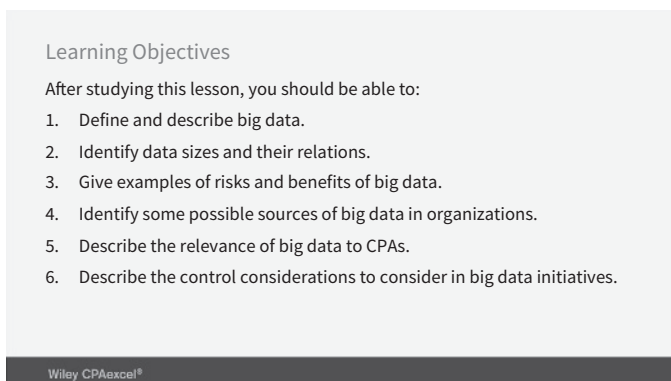
Lindell, Jim. *Analytics and Big Data for Accountants*. John Wiley & Sons, 03/2018.

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Big Data







Emerging Technologies in AIS: Big Data

COSO's principle #11 (out of 17) is, "The organization selects and develops general control activities over technology to support the achievement of objectives."

This lesson discusses big data—what it is, its value and risks, and its implications for accounting and accountants.

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What is it?

"Big data" = creation, analysis, storage and dissemination of extremely large data sets.

Feasible due to advances in networked computer storage (e.g., the cloud), advanced analytics, and massive computing power.

Gartner definition, "'high volume, velocity, and/or variety information assets that demand new, innovative forms of processing for enhanced decision making, business insights or process optimization."

Data Sources: Ubiquitous computing (i.e., smart phones and wearables, e.g., the Fitbit), the Internet of Things, biometrics (i.e., automated human recognition).

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Governance

Need a clear governance structure for big data projects:

- Responsibilities, scope and limits of project
- Require a clear purpose, scope and plan
- Consider qualitative characteristics of information in formulating big data plans (see COBIT lesson)

Emerging possibilities for monitoring of accounting and internal control systems (continuous monitoring)

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Implications

Big data source—"dark data"

- Data from business activities that may be reused in analytics, business relationships, or directly monetized (sold).
- "Meta-data" helps to identify potential value of big data.
- Operational and social media data that we collect.

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Implications

Will result in expanding existing data warehouses

Big data analytics and "smart data"

- Emerging focus of big data—data mining (discovering data trends), expanded OLAP (online analytical processing)
- Another name for big data is "smart data", which generally refers to both big data and applications of advanced analytic methods to it
- E.g., big data-based audits

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Big Data Sizes

Data Measurement	Symbol	Size	Examples (as of 2018)
Bit		1 or 0	"0"
Byte		8 bits	A letter on a computer keyboard, e.g., "a"
Kilobyte	KB	1,024 Bytes	About ¼ page of a plain text file (no images)
Megabyte	MB	1,024 Kilobytes	~ 1 text message with an attachment 1 low-resolution photograph
Gigabyte	GB	1,024 Megabytes	~ 44 hours of web browsing, 1 streamed movie in HD
Terabyte	TB	1,024 Gigabytes	~ 256,000 songs streamed on Spotify
Petabyte	PB	1,024 Terabytes	Data from a stack of CD-ROMs ~ 1 mile tall ½ of all US research library collections
Exabyte	EB	1,024 Petabytes	> 400 times the Library of Congress collection (as of 2011)
Zettabyte	ZB	1,024 Exabytes	The number of grains of sand on the earth's beaches
Yottabyte	YB	1,024 zettabytes	The number of atoms in 7,000 human bodies

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Bit & Byte

[illegible]

Kilobyte

Name	Description	Type	Size
52 of 100	2/12/2019 1:10 PM	Text Document	1 KB

1,024 bytes

"I should study for the CPA exam, because if I do my career prospects will improve, I will get a raise, and I'll do more interesting work."

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Kilobytes



Wiley CPAexcel®

Megabyte

1,024 kilobytes



Wiley CPAexcel®

Gigabyte

1,024 megabytes



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Terabyte

1,024 gigabytes

Library of Congress collection ~ 235 terabytes (as of 2011)



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Petabyte

1,024 terabytes



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Exabyte

1,024 petabytes

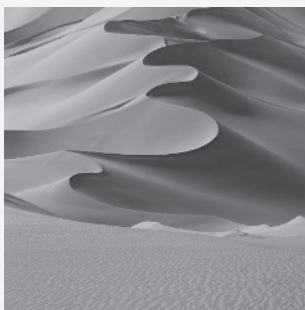
> 400 times the
Library of
Congress
collection (as of
2011)



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Zettabyte

1,024 exabytes



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Yottabyte

1,024 zettabytes



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Value and Risks of Big Data

Value—Uses marketing and sales, monitoring and performance evaluation, operational and financial performance, risk and compliance management, product and service innovation, improving customer experiences and loyalty, data monetization (data sales).

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Value and Risks of Big Data

Example projects (source: InformationWeek)

- Xerox used big data to reduce attrition at call centers by ~ 20% (source: Information Week).
- The Weather Company and IBM partnered to better manage weather forecasts to improve business performance. The project integrates data from over 100,000 sensors and aircraft, and millions of smart phones, buildings, and moving vehicles.
- Kroger integrates customer data to enable it to improve its product offerings and target offerings to specific sets of customers. As a result, Kroger's is the #1 rated loyalty card program in the industry.
- Accounting firms funding continuous auditing research (e.g., at Rutgers).

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Value and Risks of Big Data

Risks—

- Privacy
- Legal issues and prohibited uses (e.g., of medical data and HIPPA)
- Technology and structure—where and how will we store and protect it?

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Managing Big Data Initiatives

Approach and understanding—top management informed of and engaged in big data initiative” Understand scope and risks?

Data quality—Does the data collection and storage process result in accurate, reliable, complete, timely data?

Data confidentiality and privacy—Does the organization comply with external laws and regulations, and its own internal standards for data confidentiality and privacy?

Availability—Are disaster recovery and event response plans in place and reliable?

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Relevance to Accounting and Accountants

Possible new roles for CPAs—data scientists of financial information

Applications of big data in auditing, tax work, and risk analysis

- Big data analysis of risk of material misstatement of an audit client
- Big data analysis of our identified risk areas
- “Continuous audit” of big data streams

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Conclusion

Big data sets are here and growing in frequency and importance

Varied uses and applications

Must consider ethical and legal risks

Must consider governance and controls over big data projects

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Sources Used in Preparing this Lesson:

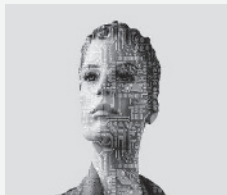
Gartner Reports—Answering Big Data's 10 Biggest Vision and Strategy Questions

ISACA—Big Data Impacts and Benefits

InformationWeek—Big Data: 6 Real-Life Business Cases

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define “big data”

Creation, analysis, storage and dissemination of extremely large data sets

From Gartner Reports: “high volume, velocity, and/or variety information assets that demand new, innovative forms of processing for enhanced decision making, business insights or process optimization”

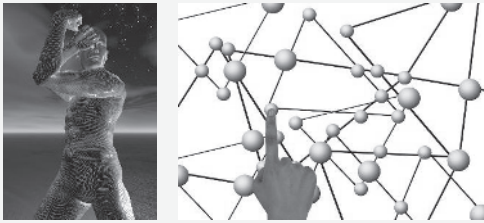
Define “dark data”

Activity, operational or social media data that is unused or underused

Very useful to have “meta-data” about dark data

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Lesson Quiz: Application



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Lesson Quiz: Application

Gary Grey is a partner in Grey, Aragon, and Mithrandir, CPAs. Mr. Grey asks you to provide him with an introduction as to how big data may be useful to accounting firms.

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Learning Objectives: Summary



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Learning Objectives

After studying this lesson, you should be able to:

1. Define and describe big data.
2. Give examples of risks and benefits of big data.
3. Identify some possible sources of big data in organizations.
4. Describe the relevance of big data to CPAs.
5. Describe the control considerations to consider in big data initiatives.

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Data Visualization

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Data Visualization

Learning Objectives



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Learning Objectives

After studying this lesson, you should be able to:

1. Define and give examples of data visualization applications in accounting
2. Identify, describe, and give examples of visualization best practices
3. Identify, describe, and give examples of the options for visually displaying numbers
4. Choose visualization options that are useful and appropriate to accounting problems and applications

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What is Data Visualization?

- Visualization is the art and science of designing information for visual perception, (e.g., in graphs, charts, icons)
- Human perception “designed” for sights vs. sounds (e.g., bats and dolphins) and smells (e.g., dogs)



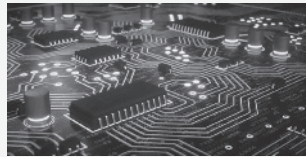
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What is Data Visualization? Sam Combe Products Case

Global producer and distributor of electronic components, software, and online products in Europe and South America

Analyze 11 quarters of data (2015 to 3rdQ 2017) for :

- unusual changes in sales or profits company wide, over time, and by region
- the relationship between sales and profits company wide, over time, and by region



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What is Data Visualization? Sam Combe Products Case

Andy (staff accountant) initial analysis

Cross-tabs (average by quarter) of overall means of sales (in millions), profit (in hundreds of thousands), and profitability ratio (profit/sales), called p ratio appear in Tables 1 & 2

r = the correlation of sales and profit

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What is Data Visualization? Sam Combe Products Case

Andy (staff accountant) initial analysis

Table 1 – Overall Average by Quarter

	Sales	Profit	P ratio
Mean	\$9	\$0.75	0.086
SD			
r	0.82		

Table 2 – Average by Region & Quarter

region	Europe	Europe	Europe
measure	Sales	Profit	P ratio
Mean	\$9	\$0.75	0.087
SD	3.16	0.194	0.015
r	0.82		

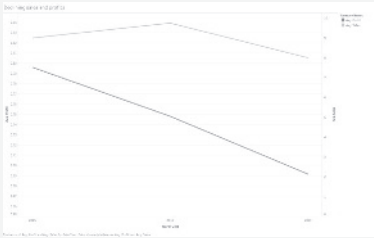
region	S America	S America	S America
mean	\$9	\$0.75	0.086
SD	3.16	0.194	0.015
r	0.82		

Sales & Profits in millions

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What is Data Visualization? Sam Combe Products Case

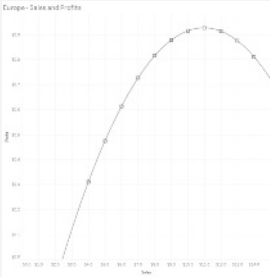
Additional Analysis: Sales and Profits by Year Indicates Declining Sales & Profits



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What is Data Visualization? Sam Combe Products Case

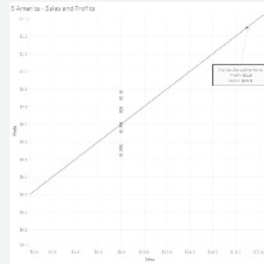
Additional Analysis: Sales and Profits in Europe are polynomial
Profits decline with sales > \$11M – what is going on?



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What is Data Visualization? Sam Combe Products Case

Sales and Profits in South America – constant sales except for 1 quarter when sales are > 2 times other quarters!



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What is Data Visualization? Sam Combe Products Case

- Conclusion: Andy's conclusions could not be more erroneous
- Weird relationships between sales and profits
- Descriptive statistics provided little help
- Visualization showed "the picture"



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Principles of Data Visualization—Color

- Essential element of visualization
 - The color wheel (see Exhibit 1) for combining colors
 - E.g., opposites, a triad, opposite quadrants
 - Color psychology. Darker colors convey seriousness, lighter colors convey lightness and friendliness
 - Choosing a contrasting color can highlight something (e.g., a single data value)



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Principles of Data Visualization—Color

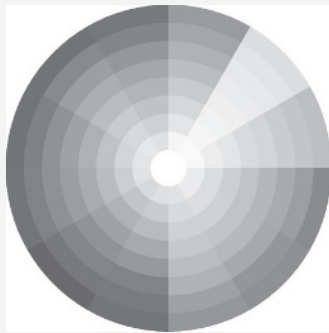
- Alternatively, choosing shades (i.e., gradients) of a color (e.g., colors from within the blue segment of the wheel) highlight differences without a strong contrast
- Generally → four or fewer colors in visualizations
- Too many colors = chaos and confusion



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Principles of Data Visualization

Exhibit 4 – The Color Wheel



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Principles of Data Visualization—Contrast

Creating contrasts

- Use colors to create contrasts and highlights
- Other contrasts use size (i.e., larger) and highlighting (e.g., bold)



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Principles of Data Visualization—Arrangement, Organization, and Repetition

- Choice and placement of objects and elements
- E.g., “negative space” $1 + 1 = 3$
 - When adding two elements to a design, you create “negative space,” or arrangement of the objects within the space

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What is negative space here?



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Principles of Data Visualization—Iconography and Typography

- Iconography = choice of icons in a design (e.g., the Apple corporation logo of an apple)
- Typography = choice of fonts within a visualization. Generally, use two or fewer fonts

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Icons



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Typography



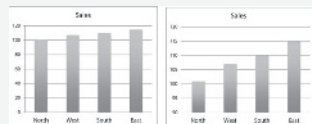
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Viz Principles—Which Graph?

Bar charts compare data across categories

- Exhibit 2, two bar charts of sales by region. In first, vertical axis begins at zero. In second, vertical axis begins at 90. Bar charts should always include a zero axis to avoid visual distortion (i.e., deception).

Exhibit 5 – Bar Charts – With 0 and Nonzero Axes



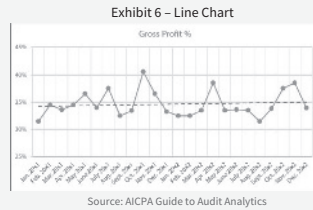
Source: AICPA Guide to Audit Analytics

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Viz Principles—Which Graph?

Line charts show changes in a variable, usually over time.

- E.g., changes in gross profit % by month.
- Mean value line added (show as a broken line)

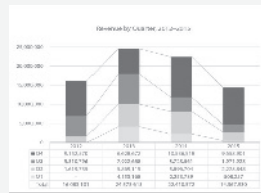


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Viz Principles—Which Graph?

- Stacked bar chart
 - Parts of a whole and changes over time
 - E.g., revenue by year (across the y or horizontal axis), and by quarter (using color and table at bottom)
 - Chart also uses (green) shades to highlight quarters

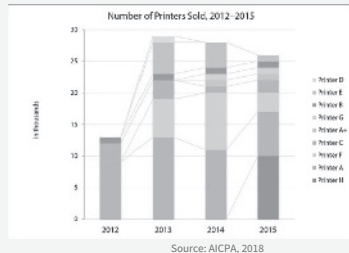
Figure 6 – Stacked Bar Chart of Revenue by Year and Quarter



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Viz Principles—Which Graph?

Exhibit 8 – A Stacked Bar Chart that Uses Colors Poorly



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Viz Principles—Which Graph?

Pie charts, used alone, generally a poor choice for visualization

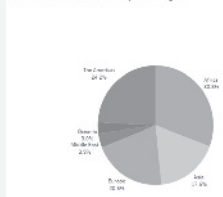
- Humans inaccurately maps “pie slice sizes”
- E.g., pie chart showing the % of total hours, across six regions, of the average time required to complete an individual tax return

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Viz Principles—Which Graph?

Exhibit 6 – Pie Chart of Time Required to Complete Tax Returns Across Six Regions

% of hours to do tax returns - by region



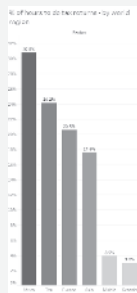
Data source: The World Bank, <http://www.worldbank.org/>

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Viz Principles—Which Graph?

Bar chart of same information

Exhibit 7 – Bar Chart of Time Required to Complete Tax Returns Across Six Regions



Data source: The World Bank, <http://www.worldbank.org/>

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Viz Principles—Which Graph?

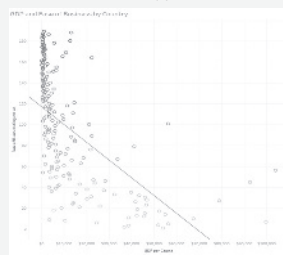
Scatterplots show relationship between (at least) two variables

- E.g., Exhibit 11 country's gross domestic product (GDP) against how easy it is to start a business in the country
 - Trend line (using regression) shows relationship
 - Color highlights (in red) the countries where it is harder to start a business

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Viz Principles—Which Graph?

Exhibit 11



Data source: The World Bank, <http://www.worldbank.org/>

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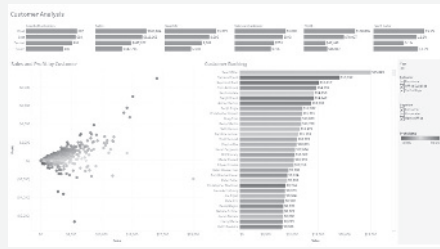
Dashboards

- Collection of data views that allow user to understand, and often monitor, a process
- Typical examples monitor sales and revenue, control violations, accounts receivable balances, cash, human resource productivity and absenteeism, and loan and interest rates
- E.g., dashboard in Exhibit 12 for analyzing the number of customers by region and customer contribution to profitability

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Dashboards

Exhibit 12 – Customer Analysis Dashboard



Source: Tableau Desktop software dashboard

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Dashboards

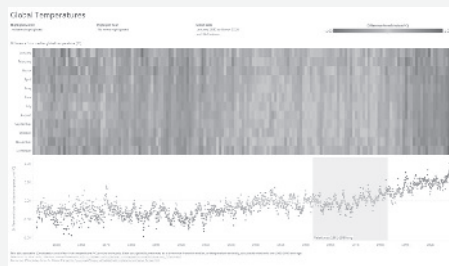
Exhibit 13 shows change in global temperatures beginning in 1858.

- Useful to company influenced by temperature change (e.g., agriculture, insurance, banking)
- Also illustrates a “heat map”
 - Often used in risk analysis and auditing
 - Usually greater risk shown in red

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Dashboards

Exhibit 13 – Change in Global Temperature (since 1858)



Source: Tableau Desktop software dashboard

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Summary & Conclusion

- Humans are primarily visual perceivers
- Well-designed data visualizations make complex patterns easy to see
- Core principles of data visualization should guide design
- Data visualization software is great (far better than vizzing in Excel)
- Dashboard enable decision makers to quickly understand and act upon complex data



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Sources for this lesson

- AICPA, *Guide to Audit Data Analytics*. John Wiley & Sons, 08/2018.
- Anscombe, F. J. (1973). "Graphs in Statistical Analysis," *American Statistician*. 27 (1): 17–21. doi:10.1080/00031305.1973.10478966. JSTOR 2682899. (Data source for Sam Combe case.)
- Tableau Desktop software, v2018.3.2, Professional Edition, January 13, 2019.

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Statistics in Business Analytics

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Statistics in Business Analytics

Learning Objectives:

1. Define, and explain the value and limitations, of the mean, median, mode, quantiles and standard deviations for conducting business analytics.

2. Describe the purpose and limitations of histograms and box plots in business analytics.

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BEC CPA Exam Tip

You will not need to analyze data; you may need to interpret the meaning of data analyses in an accounting or business problem.

• For example, you can expect to interpret the meaning of a graph or statistical measures in the context of a business problem.

• Examples: valuation, identifying outlier (unusual) observations, interpret results of an analysis of internal control

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Mini-Case: Frequency Distributions and Descriptive Statistics

- Consulting engagement for a local jewelry (also online) store - Rue's Jewelry: Inventory Valuation and Assessment
- Retiring owner
- After partial liquidation ~ 500 items in inventory



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Frequency Distributions and Descriptive Statistics

How to characterize the inventory? Graphs (best) and measures of central tendency (2nd best)

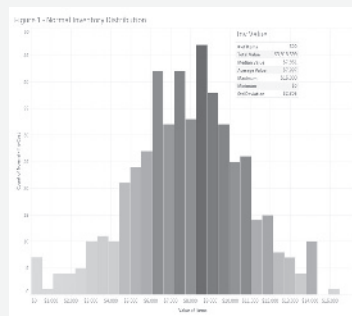
Most useful starting point for understanding a distribution is a **histogram**.

- A graph of the frequency of values in a distribution, grouped into bins
- See Figure 1 - frequency distribution and descriptive statistics

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Frequency Distributions and Descriptive Statistics

Histogram



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Frequency Distributions and Descriptive Statistics

Mean – average of values (arithmetic average)

- Example accounting uses: average variable cost, average receivables (# of days required to collect receivables).
- Most useful when the distribution is normal.
 - Strongly influenced by extreme observations
- In this example, distribution ~ “normal.”
 - Symmetrical, bell-shaped, mean, median, and mode are close to one another.

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Frequency Distributions and Descriptive Statistics

Median – middle value

- Center of a road is “the median” – it divides the road in half.
- For odd set of numbers = the middle value.
- For even set of numbers = average of the two middle numbers.
- Useful measure when distribution is skewed (i.e., non-normal).



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Frequency Distributions and Descriptive Statistics

Mode – most frequent value

- May be no mode (no repeated values) or multiple modes - multiple numbers may tie for the most frequent.
- Often useful, and intuitive, when shown in a histogram. For example, in Figure 1 the modal value is shown in darkest color.

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Frequency Distributions and Descriptive Statistics

Quantiles – dividing a distribution into sections

- E.g., **quartiles** = quarters, **quintiles** = fifths, **deciles** = tenths.
- Useful in characterizing the shape of a distribution.
- Figure 2 adds quartiles for the distribution
 - 75th percentile divides top ¼ from bottom ¾s
 - 25th percentile divides bottom ¼ from top ¾s

Figure 2 - Inventory Value - Including Quartiles

# of Items	500
Median Value	\$7,951
Average Value	\$7,837
Percentile (75) of Normal ..	\$9,616
Percentile (25) of Normal ..	\$6,100
Maximum	\$15,000
Minimum	\$0
Std Deviation	\$2,806
Total Value	\$3,918,599

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Frequency Distributions and Descriptive Statistics

Standard deviation – a standardized measure of dispersion (variation) in a variable.

- See BEC lesson *Short-Term Securities Management*; full lesson path: BEC > Financial Management > Working Capital Management > Short-Term Securities Management.
- In securities, a measure of risk. “The standard deviation of an investment’s expected return is a measure of its risk.”
- Higher = more dispersion and risk, lower = lower dispersion and risk

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Frequency Distributions and Descriptive Statistics

Standard deviation

- For normally distributed data, ~ ⅔ of observations are within 1 standard deviation of the mean, ~ 95% are within 2 standard deviations of the mean.
- For this distribution (given that it is ~ normal) standard deviation tells use that about ⅔s of the inventory values are + or - \$2,806 from \$7,837.

Figure 2 - Inventory Value - Including Quartiles

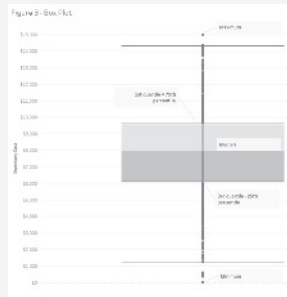
# of Items	500
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Percentile (25) of Normal ..	\$6,100
Maximum	\$15,000
Minimum	\$0
Std Deviation	\$2,806
Total Value	\$3,918,599

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Box Plot

Another way of seeing and graphing single variables

- Show the median, 1st and 3rd quartile, interquartile range (distance from 1st to 3rd quartile), and maximum and minimum values (see Figure 3).



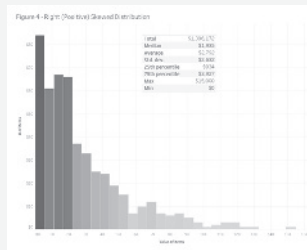
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Comparing Distributions

Right Skewed (Positive Skew) Distribution

Imagine distribution is shown in Figure 4.

How does the inventory value differ from Figure 1?



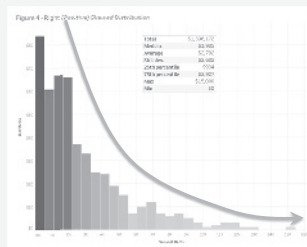
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Comparing Distributions

Right Skewed (Positive Skew) Distribution

How does the inventory value differ?

- A non-normal, right-skewed distribution.
- Called a *positive skew* because you can imagine an arrow pointing from the fat (left) to the thin (right) part of the distribution – that is an increasing (positive) arrow.



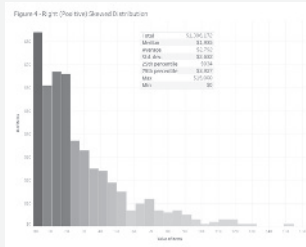
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Comparing Distributions

Right Skewed (Positive Skew) Distribution

How does the inventory value differ?

- This is a “costume” (cheap) jewelry inventory. Lots of low value items.



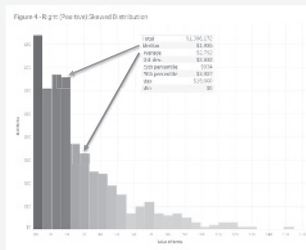
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Comparing Distributions

Right Skewed (Positive Skew) Distribution

How does the inventory value differ?

- Median is closer to central mass of the distribution (on the left) than is the average (mean), i.e., Mean > median.
- Average is more sensitive to extreme (unusual) values – here, the high value items.

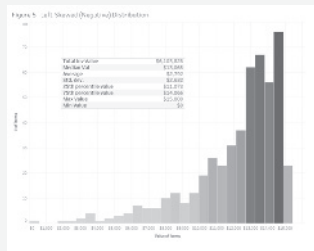


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Comparing Distributions

Left Skewed (Negative Skew) Distribution

Imagine distribution of inventory is shown in Figure 5.



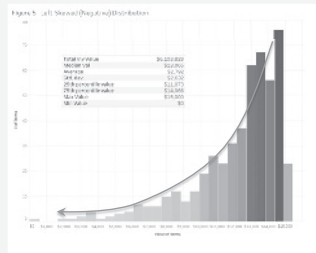
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Comparing Distributions

Left Skewed (Negative Skew) Distribution

How does the inventory value differ?

- A non-normal, left-skewed distribution.
- Line from fat (right) to thin (left) part of the distribution would point down; therefore, called *negative skewness*.



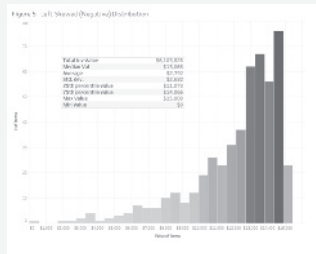
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Comparing Distributions

Left Skewed (Negative Skew) Distribution

How does the inventory value differ?

- This is a high-end, luxury jewelry inventory. Lots of high-value items.



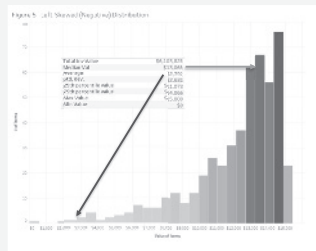
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Comparing Distributions

Left Skewed (Negative Skew) Distribution

How does the inventory value differ?

- Median is larger than average (mean) and is closer to central mass of the distribution.
- Average is more sensitive to extreme (unusual) values; here, the low-value items.



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Comparing Distributions and Inventory Values

Summary – what do the distributions tell us about inventory value?

- **Normal distribution** – The average and median are in the middle. Many average-value items.
- **Right skewed (non-normal)** – Mean (average) > median. Many cheap items. Median a better indicator of mass of distribution than average.
- **Left skewed (non-normal)** – Median > mean (average). Many expensive items. Median is a better indicator of the mass of distribution than average.

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Outliers (Unusual and Influential Observations)



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Outliers (Unusual and Influential Observations)

From the inventory example

The sample includes:

- \$0 cost items. Why would jewelry have a \$0 cost? Is this real or a system error?
- A \$15,000 cost item that is higher than all others. Is this correct?

Accounting and business importance:

- Can indicate control errors in a system.
- May indicate data import or data entry errors.



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Example: Outliers (Unusual and Influential Observations)

Manufacturing company, sample of average value of inventory purchases per invoice from four clients:

- Client 1: \$5,384 per invoice
- Client 2: \$7,591 per invoice
- Client 3: \$6,473 per invoice
- Client 4: \$1,149,000 per invoice



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Outliers (Unusual and Influential Observations)

Figure 6 shows some distribution measures for this sample.

- Does one client stand out?
Client 4 is outlier (an unusual, influential observation).
- Notice that the average is much larger than the median, and that the standard deviation is large (~ twice the average).

Figure 6 - Average Invoice Amount Per Client

Total Invoices	1,168,448
Median Invoice	7,032
Avg. Invoice	292,112
Max. Invoice	1,149,000
Min. Invoice	5,384
Std. dev. of Invoice	571,259

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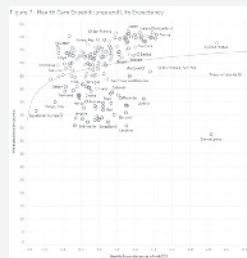
Outliers (Unusual and Influential Observations)

Another example:

Health care spending as a % of GDP and life expectancy by country and region.

U.S. an outlier (with Marshall Islands, Sierra Leone):

- Spend more health care without increases in life expectancy.



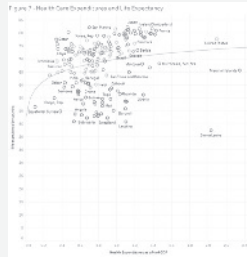
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Outliers (Unusual and Influential Observations)

Why?

U.S. may spend on health care that is:

- Unrelated to mortality (e.g., cosmetic surgery, sports injuries).
- Overpriced (i.e., same health care in U.S., but higher cost).



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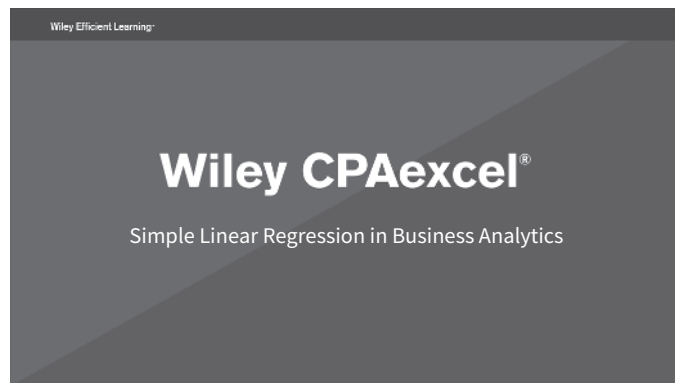
Summary and Conclusion

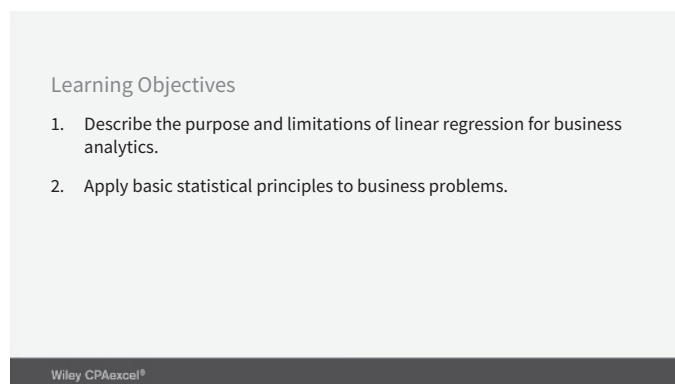
Need to know:

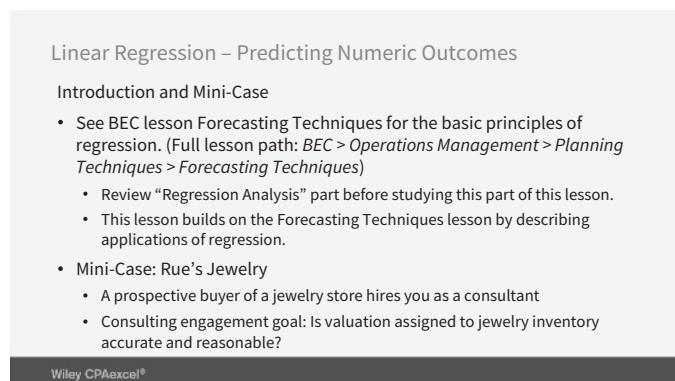
- On BEC section:
 - You won't conduct analytic analyses.
 - Hope that you get graphs but know how to use descriptive statistics.
- Histograms, box plots, and their use and meaning.
- Basic descriptive statistics and their meaning.

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Simple Linear Regression in Business Analytics







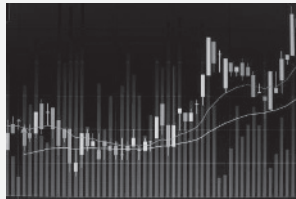
What is Regression?

- The name “regression” is not descriptive and results from a historical misnaming.
- Better name is “fitting a line through data points.”

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Types of Regression

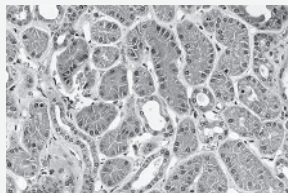
1. A **time-series** regression predicts outcomes over time, e.g., monthly, quarterly, yearly.
2. Example: Predicting monthly sales (y) based on advertising expenditures for previous month (x)



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Types of Regression

1. A **cross-sectional** regression predicts outcomes at one point in time.
2. E.g., predict monthly sales for a retail chain (y) based on the store's square footage (x)



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What is Regression?

For the CPA Exam: numbers predicting numbers: Regression uses numeric predictors to predict numeric outcomes.

Variations on regression for:

1. Categorical predictor variables (e.g., which client purchased the product?)
2. Categorical outcomes (e.g., is the account receivable late or not?)

You do not need to know these variations for the CPA Exam.

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What is Regression?

Correlation is not causality: Regression can establish a relationship between a predictor variable (x) and outcome variable (y):

- The existence of a relationship between x and y doesn't indicate that x causes y



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Correlation is Not Causation: Example

Regression of Internet Explorer browser market share (x) and murders in the U.S. (y) (2006 to 2011 data) indicates a strong relationship.

Obviously, it is ridiculous to claim that growth in Internet Explorer browser market share causes rise in U.S. murders.



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What is Regression?

This lesson focuses on simple, linear regression in which there is one predictor variable.

In multiple regression, there is more than one predictor variable.

- *You only need simple, linear regression for the CPA Exam.*

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Advantages and Disadvantages of Using Regression in Accounting

Advantages:

- Formal, rigorous statistical method that provides precise, quantitative predictions.

Disadvantages:

- Requires data
- Describes the strength of a relationship between two or more variables but doesn't provide insight into causal relationships.

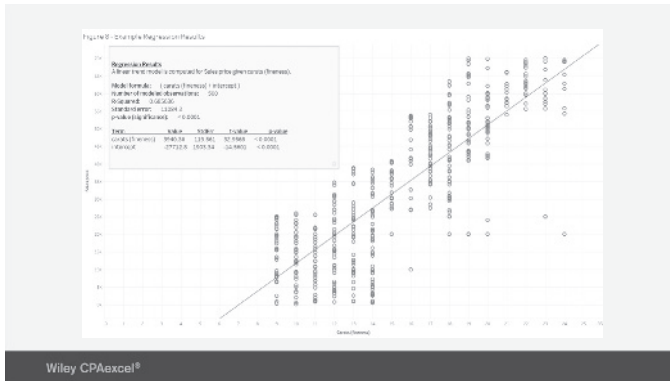
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Uses of Regression in Accounting

Example: Predict inventory value for individual inventory items

- For example, Figure 8 predicts sales price of a diamond (y) based on the number of carats (x).
- As will be presented shortly, the relationship is strong ($r^2 = 0.686$) and significant ($p < 0.001$).

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Uses of Regression in Accounting

To predict:

- Allowance for doubtful accounts balance (y) from the age of accounts receivable (x)
- Employee turnover (y) using benchmark data on employee salaries (x)
- Company stock prices (y) based on announced forecasted earnings (x)
- Sales (y) based on advertising (x)

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Uses of Regression in Accounting

- For a real estate management company, predict rental revenue (y) based on the number of apartment units that company manages (AICPA example).

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Regression Uses in Accounting

Examples from the BEC lesson *Forecasting Techniques*:

1. Using cost drivers, for example, machine hours or direct materials weight (the x variables) to predict overhead costs (y) in cost accounting.
2. Analyzing price elasticity by using price (x) to predict quantity demanded (y).
3. Using production level (x) to predict maintenance costs (y).
4. Using production level (x) to predict manufacturing costs (y).

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Review of Basic Regression Equation

The basic regression equation is $y = A + Bx$

- Y = dependent (or outcome) variable
- A = y-intercept, i.e., where the regression line crosses the X axis
- B = slope of the line, i.e., the amount of change in Y for every unit change in X
- x = predictor variable

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Is the Regression Model a Good Fit? r^2

The coefficient of determination, r^2 (**R-squared**), is the degree to which independent variable predicts dependent variable.

- Calculated by squaring the correlation coefficient
- $0 \leq r^2 \leq 1$



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Is the Regression Model a Good Fit? r^2

1. As r^2 approaches 1, x perfectly predicts y.
2. As r^2 approaches 0, there is no relationship between x and y.
3. Although it depends on context, $r^2 > 0.1$ is significant, $r^2 > 0.5$ is large.

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Is the Regression Model a Good Fit? **p values**

p values also indicate strength of regression relationship.

When p value is:

- Small (e.g., $< .05$), the relationship between x and y is significant.
- Large (e.g., $> .1$), the relationship between x and y is not significant.
- Medium (between .05 and .1), we are unsure of the relationship between x and y.

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Is the Regression Model a Good Fit? **t values**

Both **p** and **t values** are indicators of the ratio of explained to unexplained variance in a regression model.

Both are measures of fit:

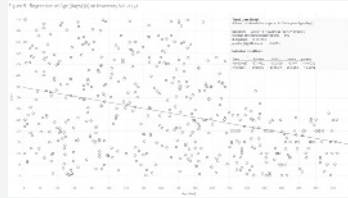
- **T value** meaning is the opposite of p values (but a similar measure).
- A **low p value** indicates good fit, a **high t value** indicates good fit.
- A **high p value** indicates bad fit, a **low t value** indicates bad fit.

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Linear Regression: Example

Predict jewelry inventory value by age in days (see Figure 9)

- This regression is significant ($p < 0.0001$) and has a small but meaningful r^2 ($= 0.12$)

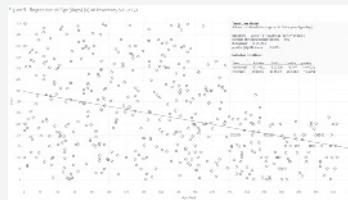


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Linear Regression: Example

Here, assess inventory value by predicting the value of each item based on its age.

Then, test for items that may be overvalued based on a comparison of actual versus predicted valuation.



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Summary and Conclusion

Need to know:

- Principles, applications, value, and limitations of simple linear regression.
- Accounting or business meaning of a simple linear regression model.

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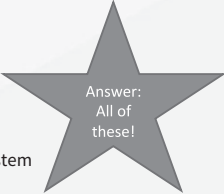
Bitcoin and Blockchain



Bitcoin Introduction

What is bitcoin?

- A. an intangible asset
- B. "electronic cash"
- C. a decentralized currency
- D. a network, payment, and accounting system



Answer:
All of
these!

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Bitcoin Technology, Benefits, and Risks

The technology of bitcoins:

- Created by "mining"
- Traded and exchanged on a peer-to-peer network
 - A peer-to-peer network is decentralized, essential to goal of independence of centralized authority
- Send or receive bitcoins with an address, like a bank account.
An example of a bitcoin address: 2MJf24pNsLuFYk9mJd1dXHkKj9h5YhoEey

Stored in a "blockchain," i.e., a type of fancy database = topic of the second part of this lesson.

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Why Use Bitcoins?

- Independent of any government or central authority (favorites of libertarians)
- May be anonymous (favorites of criminals, terrorists)
- Historically: low transaction costs

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Bitcoin Risks

New investments (and currencies) have higher fraud risk.

- Bitcoin investors and users may be targets for fraudsters and criminals (nickname “bitcons”).
- Examples
 - a Bitcoin Ponzi scheme discovered by SEC
 - In 2016, \$72M was stolen from the world’s largest bitcoin exchange (Bitfinex Exchange in Hong Kong).

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Bitcoin Risks (continued)

Risks of holding and investing in bitcoins

- No insurance
- Extreme price fluctuations
- Possibility of government regulation and restriction of bitcoins
- Fraud and security issues (see above)

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Bitcoin: Fraud, Loss, Recovery

Don't expect to recover losses from bitcoin fraud.

- Ironically, the alleged anonymity of bitcoins (which makes them attractive) makes recovery of losses difficult.

Recovery issues:

- difficulty of tracing bitcoin transactions
- international (cross-border) use
- absence of an issuing authority
- difficulty of seizing and freezing bitcoins

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Blockchain Introduction

What is blockchain?

- A decentralized, distributed ledger. An independent, secure, nonmodifiable audit trail of transactions, stored in open-ledger database
- A part of the invention of bitcoins to provide secure, decentralized accounting
- A blockchain record exists in a file that consists of "blocks," i.e., documented transaction records
- Requires adoption by many users to be useful
- The security of blockchain depends on three factors: independent confirmation; asymmetric encryption; and cheap, fast computing capacity.

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Blockchain Applications

1. **Smart Contracts** – Enables contract enforcement through mutual block monitoring
2. **Internet of Things** – A likely application of "smart contracts"
3. **Open Source Payment** – Why use financial institutions, and their fees, for payments, when a cheap, verifiable, open-ledger network is available? Why not make payments directly between parties?
4. **Financing and Crowdfunding** – Previous example also illustrates the use blockchain for financing.
5. **Corporate Governance and Financial Reporting** – Current, 24/7 availability of financial information

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Blockchain Applications (continued)

6. **Supply Chain Auditing** – Was my t-shirt made by child labor in Cambodia? Trace its blockchain record.
7. **Predictive Analytics** – Aggregate millions of users' expectations about an event. Resulting predictions can improve forecasting of weather, business outcomes, sporting events, elections, etc.
8. **Identify and Access Management** – Blockchain ledgers can document characteristics of users that enable unassailable multifactor identification (based on transaction record).
9. **Auditing and Monitoring** – Imagine the savings if auditors began with an unalterable, continuously available record of all transactions.

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Blockchain Risks and Limitations

1. **Hacks, Cracks, and Attacks**
 - Attacks and hacks discussed in the bitcoin section are examples of potential hacks on any blockchain network.
2. **Blockchain technology is complex and relies on sophisticated, advanced encryption and networking technologies.**
 - For crooks and fraudsters, complexity = opportunity.
 - Complexity means that users can commit what are, after the fact, obvious control errors that lead to large losses.

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Summary and Conclusion

Bitcoin and blockchain are critical, potentially disruptive technologies for accounting and accountants.

- A basic knowledge of these technologies is essential to professional accountants.
- Large accounting firms are investing heavily in exploring blockchain technologies.
- A basic knowledge of these technologies can impress BEC TBS and written communication graders!

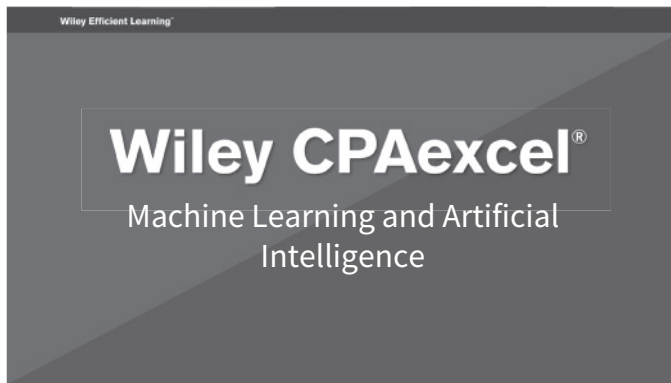
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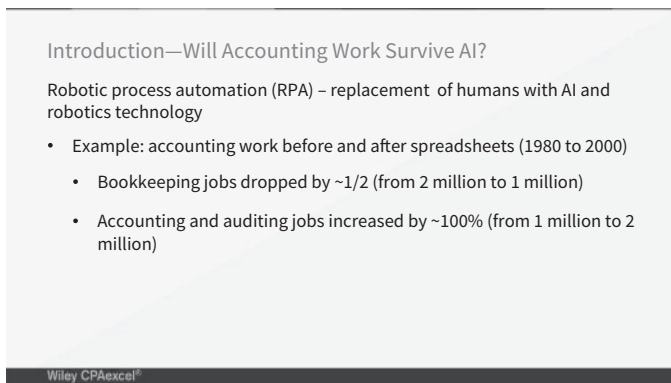
Lesson Quiz

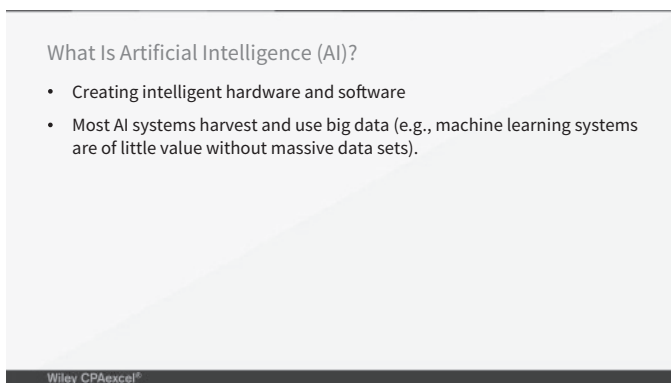
Lemony Snackit, CPA of Snackit, Chicklet, and Snarklet, asks that you to introduce him to the potential value of blockchain to business and accounting firms. Specifically: how might blockchain be useful to Snackit's accounting firm and its clients?

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Machine Learning and Artificial Intelligence







Categories of AI

Machine learning (analysis)

- Use big data to learn rules and categories to enable prediction and classification (e.g., neural networks).
- A common accounting application—classifying journal entries

Robotics (activity)

- Machine-directed observation (e.g., TSA) and activity (e.g., welding, controlling production, manufacturing, and distributing processes)

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Categories of AI (continued)

Intelligent agents (engagement)

- Computer “agents” that perform tasks (e.g., data harvesting and cleaning)
- Analysis of market trends (e.g., in purchasing airline tickets)
- Interact with humans (e.g., Siri® on the Apple® iPhone®)

Expert systems (analysis and activity)

- Build and apply expertise in a domain (e.g., configuring Dell® systems, medical diagnosis)
- May include machine learning or intelligent agent subsystems

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AI Tasks and Intelligence

- Data harvesting and cleaning. Prepping and cleaning client data (e.g. loan documents).
- Analyzing numbers (e.g., Netflix suggests what to watch next based on quantitative data about your ratings and viewing habits).
- Analyzing words, images, and sounds. Examples include analyzing vitas for hiring decisions and using Google Translate™.
- Performing digital tasks (e.g., automating security systems).

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AI Tasks and Intelligence (continued)

- Performing physical tasks (e.g., self-driving cars)
- Self-aware AI
 - That rivals and eventually exceeds human intelligence
 - Does not yet exist – 20 to 100 years?

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AI Accounting Applications—Reported Big 4 Initiatives

KPMG – implemented an AI unit and partnered with IBM Watson initiative.

- IBM Watson = Expert system and natural language processing system (featured on *Jeopardy*)
- Example—AI predictive analytics to identify and manage financial statement risks

Deloitte – Partnering with many vendors to automate specific audit tasks and processes including document review, confirmations, inventory counts, disclosures, predictive risk analytics, and client request lists

- Example—Partnering with Kira Systems to extract data from client contracts, leases, employment contracts, invoices, and other documents

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AI Accounting Applications—Reported Big 4 Initiatives

PwC – Halo System analyzes accounting journals for risky transactions and to identify inefficient processes

- Automates coding and classification of journal entries
- Includes a dashboard that displays financial analytic data + predictive analytics

EY – Focused on integrating Big Data and advanced analytics into audit practice

- 2017—Launched AI center (India), hired “Global Innovation Artificial Intelligence Leader”

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AI Benefits

Speed, accuracy, and cost

- Ability to scale and speed applications, reduced costs, new applications
- Ability to obtain, clean, and analyze large (all available?) data in real time
- Apply AI to robotics, pattern recognition and complex communication (e.g., natural languages) problems

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AI Risks—Biases

Short term: AI systems often include the biases of their developers. Biases include:

- Data biases – Harvesting and creating data sets that omit relevant variables and considerations.
- Prediction biases – Systems that include biased data will, obviously, generate biased predictions.
- Learned (“emergent” or “confirmation”) biases – Smart machines will learn and integrate the biases of those who train them. Hence, machines can be trained to “confirm” the biases of their trainers.

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AI Risks—Biases (continued)

Medium term:

- Lost jobs and disappearing employment
- Legal and ethical issues—Liability? Privacy? Security?

Long term:

- The end of humanity? Machine overlords?

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Implications for Accounting and Auditing Work

Evolution of accounting jobs to include:

- Partnering with AI to monitor and improve results
- Oversight of AI in accounting and auditing tasks. When and how tasks should be automated versus not?
- Developing new and refining existing AI applications
- Executing human-only tasks, including:
 - client relations and interpreting complex financial results and scenarios
 - tasks that are too narrow or rare to be successfully automated

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Lesson Example Question

Grindel Freshensmitt owns 385 franchise restaurants in the U.S. and Canada. He is interested in better managing his operations and business. He has asked to meet to learn about how emerging advances in artificial intelligence and machine learning can help him. Please write a memo that outlines your plan for an initial meeting with Mr. Freshensmitt.

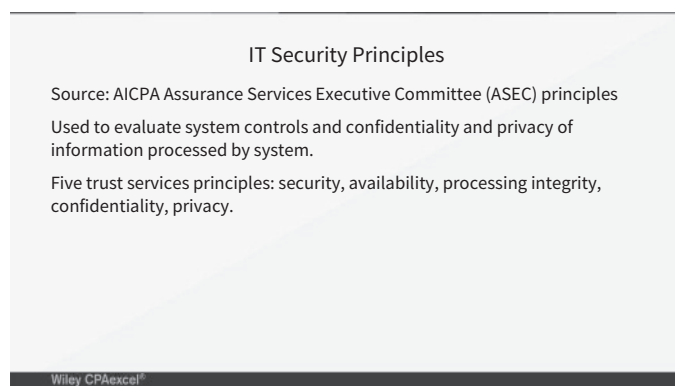
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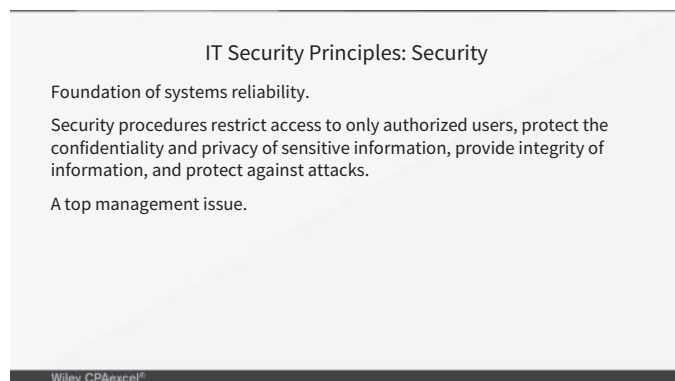
Information Security/Availability

Protection of Information

IT Security Principles







IT Security Principles: Availability

Is system operational and usable as specified in commitments and agreements?

Does internal control support (or impede) system availability?

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IT Security Principles: Processing Integrity

Concerns the completeness, validity, accuracy, timeliness, and authorization of system processing.

Does system of internal control help ensure that system processes execute as intended without error or manipulation?

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IT Security Principles: Confidentiality

Is confidential information protected consistent with the organizations' commitments and agreements?

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IT Security Principles: Privacy

Does system's collection, use, retention, disclosure, and disposal of personal information conform to its own commitments and with generally accepted privacy principles (GAPP)?

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IT Security Principles: GAPP 10 Sub-principles

1. Management. The entity defines documents, communicates, and assigns accountability for its privacy policies and procedures.
2. Notice. The entity tells people about its privacy policies and procedures and explains why personal information is collected, used, retained, and disclosed.
3. Choice and consent. Users can opt out (in US) of collection of personal information.
4. Collection. Collects personal information only for identified purposes.
5. Use and retention. Uses personal information consistent with statements about use. Retains only as long as needed or allowed by law or regulation.

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IT Security Principles: GAPP 10 Sub-principles

6. Access. People can access, review and update their information.
7. Disclosure to third parties. Third parties receive information according to policy and individual consent.
8. Security for privacy. Protect personal information against unauthorized access.
9. Quality. Personal information is accurate, complete, and relevant.
10. Monitoring and enforcement. Someone monitors the entity's compliance with privacy policies and procedures and has procedures to address privacy-related complaints and disputes.

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Categories of Criteria for Assessing Achievement of IT Security Principles

1. Organization and management. organizational structures and processes for managing and supporting people includes criteria addressing accountability, integrity, ethical values and qualifications of personnel, and the operational conditions in which they function.
2. Communications. Communication of policies, processes, procedures, commitments, and requirements.
3. Risk management and design and implementation of controls. How the entity (i) identifies potential risks, (ii) analyzes risks, (iii) develops risk responses, and (iv) conducts ongoing monitoring of risks and risk management.

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Categories of Criteria for Assessing Achievement of IT Security Principles

4. Monitoring of controls. Including the suitability, and design and operating effectiveness of the controls, and actions to address identified deficiencies.
5. Logical and physical access controls. How entity restricts access, provides and removes access, and prevents unauthorized access.
6. System operations. Management of execution of system procedures including detecting and mitigating processing deviations.
7. Change management. Identification of needed changes, management of changes, and prevention of unauthorized changes.

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Time-Based Model of Controls

Given enough time and resources, preventive control can be circumvented.

Accordingly, detection and correction must be timely.

The time-based model evaluates the effectiveness of an organization's security by measuring and comparing the relationships among the three categories of controls:

1. P = time it takes an intruder to break through the organization's preventive controls.
2. D = time it takes to detect that an attack is in progress.
3. C = time to respond to the attack.

If $P > (D + C)$, then security procedures are effective.
Otherwise, security is ineffective

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Defense-in-Depth

Implement multiple layers of controls /holistic approach

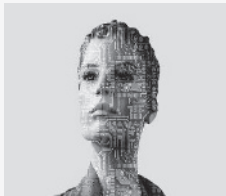
E.g., Combination of firewalls, passwords, and other preventive procedures to restrict access.

Examples of IT preventive controls used for defense-in-depth include:

- Authentication controls to identify the person or device attempting access.
- Authorization controls to restrict access to authorized users. These controls are implemented with an access control matrix and compatibility tests.
- Training to teach employees why security measures are important and teach them to use safe computing practices.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define Availability

- Is system operational and usable as specified in commitments and agreements?
- Relates to whether internal control supports system availability.

Define Processing Integrity

- Is system processing complete, valid, accurate, timely, and authorized?
- Does the system of internal control help ensure that processes operate as intended without errors or manipulations?

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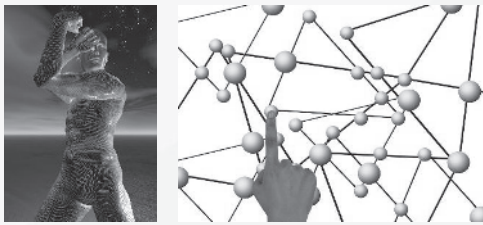
Lesson Quiz: Understanding

Define Defense-in-depth

- The strategy of implementing multiple layers of controls to avoid having a single point of failure.

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Lesson Quiz: Application



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Lesson Quiz: Application

Rhett Butler Tails and Tuxes rents formal apparel for men. Much of the company's business is in online sales. Several recent security breaches at the company have Rhett, frankly, giving a darn about the idea of implementing a "defense in depth" strategy. Explain such a strategy, and its benefits, to Rhett.

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Lesson Quiz: Application

Implement multiple layers of controls
This is a holistic approach that anticipates that some controls will fail
Likely to result in superior controls but at a greater cost
Need to ask Mr. Butler about the incidents that have occurred
Begin with a risk assessment relate to IT systems

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Learning Objectives: Summary



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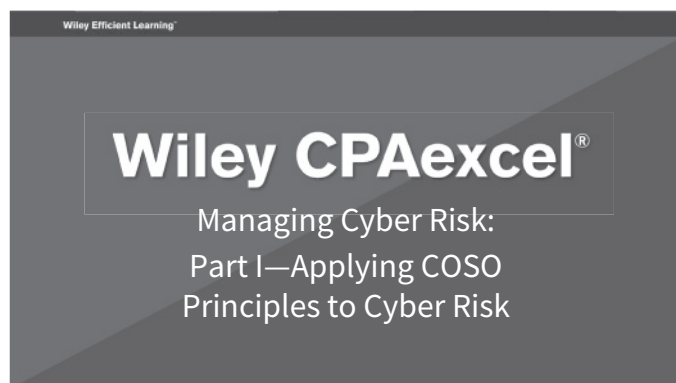
Learning Objectives

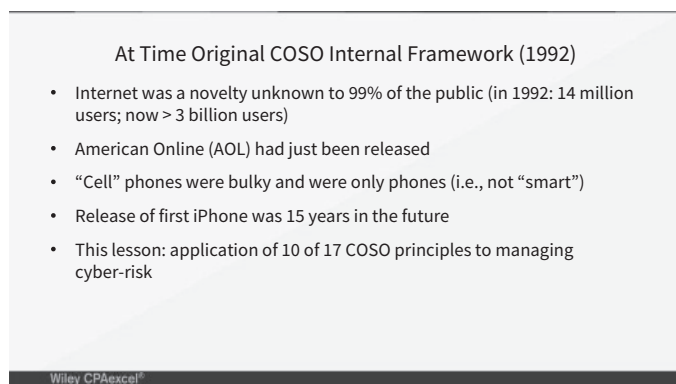
After studying this lesson, you should be able to:

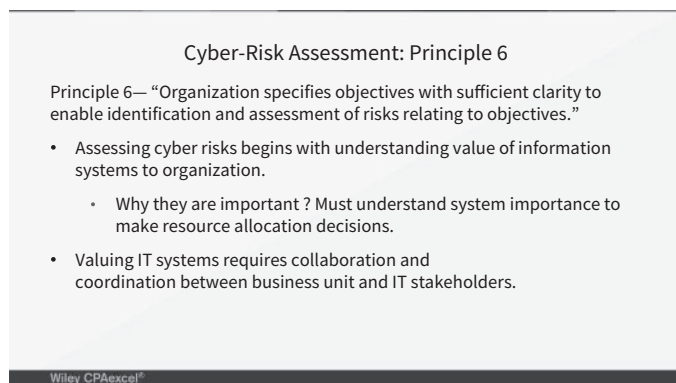
- Describe the five IT security principles specified by AICPA Assurance Services Executive Committee (ASEC).
- Give examples of each of the five IT security principles.
- Identify the 7 categories of criteria that can be used to assess the five IT security principles.
- Describe the time-based model of controls.
- Describe a defense-in-depth strategy.

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Managing Cyber Risk: Part I—Applying COSO Principles to Cyber Risk







Risk Identification and Fraud: Principles 7 and 8

Principle 7—"Organization identifies, analyzes and manages risks"

Principle 8—"Organization considers fraud risks"

- Assess likelihood and severity of cyber risk impact
 - Led by senior management
 - Collaborate with business and IT stakeholders
 - Include individuals with deep understanding of organization's cyber risk profile.
- Consider industry-specific attacks
 - E.g., criminals attack financial institutions and retailers to exploit systems for profit
 - E.g., nation-states or industrial spies might attack oil and gas industry to steal strategic data about exploration sites

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Principle 9

Principle 9— "organization identifies and assesses changes that could impact internal control."

- Risks: Rapidly changing technologies, cyber criminals' quick adaption to changes yield new methods of exploiting vulnerabilities.
- E.g., changing technologies of Web, mobile, cloud, and social media can increase risks of exploitation by cyber criminals.
- E.g., outsourcing, offshoring, and third-party contracting (e.g., for cloud storage) expose organizations to potential cyber vulnerabilities that are outside of organization's control.

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Control Activities to Address Cyber Risks: Principles 10, 11, and 12

Principle 10— "Organization selects and develops control activities that contribute to mitigate risks."

Principle 11—The organization selects and develops general control activities over technology to support the achievement of objectives.

Principle 12—Organization deploys control activities through policies that establish expectations and procedures that implement policies."

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Control Activities to Address Cyber Risks: Principles 10, 11, and 12

Control activities related to cyber risks to each organizations' objectives and cyber risk profile.

E.g., defense-in-depth approach (see prior CPAExcel). Manage cyber risks through careful design and implementation of controls.

Cyber breaches are inevitable—layered control structures should prevent intruders from freely roaming systems after breaches.

- Preventive, detective, and corrective controls are all essential to addressing cyber risks.
- Critical function: Timely detection of breaches and corrective actions.
- After corrections, determine root causes of failure.

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Communicating About Cyber Risks and Controls: Principle 13

Principle 13—“Organization obtains, generates and uses relevant, quality information to support internal control.”

- Information needs follow from cyber risk assessment and control design processes.
- Formally document information requirements to support processes and controls.
- Availability of “big data” (e.g., terabytes of log data related to information systems) can create information overload problem.
- Transform control system data into actionable, high-quality information to support cyber-related controls.

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Communicating About Cyber Risks and Controls: Principle 14

Principle 14—“Organization internally communicates information, including objectives and responsibilities for internal control, necessary to support internal control functioning.”

- Communication about cyber risks should include all personnel, personnel responsible for managing and monitoring cyber risks and controls, and the Board of Directors.

All Personnel:

- People are often weakest link in internal control.
- Organization-wide communication should raise awareness and vigilance regarding cyber risks.
- Cyber criminals “socially engineer” their attacks to exploit human trust and curiosity.
- E.g., what should employees do when they receive an email from a co-worker that includes an attachment? Find a USB drive on the floor?

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Communicating About Cyber Risks and Controls: Principle 14

Personnel Responsible for Managing and Monitoring Cyber Risks and Controls

- Share information to enable relevant personnel to execute their cyber control responsibilities.
- Responsible personnel must formally document cyber controls.

Board of Directors

- Board must understand critical, relevant cyber trends.
- Communicate complex IT topics respectfully and meaningfully to the board.

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Communicating About Cyber Risks and Controls: Principle 15

Principle 15— “Organization communicates with external parties regarding internal control.”

From:

- External parties are useful sources of information about cyber risk assessment and controls (e.g., regulators, industry experts).
- Assistance from cyber risk specialists may be needed to prioritize deployment of resources against cyber risks.

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Communicating About Cyber Risks and Controls: Principle 15

To:

- Inform some (not all!) external parties about cyber events and cyber control activities (e.g., external auditor).
- Communications about pro-active organizational cyber security measures may be relevant to shareholders, owners, customers, business partners, regulators, financial analysts, government entities, and other external parties.

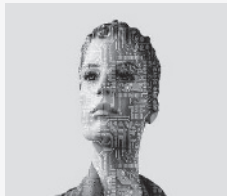
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Sources:

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define “Cybercrime”

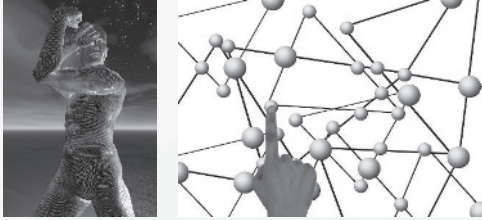
- Illegal activity that uses a computer as its means of commission, or, in which a computer is the target of the crime.

Define “Cyber risk”

- The likelihood of a financial loss, a disruption or damage to an organization from failure of, or an attack on, its IT systems.

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Lesson Quiz: Application



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Lesson Quiz: Application

Flatus Bonibucs is the managing partner of Bonibucs, Coughanuts, and Coconuts, CPAs. Mr. Bonibucs has been a practicing CPA since 1972. He asks you to explain to him why CPA firms have higher risks of online fraud and errors now than when he began practicing.

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Lesson Quiz: Application

Important to avoid:

- Condescending language
- Suggesting that old people are ignorant about technology (many CPA human graders are older, on average, than CPA exam candidates)

Increasing use of online systems and digitization of accounting practices and records.

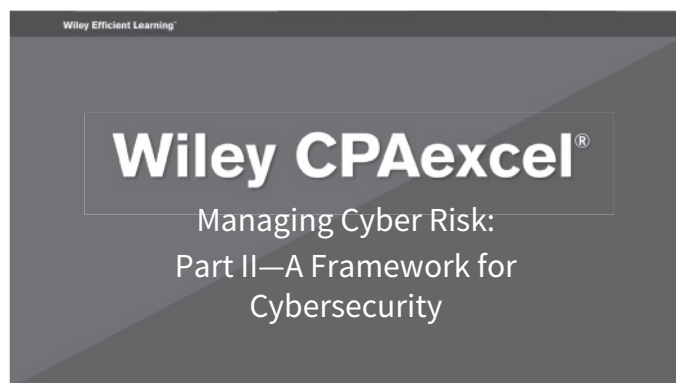
Higher risks result from changing technologies that place materials in digital archives.

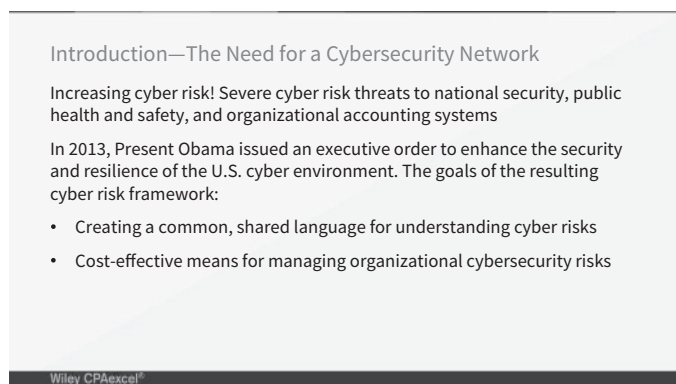
Advantages of these trends: greater accessibility and more powerful systems

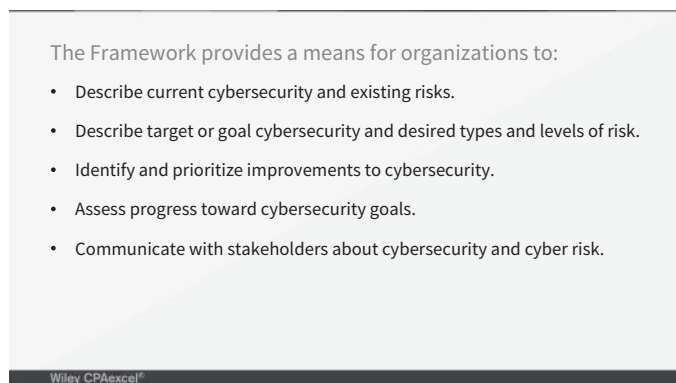
Disadvantages: higher access breach, privacy, and confidentiality risks

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Managing Cyber Risk: Part II—A Framework for Cybersecurity







Framework Principles

- Framework complements, but does not replace, existing risk management and cybersecurity approaches.
- Both public and private organizations have responsibilities related to ensuring the **U.S. critical infrastructure**.
- **U.S. critical infrastructure** is defined as the “systems and assets, ... physical or virtual, so vital to the United States that their incapacity or destruction would ... debilitate security, national economic security, national public health or safety, or any combination of these.”

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Framework Structure

1. **The Core** include cybersecurity activities, outcomes, and references.
2. **The Implementation Tiers** provide a mechanism for viewing and understanding the approaches to managing cybersecurity risk.
3. **The Profiles** help align organizational cybersecurity activities with business requirements, risk tolerances, and resources.

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Framework Core—Matrix

Functions	Categories	Subcategories	References
Identify			
Protect			
Detect			
Respond			
Recover			

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Core Element Relations

1. **Functions** – Organize basic, high-level cybersecurity activities and include: Identify, Protect, Detect, Respond, and Recover.
2. **Categories** – High-level cybersecurity outcomes that link to organizational needs and activities.
3. **Subcategories** – Divide categories into specific outcomes of technical and/or management activities.
4. **(Informative) References** – Specific standards, guidelines, and practices that provide benchmarks and methods for achieving the control goals found in the subcategories.

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The Five Core Functions

These may be performed periodically or continuously to address evolving cybersecurity risks.

1. **Identify** – Develop foundational understanding to manage organizational cybersecurity risk by identifying and assessing organizational systems, assets, data, and capabilities.
2. **Protect** – Develop and implement controls to ensure delivery of critical infrastructure services.
3. **Detect** – Develop and Implement controls to identify cybersecurity incidents.
4. **Respond** – Develop and implement controls to respond to detected cybersecurity events.
5. **Recover** – Develop and implement controls for building resilience and restoring capabilities or services impaired due to a cybersecurity event.

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Implementation Tiers

Identify the degree of control that an organization desires to apply to cybersecurity risk.

Tier 1: Partial

- *Risk Management* – Organizational cybersecurity risk management practices are informal. Risk is managed as ad hoc and reactive.
- *Integrated Risk Management Program* – Limited awareness of cybersecurity risks with no organization-wide approach to managing cybersecurity risk.
- *External Participation* – Organization has weak or nonexistent processes to coordinate and collaborate with other entities.

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Implementation Tiers

Tier 2: Risk Informed

- *Risk Management* – Management approves risk management practices but not as organization-wide policy.
- *Integrated Risk Management Program* – Some awareness of organizational cybersecurity risk. No organization-wide approach to cybersecurity risk.
- *External Participation* – The organization assesses and understands its cybersecurity roles and risks. No formalized process to share information externally.

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Implementation Tiers

Tier 3: Repeatable

- *Risk Management Process* – Organization's risk management practices are formally approved as policy.
- *Integrated Risk Management Program* – Organization-wide management of cybersecurity risk. Management has risk-informed policies, processes, and procedures that are defined, implemented, and regularly reviewed.
- *External Participation* – Organization understands its dependencies and partners. Communicates with partners to enable collaboration and risk-based management incident responses.

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Implementation Tiers

Tier 4: Adaptive

- *Risk Management Process* – Organization adapts its cybersecurity practices based on experience and predictive indicators derived from cybersecurity activities and engages in processes of continuous improvement.
- *Integrated Risk Management Program* – An organization-wide approach to managing cybersecurity risk uses risk-informed policies, processes, and procedures to address cybersecurity events. Cybersecurity risk management is integral to organizational culture.
- *External Participation* – The organization manages risk and actively shares information with partners to ensure the sharing of accurate, current information to improve collective cybersecurity before a cybersecurity event occurs.

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Profiles

Align and integrate the functions, categories, and subcategories with the organization's requirements, risk tolerance, and resources.

- Enables organization to create a plan to align cybersecurity risk with organizational goals.
- Considers legal and regulatory requirements, industry best practices, and risk appetite.
- Can be developed for both the current and desired state of cybersecurity.

Comparing profiles (e.g., current and target) may reveal gaps to address in meeting cybersecurity risk management objectives.

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Recommended Framework Applications

Review and Assess Cybersecurity Practices

Establish or Improve a Cybersecurity Program

- **Prioritize Risks and Determine Scope** – After identifying mission, make strategic decisions regarding scope and purpose of cybersecurity systems and assets needed to support these objectives.
- **Link Objectives to Environment** – Identify systems and assets, regulatory requirements, and overall risk approach to support cybersecurity program.
- **Create Current Profile** – Develop a Current Profile by indicating which category and subcategory outcomes from the Framework Core are achieved currently.

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Recommended Framework Applications

Establish or Improve a Cybersecurity Program

- **Conduct Risk Assessment** – Guided by overall risk management process or previous risk assessment, analyze the operational environment to determine likelihood of a cybersecurity event and its potential impact.
- **Create a Target Profile** – Assess Framework categories and subcategories to determine desired cybersecurity outcomes.
- **Determine, Analyze, and Prioritize Gaps** – Compare current and target profile to determine gaps. Create a prioritized action plan to address gaps.
- **Implement Action Plan** – Determine and implement actions to address gaps.

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Communicate Cybersecurity Requirements to Stakeholders

Use Framework's common language to communicate with stakeholders for the delivery of essential critical infrastructure services. Examples:

- Create a target profile to share cybersecurity risk management requirements with an external party.
- Determine the current cybersecurity state to report results as a part of a control review.
- Use a target profile to convey required categories and subcategories to an external partner.
- Creates a target profile to share among constituents as a baseline profile to build organizationally tailored target profiles.

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Identify Opportunities to Adapt or Apply New or Revised References

Use the Framework to identify opportunities for new or revised standards, guidelines, or practices where additional references would help address emerging risks.

- Example—An organization implementing a given subcategory, or developing a new subcategory, might discover few relevant informative references for an activity.
- To address the needs of the new system, the organization might collaborate with technology leaders or standards bodies to draft, develop, and coordinate standards, guidelines, or practices.

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Methods for Protecting Privacy and Civil Liberties

Privacy and civil liberties implications arise when personal information is used, collected, processed, maintained, or disclosed in connection with an organization's cybersecurity activities.

Examples of Relevant Activities:

- Cybersecurity activities that result in the overcollection or overretention of personal information.
- Disclosure or use of personal information unrelated to cybersecurity activities.
- Cybersecurity activities that result in denial of service or other similar potentially adverse impacts.

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Processes for Addressing Privacy and Civil Liberty Risks

Governance of Cybersecurity Risk

- The organization's assessment of cybersecurity risk and responses should consider privacy implications.
- Individuals with cybersecurity-related privacy responsibilities report to appropriate management and receive appropriate training.
- Organizational processes support compliance of cybersecurity activities with applicable privacy laws, regulations, and constitutional requirements.
- Monitor (continuously and periodically) privacy implications of cybersecurity measures and controls.

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Processes for Addressing Privacy and Civil Liberty Risks

- **Identify and authorize individuals to access organizational assets and systems** – Identify and address privacy implications of data access that include collecting, disclosing, or using personal information.
- **Implement awareness and training measures** – Training includes organizational privacy policies and regulations. Organization informs service providers of organization's privacy policies and monitors for compliance with these policies.
- **Anomalous activity detection and system and assets monitoring** – Conduct privacy reviews of anomalous activity detection and cybersecurity monitoring.
- **Response activities, including information sharing or other mitigation efforts** – Assess and address whether, when, how, and the extent to which personal information is shared outside the organization as part of cybersecurity assessment and monitoring. Conduct privacy reviews of cybersecurity initiatives.

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Summary and Limitations

- Cybersecurity is a national security issue and a requirement of almost every organization.
- The Framework for Cybersecurity guides organizations in common cybersecurity principles, standards, and best practices.
- While not tailored to the specific needs of individual organizations, the Framework enables organizations to review and assess their cybersecurity programs.

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Lesson Question (Application)—Cybersecurity for Lebowitz's

"The Duke" owns "Lebowitz's High Line" cannabis bowling alleys and smoking boutiques in the "Mile High" state of Colorado. Because the chain has been a remarkable success, "The Duke" fears that it is an increasing target for hackers seeking to drain its amazing cash flow. To date, Lebowitz's approach to managing cybersecurity has been, in the words of "The Duke," "chill" and "like, whatever man." Cybersecurity at Lebowitz's has been managed, in the words of "The Duke," by "some guy who seems to know something about computers who grows some really mean _____."

Propose a high-level strategy for cybersecurity to "The Duke" based on the Framework for Cybersecurity.

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Lesson Question (Application)—Cybersecurity for Lebowitz's

Issue 1: What are the unique risks of a cannabis boutique and bowling alley?

Questions to ask:

- High sales volume and cash flow?
- Competence of accounting and IT personnel? Quality and age of IT systems?
- Accounting system description and security?
- Cannabis production, supply chain, and manufacturing costs?
- Legal and regulatory issues (cannabis is legal in Colorado, illegal according to U.S. federal law)?

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Lesson Question (Application)—Cybersecurity for Lebowitz's

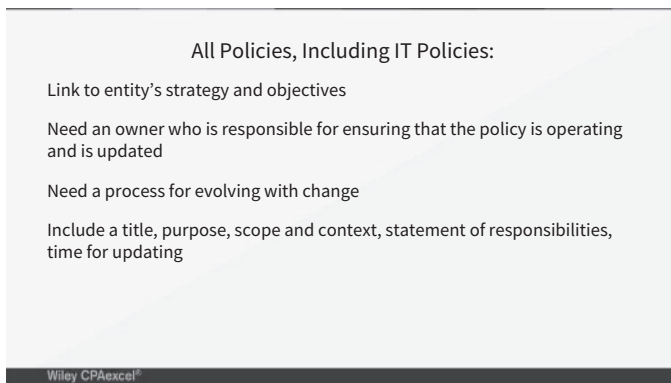
Issue 2: Adapt the Framework for Cybersecurity to:

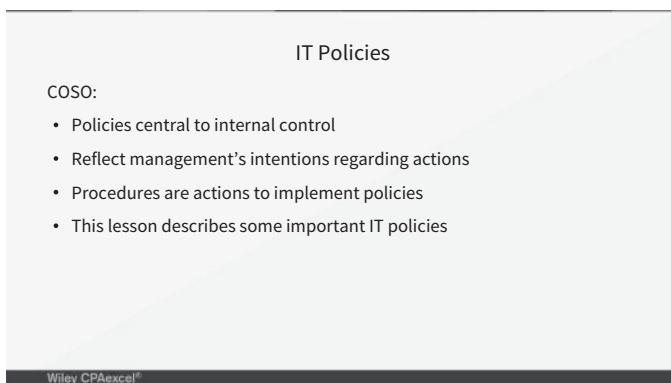
- Collect answers to issue 1.
- Create an IT security plan by adapting the framework to the client's specific needs.
- Note unique issues of the client, particularly legal and regulatory issues.

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IT Policies







Purpose of IT Policies

Help establish a shared organizational understanding of IT

Help in managing cyber risks

Particularly valuable in decentralized or geographically distributed entities

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Important IT Policies:

1. Values and Service Culture—What is expected of IT function personnel in interactions with clients and others?
2. Contractors, Employees and Sourcing—Why, when and how entity selects IT human resources from employees vs. outside contractors. I.e., IT sourcing and outsourcing policy
3. Electronic Communications Use—Policy related to employee use of the Internet, intranet, email, blogs, chat rooms and telephones
4. Use and Connection Policy—Entity's position on the use of personal devices and applications in workplace and connection to the entity's systems

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Important IT Policies:

5. Procurement—Policy on procurement processes for obtaining IT services.
6. Quality—Statement of IT performance standards.
7. Regulatory Compliance—Statement of regulatory requirements for IT systems, e.g., in banking or investment systems, or, related to data privacy.
8. Security—Policy related to guarding against physical or electronic threats to IT; may include disaster recovery preparation policies.
9. Service Management and Operational Service Problem Solving—Policies for ensuring quality of live IT services.

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Policy Monitoring

Monitor policies for compliance and success

Monitoring

- may include internal audit staff
- may be continuous or periodic

Analysis (monitoring) of IT help calls and operational reports provide evidence of policy noncompliance, use, and understanding

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

What is the IT "Values and Service culture"?

- Expectations of IT function personnel in interactions with clients and others.

What is a "use and connection policy"?

- Entity's position on use of personal devices and applications in the workplace and connection to the entity's systems.
- May also specify allowable devices and uses on the entity's systems.

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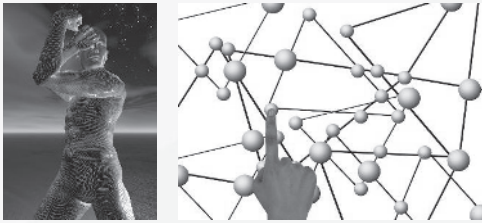
Lesson Quiz: Understanding

What is a “regulatory compliance” IT policy?

- Statement of regulatory requirements of IT systems, e.g., in banking or investment systems, or, related to data privacy.

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Lesson Quiz: Application



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Lesson Quiz: Application

Rust Cohle is CEO of “Time is a Flat Circle” Detective Agency, which has branches throughout the US and Canada. “Time is a Flat Circle” has IT processing facilities in 15 locations. Mr. Cohle, and the company’s CIO, Maggie Hart, ask you why IT policies are important to the company, and, to suggest 2 or 3 important IT policies that they should consider implementing.

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Lesson Quiz: Application

Help establish a shared organizational understanding of IT

Help in managing cyber risks.

Particularly valuable where IT is decentralized, such as “Time is a Flat Circle.”

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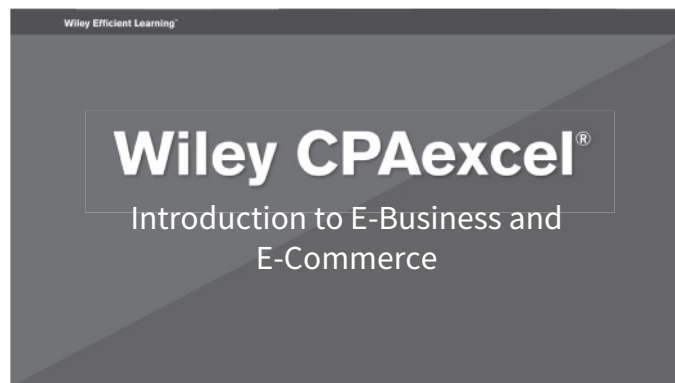
Lesson Quiz: Application

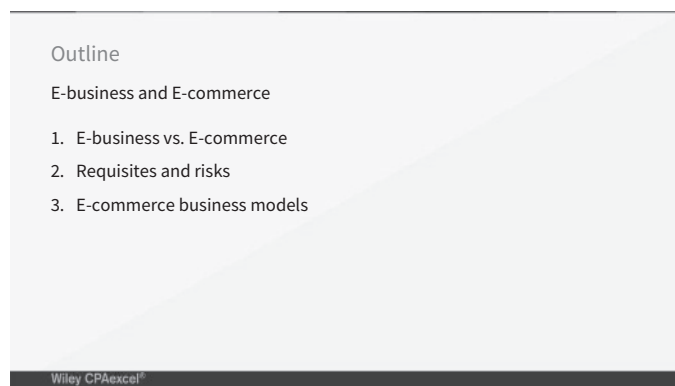
Give examples of policies from the lesson, e.g.,

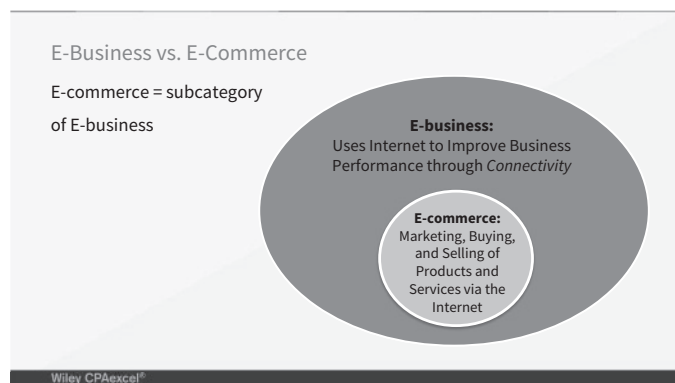
1. Values and Service Culture—what is expected of IT function personnel in interactions with clients and others?
2. Contractors, Employees and Sourcing—Why, when and how entity selects IT human resources from employees vs. outside contractors (i.e., IT sourcing and outsourcing policy).
3. Electronic Communications Use—Policy related to employee use of the Internet, intranet, email, blogs, chat rooms and telephones.

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Introduction to E-Business and E-Commerce







E-Business vs. E-Commerce

E-business

- Business process that relies on electronic dissemination of information or automated transaction processing
- Can be within or between organizations
- Most via the Internet using web-based technologies

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E-Business vs. E-Commerce

E-commerce

- Narrower → *transactions* between organization and trading partners.
- Business-to-business (B2B) ecommerce: E.g., e-processing of business transactions, electronic data interchange (EDI), supply chain management (SCM) and electronic funds transfer (EFT).
- Business-to-consumer (B2C) ecommerce: selling goods and services to consumers, usually on Internet and web-based technology.
- Relies on intermediaries or brokers to facilitate the sales transaction (e.g., eBay).

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E-Business vs. E-Commerce

E-commerce—other examples

- Business-to-employee (B2E) e-commerce: Sharing information and interacting with employees.
- Business-to-government (B2G) ecommerce: E.g., contract bidding, property disposal, audit procurement.

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EC Requisites—Trust

Trading partners

Site or service provider

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EC Risks

- Availability/downtime
- Privacy, security and confidentiality
- Authentication and nonrepudiation (after the fact, can't claim that transaction occurred)
- Integrity

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Risks of Failing to Implement EC

1. Customers go elsewhere
2. Limited growth
3. Limited markets

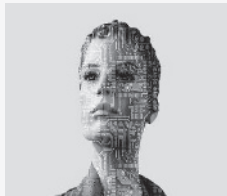
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E-commerce Business Models

1. E-marketplaces and exchanges
2. Viral marketing
3. Online direct marketing
4. E-tendering systems
5. Social networking

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Lesson Quiz: Understanding



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Quiz: Understanding

Define business-to-business (B2B) e-commerce.

- The electronic processing of transactions between businesses. It includes electronic data interchange (EDI), supply chain management (SCM), and electronic funds transfer (EFT).

Define "e-commerce."

- Transactions between the organization and its trading partners

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Quiz: Understanding

E-commerce depends on trust in two parties. Please identify them.

1. Trading partner
2. The trading site or service provider

Identify three risks of not implementing e-commerce systems.

1. Customers move online
2. Limited growth
3. Limited markets

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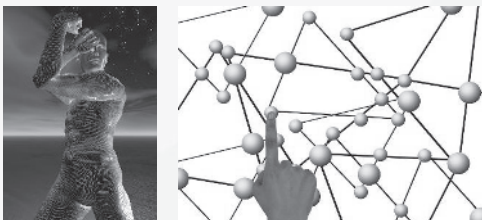
Quiz: Understanding

Identify five risks of e-commerce.

1. Risk of system unavailability
2. Privacy, security and confidentiality risks
3. Authentication risks
4. Nonrepudiation risks
5. System integrity risks

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Lesson Quiz: Application



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Lesson Quiz: Application

Dolly Parton Hair Extensions was a startup business founded in 2008 that specializes in 100% human hair extensions. They also sell hair straighteners and application kits. Dolly Parton Hair Extensions started as a local business but is considering online sales. What strategic and risk factors should Ms. Parton consider in moving to online sales?

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Lesson Quiz: Application

Strategy

Business model? B2B (salons?) B2C (customers?) both?

Vendor for EC?

Risks:

1. Availability/downtime
2. Privacy, security and confidentiality
3. Authentication and nonrepudiation
4. Integrity

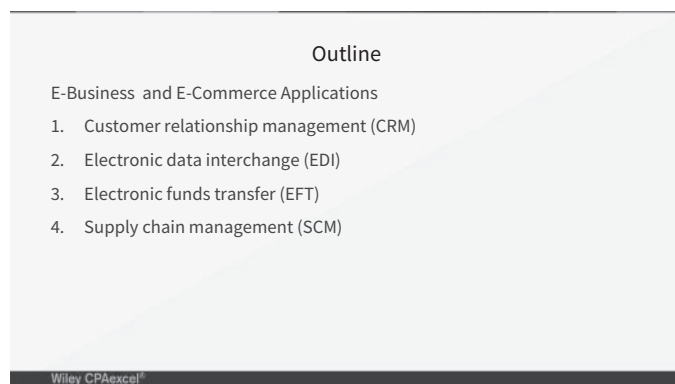
Risks of no EC:

1. Customers go elsewhere
2. Limited growth
3. Limited markets

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E-Commerce Applications







Customer Relationship Management (CRM)

Database of customer data.

- Salesforce automation: Tracking contacts and follow-ups
- Marketing automation: “Triggered” marketing (e.g., Kroger promoting grocery products only to interested customers)
- Customer service automation: Automating common customer interactions
- Analytics: Sales history and projections, marketing campaign success, trends, and performance indicators

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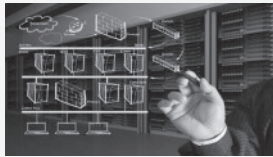
Electronic Data Interchange (EDI)

Computer-to-computer exchange of business data

Structured data and processing protocols to reduce costs and speed processing

Facilitates JIT (just-in-time) inventory

E.g., Walmart and suppliers (direct EDI connections)



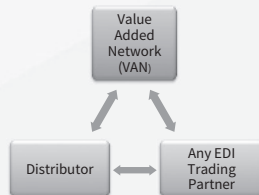
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Electronic Data Interchange (EDI)

Often, direct links between trading partners through intermediaries (called “service bureaus” or VANs)

Most EDI transactions on value added networks (VANs)

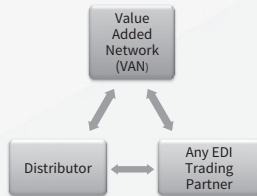
- VANs provide **audit trails, controls, and security**



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EDI Alternatives

Translation software converts between standardized EDI format and internal company format.



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EDI Benefits

Paperless (saves storage, filing, processing costs)

Zero data entry

Reduce errors in information exchange

Required by some customers (e.g., Walmart)

Real-time data, no delays

Faster invoicing and payment (\$)

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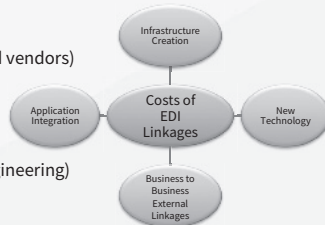
EDI Costs

Business costs

- Search (locating e-partners and vendors)
- Legal (new contracts)

People and procedure costs

- Internal policies (process reengineering)
- Training
- Security, audit, and control procedures

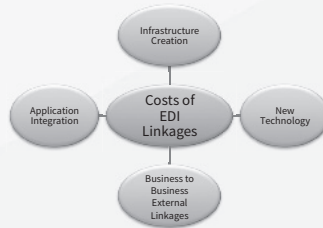


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EDI Costs

Hardware, software, data costs

- Hardware (e.g., servers, communication and network devices)
- Translation and other software
- Data transmission



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E-Banking

Demanded by customers

Management of e-banking requires:

- Senior management and B of Directors oversight
- Technology under Senior IT leadership
- Operational management monitoring and measuring risk

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Electronic Funds Transfer (EFT): Purpose

Technology for electronically transferring money (i.e., no paper money or checks)

Increase speed and reduce cost



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EFT: Purpose

Examples:

- Retail payments (e.g., credit cards, often by POS point-of-sale terminals)
- Direct deposits
- Automated teller machine (ATM) transactions
- Federal Reserve wire transfers

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EFT Service

Usually third-party vendor is intermediary between company and banking system.

Transactions processed through Automated Clearing House (ACH) network
= transfer that connects all U.S. (and most non-U.S.) financial institutions.



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EFT Security

Very important: Data encryption for transmission (discussed in a later lesson)

Token-based payment systems

- Similar to EFT but different rules
- Can be anonymous



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EFT Security

Electronic wallets

- Not payment systems
- Programs for managing credit cards, user names, passwords and address information in a easy-to-use, centralized location (e.g., RoboForm, now integrated into browsers)

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Supply Chain Management (SCM)

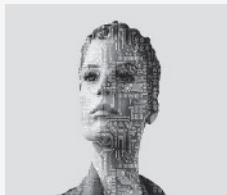
Supply chain: process of transforming raw materials into finished product and delivering goods

Process of planning, implementing, and controlling **supply chain operations**

SCM often includes EDI (e.g., Walmart)

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "supply chain management (SCM)."

- Process of planning, implementing, and controlling the operations of the supply chain:
 - Includes activities from purchase and storage of raw materials, through the production process, into finished goods through to the point of consumption.

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Lesson Quiz: Understanding

Define "electronic funds transfer (EFT)."

- A technology for transferring money from one bank account directly to another.
- Reduces the time and expense required to process checks and credit transactions.
- Does anyone write checks anymore?

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Lesson Quiz: Understanding

Define "electronic data interchange (EDI)."

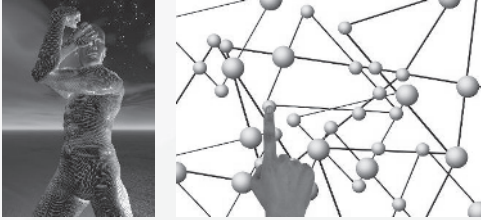
- The system-to-system exchange of business data (e.g., purchase orders, confirmations, invoices, etc.) in structured formats that allow direct processing of the data by the receiving system

What are customer relationship management (CRM) systems?

- Technologies that facilitate managing e-relationships with clients
- Store customer data in database
- Enables analytic tools. E.g., personalized marketing plans for individual customers

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Lesson Quiz: Application



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Lesson Quiz: Application

The Starbucks mobile app is a means for the company to connect with, and collect data about, its customers. Which of the applications in this lesson does the Starbucks mobile app likely illustrate. Discuss the potential value of the mobile app to Starbucks.

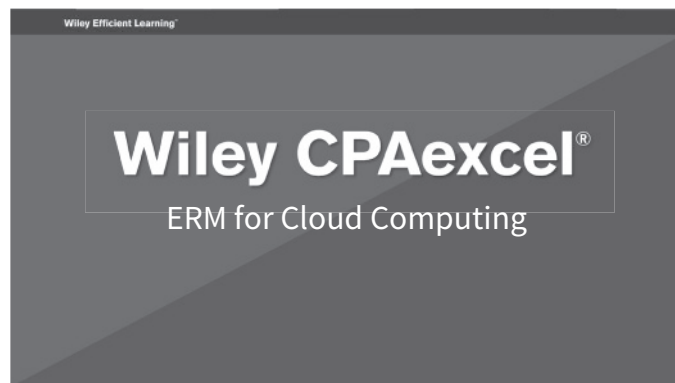
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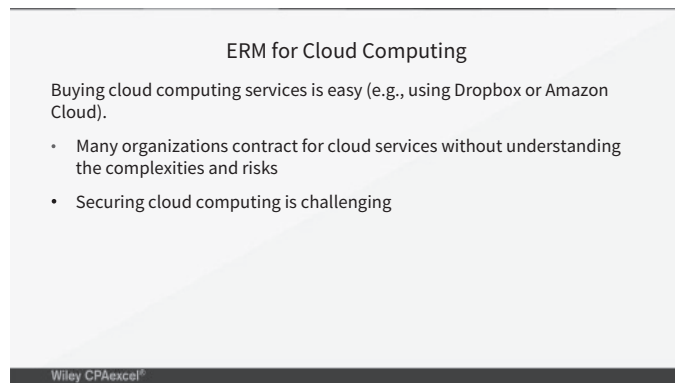
Lesson Quiz: Application

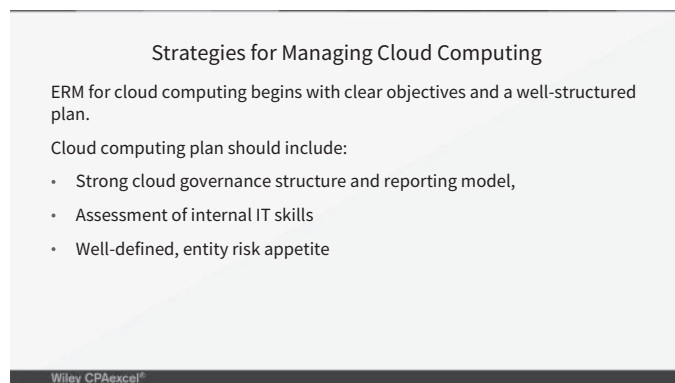
- Don't need to know anything specific about Starbucks app to answer this question
- This is certainly a CRM and likely includes elements of payment processing (some form of EFT though without more information its hard to know what)
- Value of CRM to Starbucks: customer data, analytics, brand marketing, individual service and connection, efficiency (automate order processing)
- Value of payment processing to Starbucks (in a later lesson): lower payment costs, better customer experience, better analytics

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ERM for Cloud Computing







Strategies for Managing Cloud Computing

Conduct cloud computing risk assessment and analysis **before** contracting for services.

- Consider legal, regulatory, and operational risks
- Most organizations will include senior management and IT steering committee in this analysis.
- If risk is substantial, conduct board discussion.



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Strategies for Managing Cloud Computing

Know risks of cloud deployment options

- Except for internal, private cloud, cloud computing = IT outsourcing
 - Public clouds > inherent risk than private clouds
 - Risk analysis considers inherent risk of outsourcing part of IT system

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Strategies for Managing Cloud Computing

Effective cloud solutions consider:

- Relevant business processes: e.g., sales, product development, manufacturing, distribution, procurement, payroll, financing
- Deployment model: e.g., public, hybrid, private
- What's on the cloud? Service delivery model: SAAS, PAAS, IAAS (see the introductory lesson on cloud computing for definitions)

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Cloud Computing Risks and Responses

Next: Examples of cloud risks and responses

1. Risk: Unauthorized cloud activity
2. Risk: Lack of CSP transparency
3. Risk: CSP Reliability and Performance
4. Risk: Cyber-attack

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Risk: Unauthorized Cloud Activity

Response: Preventive and detective controls to prevent unauthorized procurement of cloud services

- E.g., a cloud use policy that articulates how, when, and for what uses, cloud computing is allowed.
- E.g., a list of approved cloud vendors
- E.g., policy: who can contract for cloud services and under what conditions?

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Risk: Unauthorized Cloud Activity—Example

- Small business unit of a large corporation implemented cloud-based customer relationship management (CRM) system.
- Unit created the system without consulting senior management or the internal IT organization.
- After launch, the data included confidential customer and credit card data.
- Confidential data was stored on a public cloud in violation of the corporation's policies.

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Risk: Lack of CSP Transparency

Response: vendor selection and assessment of CSP controls

- E.g., approved list of cloud vendors includes only vendors who provide sufficient information to enable informed risk assessments of the integrity of CSP operations
- E.g., list of required information from CSP may depend on type of service provided (i.e., IAAS, SAAS, PAAS)

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Risk: Lack of CSP Transparency

Potentially relevant vendor information:

1. References
2. Information about appropriate usage
3. Performance data—description
4. Network infrastructure—description
5. Data center—description
6. Security protocols, policies, and procedures
7. Data segregation
8. Compliance policies

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Risk: CSP Reliability and Performance

Response: Effective incident management plan and procedure

- E.g., Contract with backup CSPs in case of system failure with primary CSP
- E.g., Implement CSP availability monitoring
 - Is CSP availability complying with contract?

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Risk: Cyber-attack

Response: Incident management plan that considers increased likelihood of attack on CSP

- Store only nonessential, non-sensitive data on CSP platform
- Deploy encryption on all cloud-hosted data
- Contract with backup CSPs in the event of a hack on the primary CSP

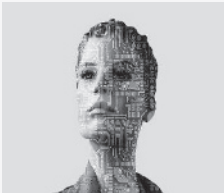
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Summary

This lesson introduces risk management principles for the cloud computing environment.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Cloud computing"

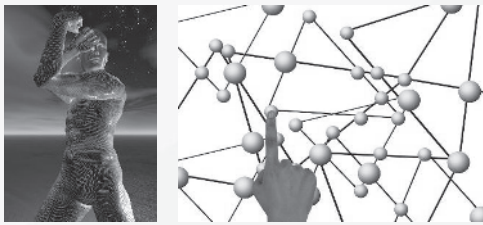
- Using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or in-house network.

What is a CSP?

- Cloud service providers (CSP) offer network services, infrastructure, or business applications in the cloud.
- Hosted in a data center than can be accessed by companies or individuals using network connectivity.

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Lesson Quiz: Application



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Lesson Quiz: Application

Molly Jones is the CEO of Ob-La-Di Markets and Produce. Her husband, Desmond, is CIO.

Because of rapid business growth, Desmond recently moved all of the company's data from private, in-house services to a public cloud.

When asked, Desmond is unaware of that storing data on the cloud differs from in-house storage. He asks you, "bro, what's the difference?"

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Lesson Quiz: Application

Well, this is a problem. Need to educate the client on risks of cloud computing.

Public clouds are riskier than private clouds.

What are goals for cloud computing beyond more storage?

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Lesson Quiz: Application

Define:

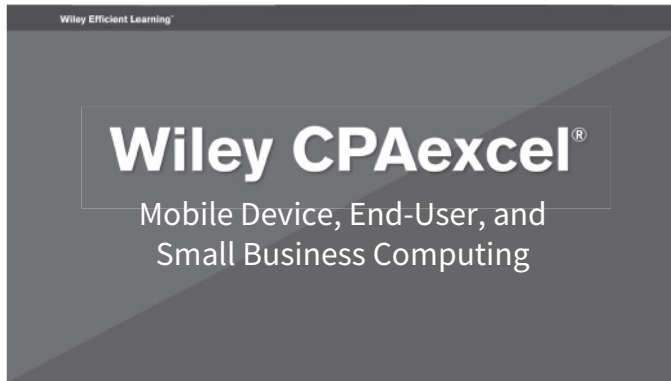
- Cloud governance structure and reporting model
- Assessment of internal IT skills—it would appear this company needs professional IT help
- Entity's risk appetite

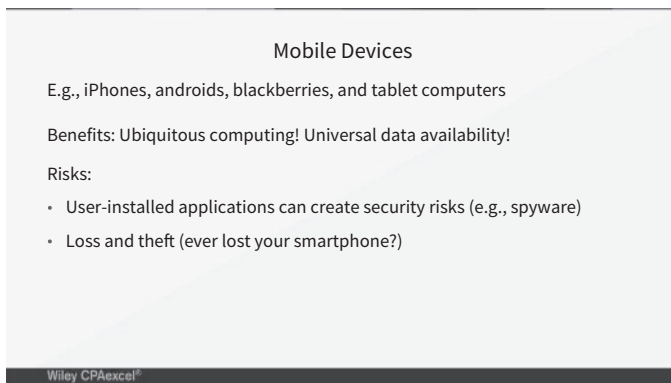
Conduct cloud computing risk assessment and analysis ***as soon as possible***

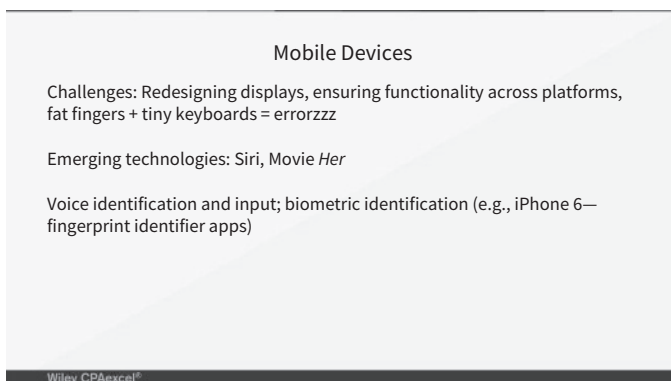
- Has company violated laws in storing data on the cloud?
- What information is at risk by storage on a public cloud?

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Mobile Device, End-User, and Small Business Computing







End-User Systems Development Risks

- No knowledge or application of SDLC
- Inadequate system testing and documentation
- Poor data controls
- Poor integration with existing systems

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Controlling End-User Development Risks

Software and program development and implementation:

- Third-party review and testing of user-developed programs (e.g., spreadsheets and databases)
- Catalog and store programs in secure and off-site location

Segregation of Duties

- Third-party review of data entry (if any) and report production
- Implement additional supervision and review as feasible

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Small Business Environment (SBE) and End-User Computing Risks

- Harder to control
- Higher risk of errors, defalcation, system failure

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Small Business Environment (SBE) Characteristics

- Exclusively microcomputers
- No centralized Info. Technology (IT) department (outsourced IT?)
- Poor segregation of duties (incompatible functions often combined)

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Controlling SBE Computing Risks

- Physical access: Unprotected computing site(s)?
- Give > attention to locked doors and secure storage (e.g., CDs, DVDs, flash drives)

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Controlling SBE Computing Risks

Logical (electronic) access:

- Require usernames and strong passwords
- Automatic log out after unused period



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Controlling SBE Computing Risks

Data Backup:

Outsource, or, establish and enforce policies (e.g., centralize and automate through network)



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SBE Computing: A Compensating Control

Close involvement of knowledgeable owner

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Summary

Mobile devices offer ubiquitous computing and increased security risks.

Poor controls over **end-user systems development** can cause major data and system security problems.

Small business computing creates challenges due to the absence of a professional IT staff and poor segregation of duties.

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Lesson Quiz: Understanding



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Quiz: Understanding

Identify five risks of user-developed systems.

1. Not integrated with existing systems
2. Inadequate testing and documentation
3. Poor data input controls
4. Poor system design
5. Management may rely on these systems without knowing their risks

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Quiz: Understanding

Identify three characteristics of the small business computing environment.

1. Exclusive use of microcomputers and laptops (e.g., there may be no servers)
2. Outsourced IT
3. Potentially poor segregation of duties
4. (a fourth: engagement of the owner as a compensating control?)

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Quiz: Understanding

Identify items that should be included in user training in mobile applications.

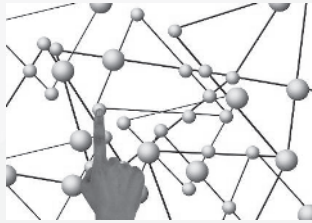
- Organizational policies
- Password maintenance and protection
- When and how to use mobile devices
- Procedures for lost or stolen devices

Define “mobile computing.”

- Transportable (ubiquitous) computing devices; that is, computing devices that can be carried from place to place

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Lesson Quiz: Application



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Lesson Quiz: Application

The Great Gatsby's Rolls-Royce repair is a small business on Long Island, that specializes in Rolls Royce repair and service. Jay Gatsby owns the business; Nick Carraway is a repair man and also does some accounting work for Jay. Most of the computers for the business are located in the repair bay, where workers will repair a car and then enter information about the repair into the accounting system.

What are some of the unique computing risks and challenges that the business is likely to encounter?

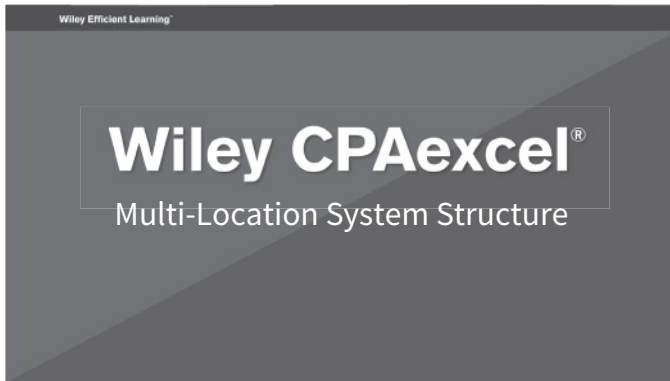
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Lesson Quiz: Application

- OMG - dirt, grease, and hardware failures. Physical protection of the computers is particularly important here.
- User access restriction is important. What systems are available in the repair bay? What can repair staff access?
- Segregation of duties may be an issue. What does Nick Carraway do, exactly? What controls ensure that he cannot defraud the business?
- Who else is engaged with and knowledgeable about the business?
- Is Jay Gatsby actively involved in the business? Is this a compensating control?
- Need to learn much more about the existing system to make substantive recommendations .

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Multi-Location System Structure



Centralized, Decentralized and Distributed Systems

Problem: How to consolidate data from multiple locations? Three approaches:

1. Centralized system:
 - Data and processing at central location
2. Decentralized system:
 - Individual location processing and data
3. Distributed (hybrid) database system:
 - Distribute to locations according to need

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Centralized System

All data and processing at one location

Users access via telecommunications channel

Advantages:

- Enables better data security
- Consistency in processing

Disadvantages:

- High transmission costs
- Input/output bottlenecks at high traffic times (end of period)
- Slow response to information requests



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Decentralized System

- Each location maintains separate system and data
- Summarized data sent to central office
- Use is declining

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Decentralized System Advantages

- ↓ transmission cost
- ↓ processing power and storage needs at central site
- ↓ input/output bottlenecks
- ↑ response to local needs

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Decentralized System Disadvantages

- ↑ data redundancy and poor information integration
- ↑ security issues
- ↑ hardware costs

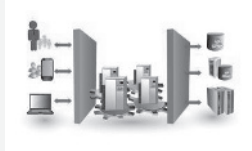
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Distributed Database System Characteristics

Compromise: Seek the best of centralized and decentralized

Database distributed across locations according to needs

Increasingly common



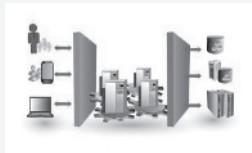
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Distributed Database System

Better communication between locations (all connected to distribute database)

More current and complete information

Reduce or eliminate need for expensive central processing center



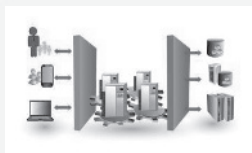
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Distributed Database System

Similar to centralized systems

Cost of **communications** among locations

Access and update conflicts among locations



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Lesson Quiz: Understanding



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Quiz: Understanding

What are distributed database systems?

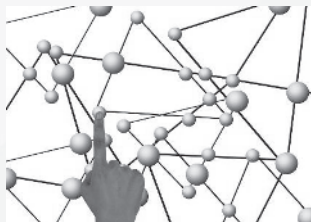
- Databases that are distributed across locations according to their needs

What are centralized systems?

- Maintain all data and perform all data processing at a central location
- Remote users access via a telecommunications channel
- All processing is centralized

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Lesson Quiz: Application



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Lesson Quiz: Application

Daniel Plainview owns "There Will be Oil" (TWBO) Oil Exploration, Extraction and Refining which has about 50,000 employees, is based in Houston, TX and runs the SAP ERP software. Historically, the company has had a centralized database system. TWBO recently acquired a Chinese subsidiary company (Oil for the Lamps of China) (OLC). OLC must comply with Chinese standards and regulations. In addition, OLC has its own accounting system (running Intact ERP software) which is state of the art. What should TWBO consider in its decision of best integrate the OLC's database and accounting system into TWBO's system?

(These facts are loosely based on a case study found at: <http://www.pacis-net.org/file/2012/PACIS2012-106.pdf>)

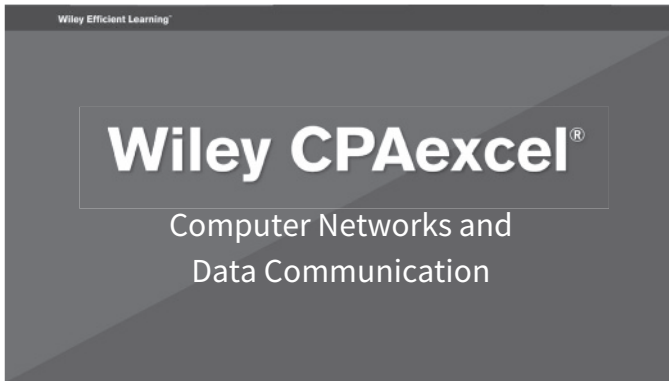
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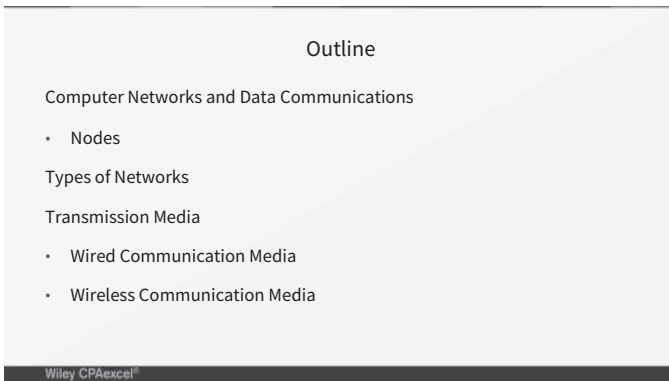
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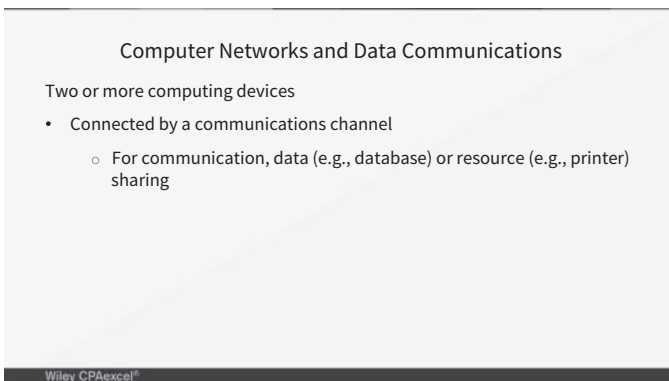
- The subsidiary runs a different ERP system and must comply with different regulations.
- Likely to move towards decentralization or a hybrid system.
- Given trends in computing (towards centralization), a hybrid system may be best.
- Must consider costs, trends in software and computing, compliance and regulatory issues, and quality of data and analytics.
- Requires considerably more analysis before deciding how to proceed.

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Computer Networks and Data Communication







Computer Networks and Data Communications

Components

Node:

- Network access point
- A connected device (computers, printers, headphones, etc.) identified by type (linked to device protocols)

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Component: Nodes

Access point to a network

- Controlling is critical to security

Measure of network complexity (e.g., 5 versus 30,000)

Each assigned a DNS and IP (internet protocol) address

- DNS (domain name system)—translates network node into IP address

Network monitors display node activity—status, extent of traffic, alarms (e.g., prohibited traffic)

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Computer Networks and Data Communications

Components:

Switch (0,1) and/or router

- Route traffic and may include security features
- Routers are smarter, more complex and cost more than switches

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Computer Networks and Data Communications

Components:

Network Interface Card (NIC) (or Network Adapter Card (NAC):

- Circuit board and software on each node
- Matched to transmission media
- E.g., in each computer

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Computer Networks and Data Communications

Components:

Transmissions media:

- Communication link between nodes (here a cable)
- May be wired or wireless

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Types of Nodes

Client:

- Usually an end user's microcomputer
- Uses but does not provide network resources

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Types of Nodes

Server:

- Provides services or resources to network
- End-users access server resources but generally don't use directly
- E.g., a **file** server maintains centralized application and data files
- A **print** server provides access to high quality printers
- May lack keyboard and video (accessed through network)

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Types of Networks

Local Area Networks (LANs)

- Mnemonic: LANDS → LANs use dedicated lines
- Use dedicated communications lines (i.e., used only by the network)
- Cover limited area

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Types of Networks

Wide Area Networks (WANs)

- Mnemonic: WANs → use Shared lines
- Use public or shared communications lines (e.g., telephone lines, television cables)



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Types of Networks

Storage Area Networks (SANs)

- Type of LAN
- Dedicated: connect storage devices to servers and other devices
- Centralize data storage
- Increasing use of in cloud computing

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Types of Networks

Personal area networks (PAN)

- Created/used by individual person
- Wireless: e.g., use Bluetooth (or IrDA) to connect a device (e.g., iPad) to keyboard, headset, mouse, another computer, etc.
- Wired: Use fiber optics, twisted pair, coax or other cable (e.g., Apple) to connect

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Why Do We Have Networks?

File and data sharing/resources

Email

Printing

Remote access

Directories (locate services on the network)

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Transmission Media

Types of Communication Media

Wired:

- Twisted pair (copper)
- Coaxial cable
- Fiber optic cable

Wireless:

- Microwave transmission
- Wi-Fi or spread-spectrum radio transmission
- Bluetooth
- Digital cellular

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Wired Communication Media

Fiber optic cable



Twisted pair



Coaxial cable



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Wired Communication Media

Twisted pair

- Originally for phone connections
- Historically, slowest, least secure (e.g., easy to tap), lowest capacity, most interference of wired media (EMI = electromagnetic interference)
- Low cost and common in U.S. buildings

Slow, Cheap, Insecure



Fast, Expensive, Secure

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Wired Communication Media

Coaxial cable

- Cable for your wired cable TV system
- Faster, more secure, moderate capacity, less subject to interference
- Slightly higher cost, common due to cable TV systems

Slow, Cheap, Insecure**Fast, Expensive, Secure**

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Wired Communication Media

Fiber optic cable

- Fast and secure, high capacity
- Light pulses not electrical impulses; no electrical interference, no degradation over long distances
- More expensive and often not already in U.S. buildings

Slow, Cheap, Insecure**Fast, Expensive, Secure**

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Wireless Communication Media

Microwave transmission

- Use of terrestrial microwave and/or satellite microwave transmission
- Primarily used in WANs



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Wireless Communication Media

Wi-Fi or spread-spectrum radio transmission

- Used in both large commercial networks and small home networks
- Used in LAN and also to provide access to WANs
- Currently: Wi-Fi connections often slower than wired systems coaxial (Ethernet) or fiber optic cable



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Wireless Communication Media

Bluetooth (a wireless communication protocol)

- Same radio frequencies as Wi-Fi
- Lower power consumption and weaker connection; (10 meter range)
- Provide direct communication link between two devices (e.g., headset and cell phone)
- Used in personal area networks (PANs)
- Example: cell phone receiving signal from GPS



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Wired or Wireless?

Wireless network advantages

- Scalable, flexible, often lower cost, mobility

Wired network advantages

- Reliable, security, speed, occasionally lower cost

Large LANs and WANs often include both

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Networks—By Ownership

- A. Private**— Small number of applications or restricted set of users
- Advantages: Secure, flexible, performance often exceeds that of public.
 - Disadvantage: Costly
- B. Public**—Owned by third-party companies and leased to users
- Access is typically through dial-up circuits.
 - Example: What you use when you go to Starbucks, McDonalds, etc.
 - Advantages and disadvantage: Opposite of private networks
 - Exploding use
- C. Cloud computing/cloud services**— A type of public network. See the separate lesson on cloud computing

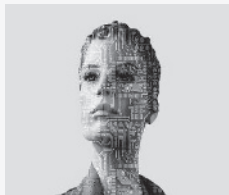
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Network Management Tools (Controls)

- Response time reports
- Downtime reports
- Online monitors
- Network monitors
- Protocol analyzers
- Simple Network Management Protocol (SNMP)
- Help desk reports

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Lesson Quiz: Understanding



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An NIC

- A. is a Novell Interface Controller
- B. is used to control a printer
- C. interfaces a modem to a computer
- D. connects a computer to a network  Yes
- E. is a network indicator capacitor

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Which of the following is most likely to lack both a video display and keyboard?

- A. Ipad
- B. Android
- C. Client computer
- D. Server computer
- E. Tablet computer  Yes

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Client/server security includes which of the following?

- A. Physical security
- B. Change control security
- C. Measures taken to secure all systems
- D. All of the above  Yes

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Which of the following is not a common type of network?

- A. LAN
- B. MAN
- C. SAN
- D. WAN
- E. PAN

← Yes

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This diagram illustrates which type of network?

- A. LAN
- B. MAN
- C. SAN
- D. WAN
- E. PAN
- F. None of the above —this is not a network

← Yes

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Quiz: Understanding

Define "Bluetooth." What is its purpose?

- Bluetooth is a wireless transmission medium. It uses the same radio frequencies as Wi-Fi but with lower power consumption, resulting in a weaker connection. It is used to provide a direct communications link between two devices (e.g., a cell phone and earpiece, a computer and printer).

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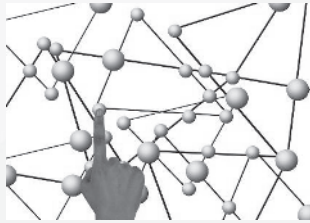
Quiz: Understanding

What is a peer-to-peer network?

- A network system in which all nodes share in communications management.
- No central controller (server).
- Relatively simple and inexpensive.
- Used in LANs.

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Lesson Quiz: Application



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The network that Professor Stone has at his house, which is used by his family (not including Charley, the family dog), is a

- A. LAN
- B. MAN
- C. SAN
- D. WAN
- E. PAN

← Yes

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This is a picture of:

- A. Twisted pair
- B. Fiber optic
- C. Microwave
- D. Bluetooth
- E. Laird
- F. Coaxial cable



Yes

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This is a picture of:

- A. Twisted pair
- B. Fiber optic
- C. Microwave
- D. Bluetooth
- E. Laird
- F. Coaxial cable



Yes

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This picture best matches what type of network:

- A. LAN
- B. MAN
- C. SAN
- D. WAN
- E. PAN



Yes

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This picture best match which type of network:

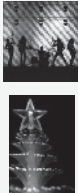
- A. LAN
- B. MAN
- C. SAN
- D. WAN
- E. PAN ← Yes



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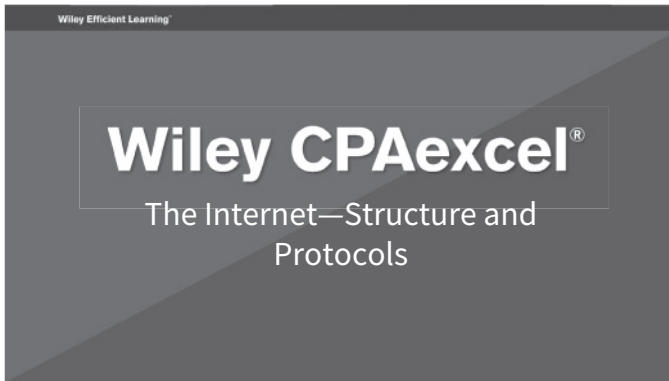
A start-up company seeks to build a wired LAN in its building. Cost is unimportant; security and speed are critical. The company should consider using:

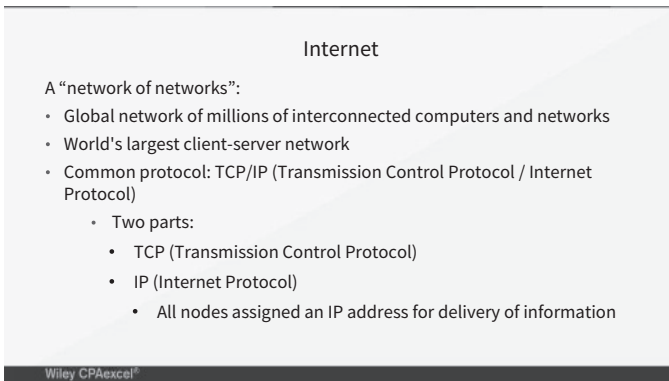
- A. Twisted pair
- B. Twisted sister
- C. Twisted rooster
- D. Fiber optic cable ← Yes
- E. Coaxial cable
- F. A fiber optic Christmas tree

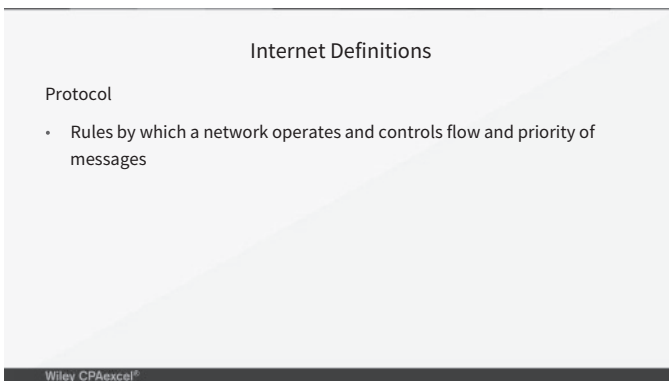


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The Internet—Structure and Protocols







Internet Definitions

Packet (or block)

- Sent files are broken into packets. Each packet contains:
- Header: Routing information (address), length, protocol (maybe), originating info
- Data
- Trailer: Used in some systems. Error detection bits, end of message identifier

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Most Heavily Used Internet Feature (in Organizations)

Email—Two components

1. Mail servers—Hosts that deliver, forward and store mail
2. Clients—Link users to servers. Allow you to read, compose, send, and store email

TCP breaks up sent messages into IP packets

- Sent to a router(s) (sort of an internet postman—delivers packets) and delivered

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Internet

url = uniform resource locator. Web address of a resource (e.g., <http://www.uky.edu/>)

Browser:

- Translates the url to an ip address
- Sends request for URL via HTTP (hypertext transfer protocol)
 - E.g., “http://” says use the HTTP protocol
 - Https:// use a protocol with great (SSL) security
 - Could use “telnet:\” to use telnet protocol to remote connect

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Protocols and Services on the Internet

Simple Mail Transfer Protocol—SMTP

- For email services

Internet Message Access Protocol (IMAP)

- Permits access to remote mailboxes (e.g., on a server) as if they were local (e.g., on a client)

File transfer services (File transfer protocol or FTP)

- For uploading and downloading files

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Protocols and Services on the Internet

Instant messaging (IM)

- Common for informal, internal corporate communications

VoIP—Voice over IP

- For internet-based phone communications

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Markup (or Tagging) Languages

Codes that indicate how parts of a file are to be processed or displayed.

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Important Internet Languages

html (hypertext markup language): Core markup language (way of tagging text for display) for web pages.

XML (extensible markup language): For encoding (tagging) documents in machine-readable form.

XBRL (extensible business reporting language): Your future! XML-based. For encoding and tagging financial information:

- Used in filings with SEC on EDGAR
- Some companies now report their financial statements in both paper and XBRL formats
- Expect to learn much more about XBRL soon

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Example of html

```
<!DOCTYPE html>
<html>
<body>

<h1>My First Heading</h1>

<p>My first paragraph.</p>

</body>
</html>
```

Source: http://www.w3schools.com/html/tryit.asp?filename=tryhtml_intro

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Example of xml

```
<note>
<to>Tove</to>
<from>Jani</from>
<heading>Reminder</heading>
<body>Don't forget me this weekend!</body>
</note>
```

Source: http://www.w3schools.com/html/tryit.asp?filename=tryhtml_intro

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Internet Security: Monitoring Employee Internet Use

Why?

- Detect and/or prevent unauthorized uses
 - Non-work tasks (shopping), legal issues (e.g., child pornography, gaming)
- National security/political control (China, Egypt, U.S.)

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Internet Security: Monitoring Employee Internet Use

How?

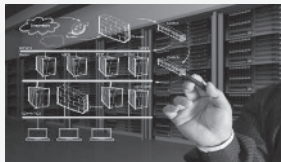
- Packet sniffers (view and capture sent information)
- Desktop surveillance (keystroke + website logging) e.g., Wavecrest

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Internet

Internet Service Providers (ISPs) provide access through either:

- Direct connections to Internet backbone (high speed, high capacity communications line)
 - E.g., Insight cable, Windstream



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Intranets and Extranets

Private (e.g. limited access) networks built using Internet protocols

- Allows access to network resources through web browsers rather than proprietary interface
- Reduces training and system development time
- Rapidly replacing traditional proprietary LANs and WANs
- Easier to use, greater security
- Intranet portal—the entry site (URL) for an intranet

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Intranets and Extranets

Intranets: Available only within organization (business, school, association); intranets are often used to connect geographically separate LANs within a company.



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Intranets and Extranets

Extranets:

- Extend intranet to associates

Examples:

- Suppliers, customers, business partners
- Extend beyond the company “firewall”



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Extending an Intranet to an Extranet

Yes!—Typically use VPN (virtual private network) technology to secure communications

- More in networks lesson about VPNs

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Web 2.0

“2nd generation” - Web-based collaboration and community-generated content using tools like:

Blog— focused discussion or (b)log led by a moderator. Way to share ideas and opinions.

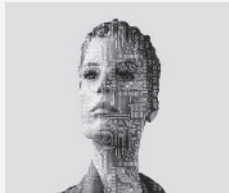
Wiki—Knowledge-sharing collaborative website

Twitter—Micro-variation of a blog with 140 character limit. Often “follow” friends and celebrities.

RSS (Really Simple Syndication)/ATOM Feeds—News and information source by (free) subscription

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Lesson Quiz: Understanding



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Quiz: Understanding

What is "Transmission Control Protocol/Internet Protocol (TCP/IP)."

- Core protocol transmission of the Internet

What is extensible markup language (XML)?

- Protocol for encoding (tagging) documents in machine-readable form

What is extensible business reporting language (XBRL)?

- XML-based protocol for encoding and tagging business information

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Quiz: Understanding

Define "hypertext markup language (HTML)."

- It is the core "markup" language (a way of tagging text) for web pages and the basic building-block protocol for constructing webpages.

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The internet is a

- A. PAN
- B. MAN
- C. LAN
- D. WAN

The world's largest!

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The core protocol for internet communications is:

- A. XML
- B. FFTP
- C. TCP/IP
- D. IMAP
- E. SMTP
- F. HTTP
- G. VoIP

Yes

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_____ are networks that connect people within a company to each other and to the company network.

- A. Extranets
- B. Intranets
- C. Internets
- D. Bitstreams

Yes

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Which of the following is inside the company firewall

- A. Internet
- B. Intranet
- C. Extranet
- D. Geonet
- E. WTFnet

Yes

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A set of rules for exchanging data between two computers is a:

- A. Communicator
- B. Anathema
- C. Antebellum
- D. Protocol  Yes
- E. GeoCache
- F. Transmission speed
- G. WTFnet
- H. ButwomperPlex

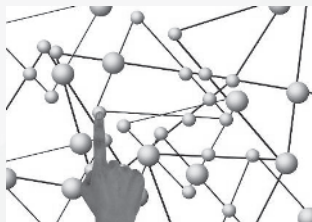
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A webpage is most frequently created using:

- A. Java
- B. C++
- C. Visual Basic
- D. SQL
- E. ERM
- F. HTML or XML  Yes
- G. XBRL
- H. AssetX

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Lesson Quiz: Application



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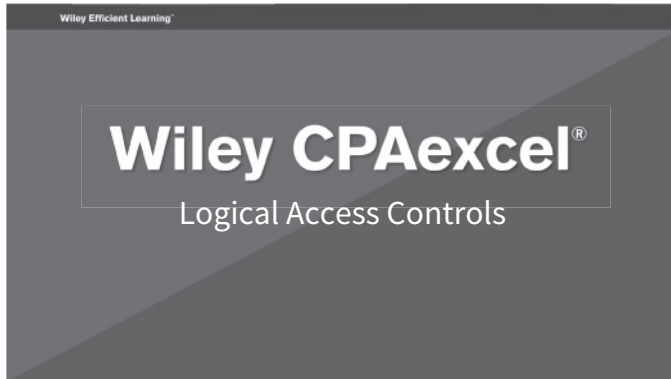
Which of the following would a company likely use when extending an intranet to its business partners?

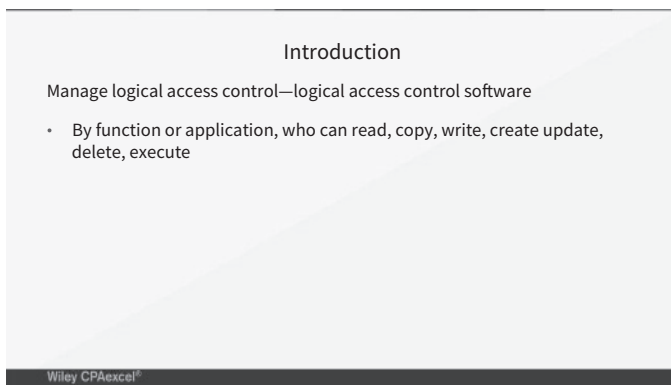
- A. PAN
- B. LAN
- C. Dial-up access
- D. VPN 
- E. MAN
- F. WOMAN
- G. WHENAMANLOVESAWOMAN

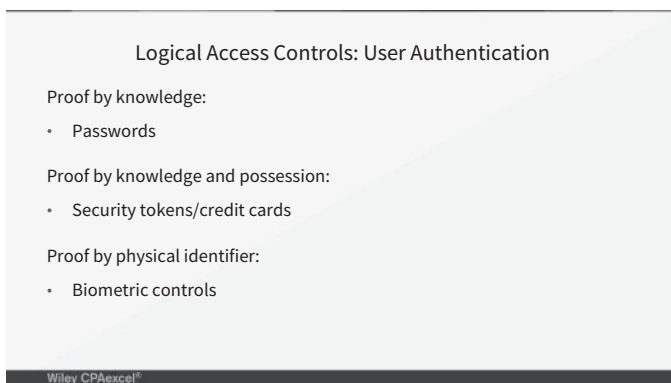
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Logical and Physical Access Control

Logical Access Controls







Logical Access Controls: User Authentication

Proof by mannerism/context

- Touch on the keyboard, time of system use

Increasing use of highly secure systems:

- Multi-factor authentication

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Logical Access Controls: Passwords (Knowledge)

A not so good authentication system:

Need to be **strong** (i.e., impossible to remember—use password manager?)

- Eight or > characters
- Include upper and lower case letters, one numeral and one special character
- Changed periodically (every 3 months?)

Standard: Lockout after three failed attempts with reset

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Logical Access Controls: Security Tokens and Smart Cards

Security token

One-time password (device displays; user inputs device password, user ID, and account password)

New password ~ 30–60 seconds

Smart cards and identification badges

Embedded identification information read by card reader



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Logical Access Controls: Biometric and Multi-Factor Controls

Biometric:

Physical characteristic for access

Examples: thumbprint, retina patterns, voice-print, face

Multi-factor:

Multiple authentication procedures

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Logical (Electronic) Access Controls: User Authorization Matrix

Defines user's access rights based on role

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Security (Challenge) Questions

Should be safe, memorable, stable, definitive

Good

- What was your childhood nickname?
- In what city did you meet your spouse/significant other?

Bad

- What was your favorite sport in high school?
- What is the name of the High School you graduated from?
- What is your pet's name?
- In what year was your father born?

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Identity and Authentication Controls: Outline: Firewalls

What is a firewall?

- Network
- Application
- Personal

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Preventing and Detecting Unauthorized Access: Firewalls

Hardware and/or software to review and filter network traffic
E.g., block noncompliant data packets based on set parameters

Types and levels: Network, Application, Personal



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Preventing and Detecting Unauthorized Access: Network Firewall

On a network (e.g., server)

Filters data packets based on header information (source and destination IP addresses and communication port)

Blocks noncompliant transmissions based on rules in access control list

Very fast (examine headers only)

Forward approved packets to application firewall

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Preventing and Detecting Unauthorized Access: Application Firewall

Characteristics:

- Inspect data packet contents
- Can perform **deep packet inspection** (detailed packet examination)
- Control file and data availability to specific applications

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Preventing and Detecting Unauthorized Access: Personal Firewall

Software enabling end-users to block unwanted network traffic. Usually on a home network or computer.

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Intrusion Detection and Prevention Systems

IDS

- Monitors network use anomalies
- What is unusual—three identification methods
 - Signature-based (stored patterns/sources)
 - Statistical-based (unusual activity—modeling)
 - Neural networks (learns from created database)

IPS

- E.g., honeypot / honeynet—allow hackers access to a decoy system.
- Allows identification and blocking from live systems

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Lesson Quiz: Understanding



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Firewall

- a) blocks internet access
- b) is spam
- c) blocks phishing
- d) filters access to computers
- e) prevents physical damage to computers
- f) performs deep packet inspection



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Authentication, access privilege management, and firewalls improve:

- a) reliability
- b) speed
- c) connectivity
- d) security
- e) storage space
- f) memory
- g) scalability



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Filters mostly based on header information:

- a) Virus
- b) Worm
- c) IPS
- d) Personal firewall
- e) Application firewall
- f) Network firewall



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Deep packet inspection:

- a) Virus
- b) Worm
- c) IPS
- d) Personal firewall
- e) Application firewall
- f) Network firewall



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Quiz: Understanding

Describe some characteristics of a "strong" (i.e., good) password.

- At least eight characters long
- Uses both upper- and lower-case letters
- Uses at least one numeral
- Uses at least one special character (if allowed)
- Changed periodically

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Quiz: Understanding

Define "biometric controls."

- A type of access control in which a physical characteristic is used to gain access instead of a password. Common choices for biometric controls include fingerprint or thumbprint, retina patterns, and voice print patterns. Biometric controls can be very reliable but generally require special input equipment.

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Quiz: Understanding

Why does multifactor authentication increase control?

- All authentication techniques may fail.
- Requiring multifactor authentication procedures—the use of several separate authentication procedures at one time (e.g., user name, password, one-time password, and fingerprint) enhances the authentication process.

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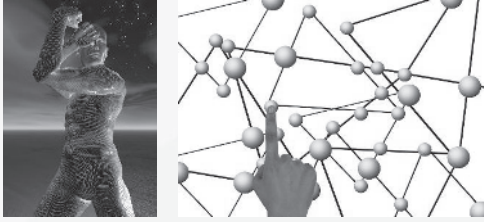
Quiz: Understanding

Describe the operation of "one-time" passwords.

- The "one time" password derives from an algorithm which usually involves the date and time. The user enters this password along with their user name and personal password. Once the computer receives the password, it independently recalculates the password. If the entered value and computed value are the same, the computer recognizes the individual.

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Lesson Quiz: Application



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Which password is strongest?

- a) X
- b) Xx
- c) Xxxxx
- d) XXXXXXXXXXXX
- e) XXXXXXXXXXXXXXXXXXXXXXXX
- f) XXXXXXXXXXXXXXXXXXXXXXXXXXXX
- g) They are all equally strong



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Which password is secure enough for use with a high-risk (e.g., bank) account?

- a) car
- b) cat
- c) rat
- d) carcat
- e) None of the above



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Which password is secure enough for use with a high-risk (e.g., bank) account?

- a) car
- b) cat
- c) 71bZ2dTT71bZ2dTT
- d) carcat
- e) None of the above



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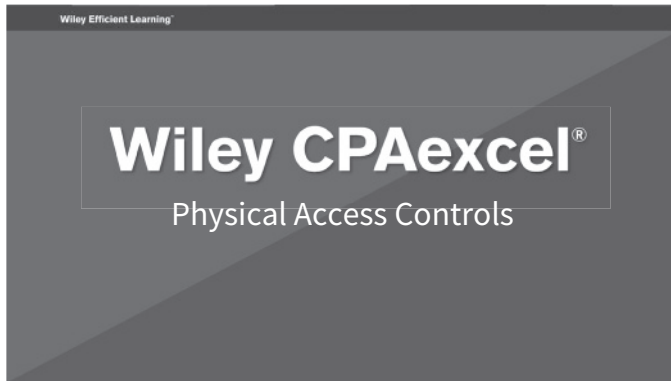
Some accounts allow you to choose a security question. The best security question for your account is:

- a) Mother's maiden name
- b) Are you wearing a shirt
- c) Your first pet
- d) What is the name of a college you applied to but didn't attend?



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Physical Access Controls



What are IT Facilities?

Defined: Computer hardware (CPUs, disk and tape drives, printers, communications devices, etc.), software (program files), data files, computing infrastructure (network communication media and devices) computing rooms and buildings in which they reside.



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What are IT Facilities?

IT facility controls:

All are general controls

Some preventive controls

- Example: restricting access to IT department

Some corrective controls:

- Examples: program and data backup, disaster recovery



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IT Facility Security: Extreme Example

American Airlines/Sabre system

- Built underground facility in Tulsa, 1972
- Expanded and completed in 1987
- Called “The Hole” by employees
- Secrecy:
 - Not listed as a location at company website
 - Zero pictures available on internet (Sabre aggressively removes them)

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Power System Risks

Failure (blackout)

Reduced voltage (brownout)

Sags, spikes, surges

Electromagnetic interference (EMI)

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Environmental Controls

- Alarm control panel
- Water and smoke detectors
- Climate control, humidity
- Fire extinguishers
- Manual fire alarms
- Uninterruptible power supply



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Physical Location

Fire suppression systems appropriate for electrical fires

- Chemical suppressor (Halon no longer used) or water
- Periodic maintenance



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Physical Access

Mainframe/large systems

Restrict access to programs, data files, and computer hardware

E.g., identification badges

Additional restrictions: locks, keypad devices, access card readers, security personnel, and surveillance

Secrecy—keep IT facilities location private



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Logical Access Controls

System Penetration Risk

- “Social engineering”: Seek access by tricking employees
 - May be conducted by “white” or “black” hackers

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Physical/Logical Access Control

Physical Access Risks

- Piggybacking = Unauthorized user follows and uses authorized user credentials
 - Electronic/logical (in a computer lab)
 - Physical (computer room)



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Physical Access

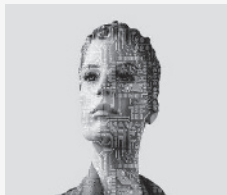
Magnetic disks and tape protection

Set file attributes

Use software to restrict, record, read, write, update

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Lesson Quiz: Understanding



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True / False

All computing facilities should be in an underground bunker with armed guards.

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Which of the following statements is true?

- A. Most physical facility controls are detective.
- B. Most legal access controls are detective.
- C. Most physical facility controls are corrective.
- D. Most physical facility controls are general controls. 

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Following someone into a building is an example of:

- A. Shoulder surfing
- B. Butt hacking
- C. Social engineering
- D. Snagging
- E. Piggybacking / Tailgating 
- F. Wobbly wumping

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CISA exam: Which risk would be reduced by supplementing a proximity card system with a biometric scanner to provide two-factor authentication?

- A. Piggybacking 
- B. Sharing access cards
- C. Failure to log access
- D. Copying of keys

Source: CISA Exam Review Manual

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Quiz: Understanding

Describe four electrical system risks.

- Failure (outage) Reduced voltage (brownout) Sags, spikes, and surges
Electromagnetic interference (EMI)

What purpose does setting file attributes serve?

- This logically restricts the ability of the user to read, write, update, and/or delete records in a file.

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Quiz: Understanding

Define "social engineering."

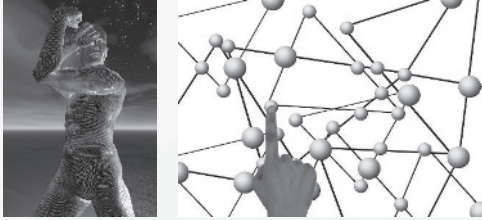
- A set of techniques used by attackers to fool employees into giving them access to information resources

What considerations should be given by an organization regarding fire-suppression systems?

- Such systems are required in IT operations. They need to be appropriate for electrical fires (not halon) and should be inspected periodically.

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Lesson Quiz: Application



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Lesson Quiz: Application

Inigo Montoya is the CEO of “Prepare to Die” Mortuary which services up-scale, wealthy clients who demand (and are dying for) the highest level of security, privacy and protection. Mr. Montoya is considering replacing the existing password system for accessing the mortuary and computer facilities in favor of multi-factor identification that would link with the physical structure of the building (e.g., locks). Explain the benefits of multi-factor identification to Mr. Montoya.

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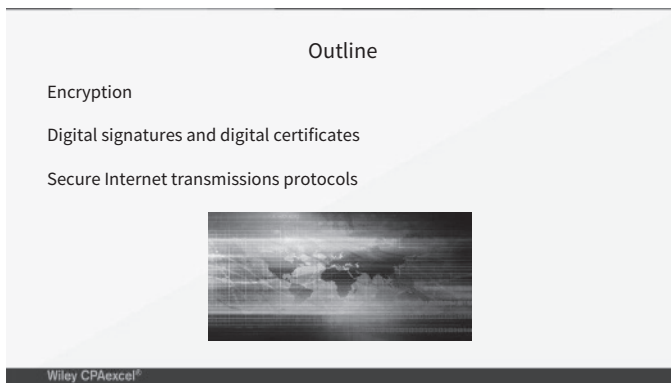
Lesson Quiz: Application

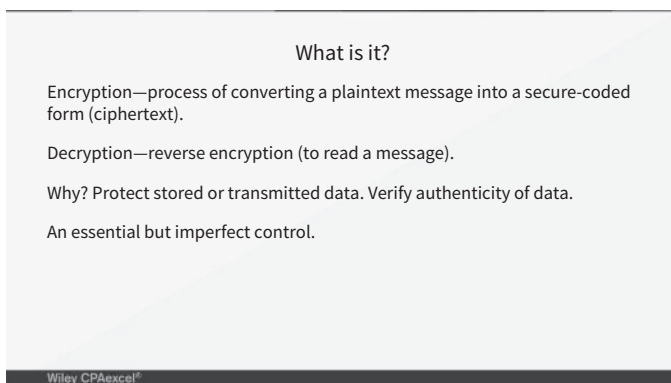
- Multi-factor identification is the state of the art in physical identification
- Many options for this system
- Advantage: can construct factors that best serve the business
- Will need to consider vendors and features that best match the unique demands of this client
- It is feasible and desirable to integrate logical with physical access controls

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Encryption and Secure Exchanges







Essential Elements

Encryption algorithm—Math function

Encryption key(s)—Device or code that makes the message unique. Needed to encrypt or decrypt

- An input or parameter
- Device encryption, e.g., on a laptop, smart phone

Key length—Longer keys are slower but harder to crack

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Preventing and Detecting Unauthorized Access: Encryption

Characteristics

Algorithm to make **information** (called **plaintext**) unreadable (called **ciphertext**) except to those with **key**



Facilitates **privacy** (protect from unauthorized access) and **authentication** (user identification).

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Preventing and Detecting Unauthorized Access: Symmetric Encryption

Single-key or private key encryption

One algorithm to encrypt and decrypt

Sender creates and sends ciphertext, tells which algorithm (key)

Receiver reverses process

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Symmetric (1 Key) Encryption

Most common: Data encryption standard (DES—old) and AES (advanced encryption standard—better!)

Advantage: Fast, simple and Easy. Common in storage archives (i.e., data at rest)

Problem: If sending a message, then sender must communicate algorithm (how? what if intercepted?)

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Preventing and Detecting Unauthorized Access: Asymmetric Encryption

Also called **Public/private-key encryption**

Paired algorithms

- One to encrypt, one to decrypt
- If public encrypts, private decrypts
- If private encrypts, public decrypts

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Asymmetric Encryption

Safer but more complicated (slower)

Common in sending of messages (i.e., data in transit)

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Limits and Future of Encryption

Encryption must be part of comprehensive strategy to achieve confidentiality and security.

- Access controls and strong authentication techniques help, as does limiting, as appropriate, user actions (read, write, change, delete, copy, etc.) when accessing confidential information.

Encryption is an “arms” race with hackers. Emerging strategies:

- “honey” encryption, wrong guesses about encrypting key yield falsified data that looks correct (but isn’t).
- Quantum encryption where data are encrypted using the Alice-in-Wonderland-like qualities of quantum computers. (source: NSF)

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What Is a Digital Certificate?

Electronic document that contains information

Purpose: provide identity and create secure communication

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Preventing and Detecting Unauthorized Access: Asymmetric Encryption

Certificate or certification authority (CA)

Created by Microsoft

To acquire key pair, user applies for CA

CA registers public key on server and sends private key to user

I.e., Additional layer of approval to get key

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Digital Certificates

Legally recognized identification

Uses public/private key technology

Added security: Certificate authority (CA) verifies identity before issuing certificate



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Digital Signatures

Facilitate secure exchanges (e.g., E-commerce)

Digital signatures:

- Use public/private key pair to authenticate sender
- Weakness: public/private key pair can be acquired without verification

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Secure Internet Transmissions Protocols

Memorize terms and abbreviations

All use some form of asymmetric encryption

- **SSL** (Secure Socket Layer)
- **S-HTTP** (Secure Hypertext Transport Protocol)
- **SET** (Secure Electronic Transactions) protocol

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Secure Internet Transmissions Protocols

Secure sensitive data using an encryption protocol:

#1 **SSL** (Secure Socket Layer)

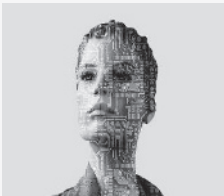
#2 **S-HTTP** (Secure Hypertext Transport Protocol)

#3 **SET** (Secure Electronic Transactions) protocol

Common for internet **consumer purchases**

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Lesson Quiz: Understanding



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The _____ is the original message before transformation.

- A) Ciphertext
- B) Plaintext 
- C) Secret-text
- D) None of the above

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The _____ is the message after transformation.

- A) Ciphertext 
- B) Plaintext
- C) Secret-text
- D) Giggle bits
- E) None of the above

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A combination of an encryption algorithm and a decryption algorithm is called a _____.

- A) Cipher
- B) Secret
- C) Key 
- D) None of the above

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A(n) _____ algorithm transforms ciphertext to plaintext.

- A) Encryption
- B) Decryption 
- C) Either (a) or (b)
- D) Neither (a) nor (b)

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In a(n) _____ cipher, the same key is used by both the sender and receiver.

- A) Symmetric-key
- B) Asymmetric-key
- C) Either (a) or (b)
- D) Neither (a) nor (b)



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In a(n) _____ cipher, a pair of keys is used.

- A) Symmetric-key
- B) Asymmetric-key
- C) Either (a) or (b)
- D) Neither (a) nor (b)



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In an asymmetric-key cipher, if the sender uses the private key, then the receiver uses _____ key.

- A) Private
- B) Public
- C) Either (a) or (b)
- D) Neither (a) nor (b)



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In an asymmetric-key cipher, if the sender uses the public key, then the receiver will use the _____ key.

- A) Private 
- B) Public
- C) Either (a) or (b)
- D) Neither (a) nor (b)

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A digital signature provides _____.

- A) Authentication
- B) Nonrepudiation
- C) Both (a) and (b) 
- D) Neither (a) nor (b)

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A digital signature cannot provide _____ for the message.

- A) Integrity
- B) Confidentiality 
- C) Nonrepudiation
- D) Authentication

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Which of the following issues private and public keys?

- A.) Certificate Authorities (CAs). 
- B.) Secure Electronic Transaction (SET).
- C.) Firewall.
- D.) Secure Sockets Layer (SSL).
- E.) None of the above.

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Quiz: Understanding

Define "encryption."

- Process of coding data so that the data cannot be understood without correct decryption algorithm

Identify the two Internet protocols typically used for secure Internet transmission protocols.

- SSL (Secure Sockets Layer)
- S-HTTP (Secure Hypertext Transport Protocol)

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Quiz: Understanding

Describe how digital certificates work.

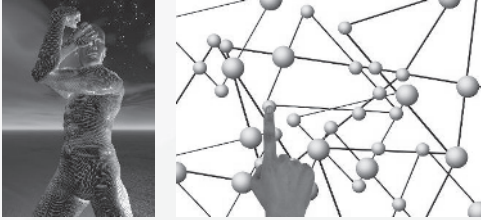
- Provide legally recognized electronic identification of sender and verify the integrity of message content. Based on public/private key technology (like digital signatures).

Describe asymmetric encryption (also called public/private-key encryption and private-key encryption).

- Uses paired encryption algorithms to encrypt and decrypt text:
- If public key encrypts, private key decrypts. If private key encrypts, public key decrypts.

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Lesson Quiz: Application



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I bank online. Which of the following are common application-level encryption protocols that I most likely use to bank securely?

- A.) SSL and SET
- B.) Verisign and SHA1
- C.) READY, SET, and GO
- D.) PGP, PEM, and SSL
- E.) GiggieWomper, Banker\$Bucks and StarSign

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I bank online. Which of the following are common application-level encryption protocols that I most likely use to bank securely?

- A.) SSL and SET 
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- D.) PGP, PEM, and SSL
- E.) GiggieWomper, Banker\$Bucks & StarSign

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Lesson Quiz: Application

“Doctor Livingston, I Presume” Health Care is considering its obligations under HIPAA, i.e., the *Health Insurance Portability and Accountability Act*. HIPAA grants health providers “safe harbor” in the event of a breach of protected health information if the provider has implemented “appropriate” encryption of data. The law leaves the specifics of implementation up to providers. Discuss the relative advantages and disadvantages of symmetric and asymmetric encryption in relation to protected health information data.

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Lesson Quiz: Application

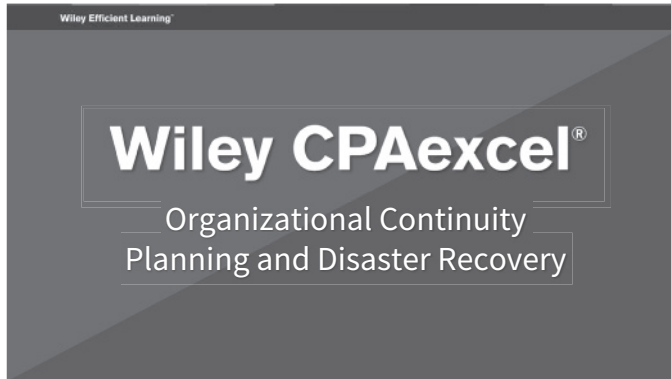
Symmetric → simple, fast, and less secure. Best application is “data at rest” e.g., data archives.

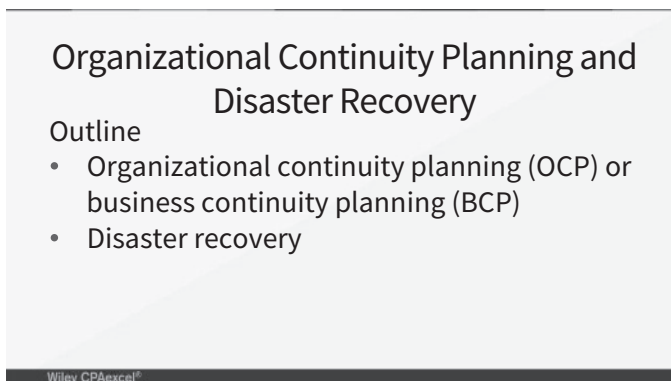
Asymmetric → more complex, slower, and more secure. Best application is often “data in transit”. A better option for all data if security is more important than cost and complexity.

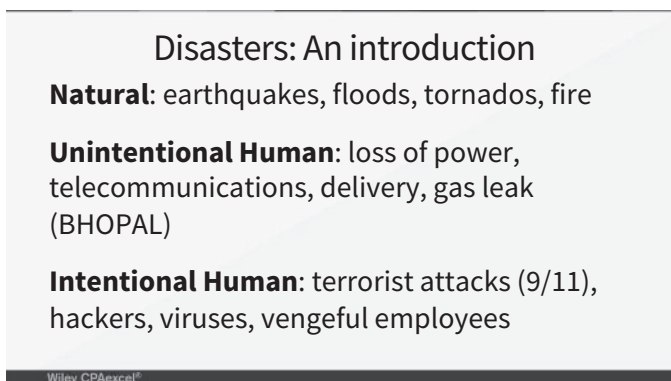
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System Disruption/Resolution

Organizational Continuity Planning and Disaster Recovery







Disasters: TEPCO + The Fukushima

Reactors

Natural* Human

- **Earthquake** → Plant shuts down, diesel generators cool radioactive material
- **Tsunami** → Sea walls too low → shuts down diesel generators → radioactive material released



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Vendors Want to Help You with Data Backup and Recovery:

- [DEVSource](#)
- [Rackspace Hosting](#)
- [Kaufman/Rossin](#)



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Disaster Recovery Planning

If disruption

- Recovery point objective—acceptable data loss
- recovery time objective—acceptable downtime (e.g., 0–24 hours)
- Determining: criticality of application, cost, time to recover, security

Contracting for disaster recovery—complex and important

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Disaster Recovery: Backup Facility Types

Cold site: no computers (\$)

Warm site: computers no data (\$\$)

Hot site: everything (\$\$\$)

Mirrored site: fully redundant (\$\$\$\$)

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Disaster Recovery: Cold Site

Off-site location with electrical and other physical requirements for processing

No equipment or files (added when needed)

1–3 days start-up

Cheaper



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Disaster Recovery: Warm Site

Off-site location with similar computer hardware

Does not include backed-up data (delivered when needed)

More \$



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Disaster Recovery: Hot Site

Completely equipped including data

Near-immediate
(within hours) operation

Big \$\$\$ (e.g., medical,
credit card systems)



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Mirrored Site

Fully redundant, fully staffed, fully equipped

Real-time replication of mission critical
systems

E.g., credit card processing

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Organizational Continuity Planning and Disaster Recovery

Outline

- Organizational continuity planning (OCP) or business continuity planning (BCP)
- Disaster recovery

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Organizational Continuity Planning

Purpose:

- Identify and plan for disruptions
- Integrate into business culture
- Recall risk management lesson / discussion (CGIC)—Integrate OCP into risk management

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Terminology

BRM = business risk management ~ = ORM

BCP = business continuity planning

OCP = organizational continuity plan

- Process of risk assessment, contingency planning, and long-term continuity maintenance

BIA = business impact analysis

- Risk analysis portion of BCP

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OCP and BCP

Steps:

1. Create a OCP policy and program.
2. Determine critical functions / business risks.
3. Determine continuity strategies.
4. Develop and implement BCM response.
5. Exercise, maintain, and update plan.
6. Embed BCM plan into the culture.

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Incident Management

Map level of incidents to events to responses

- E.g., 0 = negligible event (e.g., power spike),
7 = crisis (pandemic virus and WTC attack)
- Responses mapped to level of incidents

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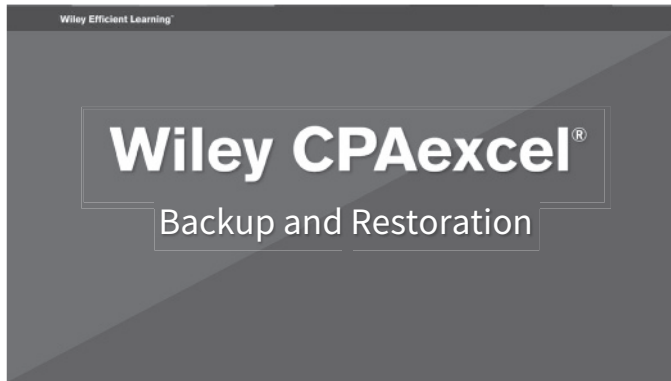
Organizational Continuity Planning and Disaster Recovery

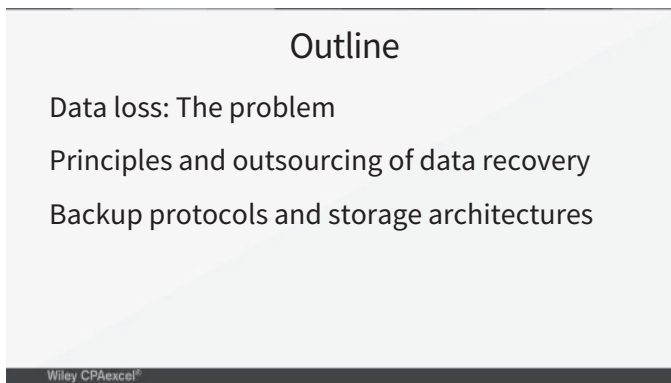
Outline

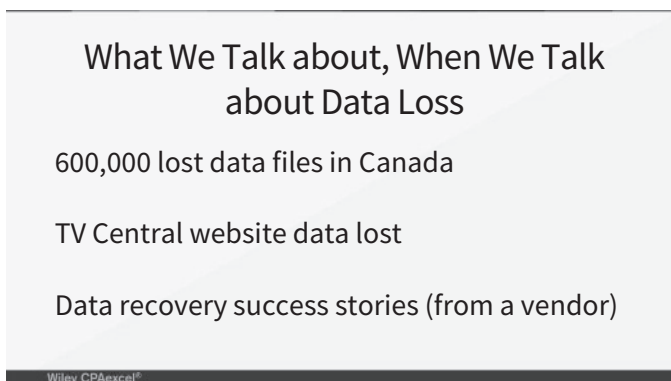
- Organizational continuity planning (OCP) or
business continuity planning (BCP)
- Disaster recovery

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Backup and Restoration







Backup Plans

Plan for data back-up

- Recover from equipment failures, power failures and errors.
- Maintain at least one remote archive off-site.
- Use redundant (multiple) backups (the “Whack-a-Mole” plan).



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Backup Plan—Principles

Where did things get screwed up?

Return to a known clean data set

Process transaction

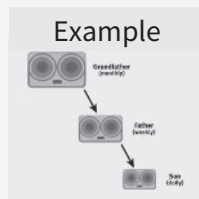
Generate current clean data set

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Backup Procedures: Archive Procedures —Old School

“Grandfather, father, son” system:

- Son newest
- Father one generation old
- Grandfather two generations old
- Batch processing



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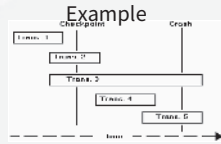
Backup Procedures

Checkpoint and restart:

Common in **batch processing**

Checkpoint:

- **Point where processing accuracy is verified**
- Periodic backups
- If problem, **return to most recent checkpoint** and restart



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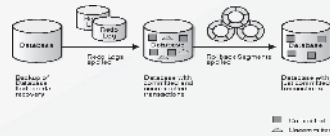
Backup Procedures

Rollback and recovery:

Common to online,
real-time processing
Record processing
transactions in log

Periodically record master file contents

If problem, return to good master file and reprocess
subsequent transactions



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Network-Enabled Backup Procedures

Fault tolerant systems: operate despite component failure (include redundancy and corrections for component failure)

- e.g., space flight, ecommerce, bank credit card processing



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Network-Enabled Backup Procedures

High-availability clusters (HACs): Computer clusters designed to improve service availability: common in e-commerce



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Network-Enabled Backup Procedures

Remote (online) backup by managed provider

Advantages: automated, outsource to experts, off-site, can be continuous



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Network-Enabled Backup Procedures

Storage Area Networks (SANs):

Replicate data from multiple sites

Data immediately available

Efficient storage for servers



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Network-Enabled Backup Procedures

Mirroring:

Maintain **exact copy** of data set

Files are stored in same format as system (e.g., not zipped)

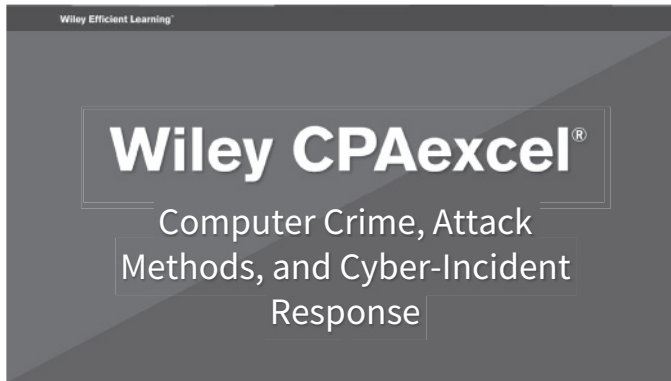
Advantage: Very fast

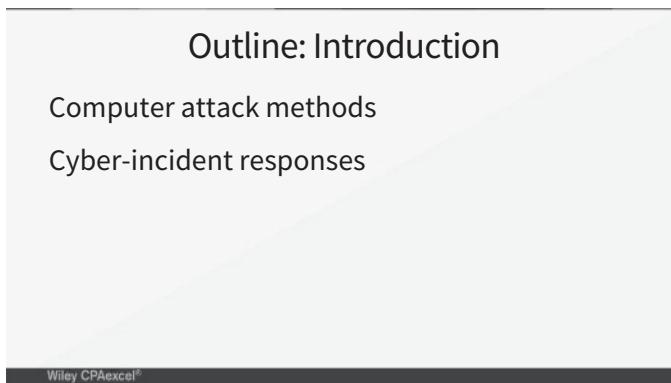
Disadvantage: Storage hog (\$\$\$)

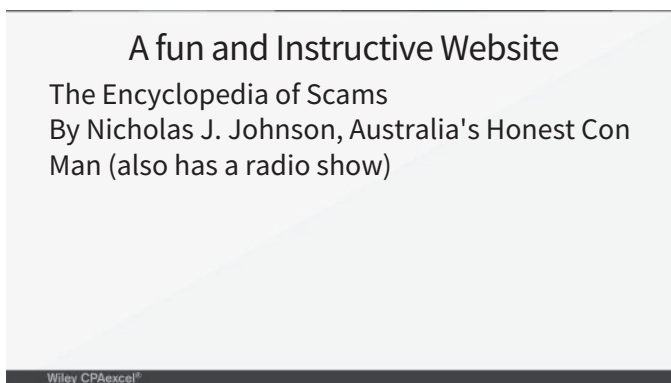


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Computer Crime, Attack Methods, and Cyber-Incident Response







Computer Attack Methods

- Back door
- Botnets
- Denial of Service (DoS)
- Eavesdropping
- Email bombing
- Logic bomb
- Malware
 - Examples: viruses, worms, Trojan Horse
- Packet sniffing
 - Ex: Man-in-the Middle
- Password crackers
- Session hijacking and masquerading
- Salami fraud
- Social engineering/spoofing
 - Example: phishing
- Spam
- War chalking, driving, walking

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Computer Attack Methods

Back door:

- Software allowing unauthorized entry to system by **omitting logon**
- Once common among programmers to facilitate development



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Denial of Service Attacks

Prevent legitimate users accessing system

How?
Flood server with incomplete access requests

Often use **botnets**
(zombie computers)



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Computer Attack Methods

Eavesdropping—Unauthorized interception of private communication

Email bombing or spamming—Sending thousands or millions of emails to an address

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Computer Attack Methods

Logic bomb: program planted in system **dormant until event or time** (e.g., date, employee deleted from active status)



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Malicious Software (malware)

Exploit system and user vulnerabilities to gain access or damage computer

Examples:

Virus: unauthorized program that **copies itself**; may damage data



Worm: Virus that **replicates across systems**; e.g., by sending email floods

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Preventing and Detecting Unauthorized Access: Virus and Spyware Detection Software

- To detect and remove malware
- Essential to networked computing
- Should always be active and up-to-date



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Privacy and Security Risks: Malicious Software (malware)

Trojan horse:
Program hidden inside
benign file; can insert
back door (see earlier)
into system



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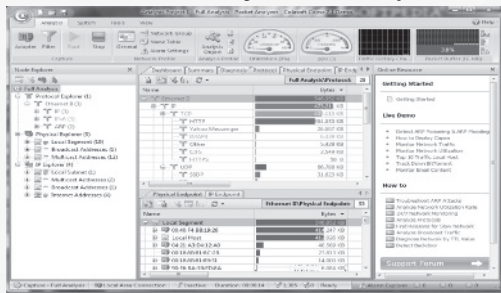
Identity and Authenticity Risks: Packet Sniffing

Packet analyzers, network
analyzers, and sniffers

- Have network control (legitimate) and data capture (nefarious) uses

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Packet Analyzer Example



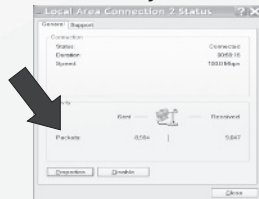
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Identity and Authenticity Risks:

Packet Sniffing

Packet = formatted block of data carried by a computer network

Packet sniffing = capture packets of data as they move across a network



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Man-in-the-Middle Attack

Example of packet sniffing

Hacker impersonates sender and receiver.

Relies on attacking mutual authentication

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Privacy and Security Risks: Password Crackers

Generate potential passwords and test to gain access

Finds weak password easily. Example:



Lists **users**
and **passwords**

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Identity and Authenticity Risks: Session Hijacking and Masquerading

Internet Protocol (IP) address—unique identifying number for each device on a networked system

Hacker can identify IP address (e.g., packet sniffing) and use to access network

Masquerade = hacker mimics legitimate user

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1. Host A Computer broadcasts ARP request asking which MAC address belongs to 192.166.3.350

2. Attacker forges a response before Host B (IP Address 192.166.3.350) can respond

3. Host A begins sending data intended for Host B computer to the Attacker

Salami Fraud (Slicing)

A favorite of movie plots: “Salami slicing has played a key role in the plots of several films, including *Superman III*, *Hackers*, *Entrapment*, *I Love You Phillip Morris*, and *Office Space*.” (Wikipedia)

Transfer tiny amounts (a penny or less) from a large number of accounts

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Social Engineering

Seek access by tricking employees

Physical—Discussed in the physical access control lesson. Example: piggybacking

Logical—E.g., phishing

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What is Phishing? (One Form of Social Engineering)

Fishing for personal information

“Spoofed” emails and fraudulent websites fool recipients into divulging personal financial data such as credit card numbers, account usernames and passwords, social security numbers, etc.

- Resource: Anti-Phishing Working Group
www.antiphishing.org/

Barbara J. Fullerton & Sabrina I. Pacifici

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Example of Phishing

From: Customer Support [mailto:support@citibank.com]

Sent: Thursday, October 07, 2004 7:53 PM

To: Dan Stone

Subject: NOTE! Citibank account suspend in process

Dear Customer:

Recently there have been a large number of cyber attacks pointing our database servers. In order to safeguard your account, we require you to sign on immediately. This personal check is requested of you as a precautionary measure and to ensure yourselves that everything is normal with your balance and personal information. This process is mandatory, and if you did not sign on within the nearest time your account may be subject to temporary suspension. Please make sure you have your **Citibank(R) debit card number and your User ID and Password at hand**. Please use our secure counter server to indicate that you have signed on, please click the link below: <http://211.158.34.249/citifi/>. Note that we have no particular indications that your details have been compromised in any way. Thank you for your prompt attention to this matter and thank you for using Citibank(R).

Regards,

Citibank(R) Card Department

Barbara J. Fullerton & Sabrina I. Pacifici

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Annual Tax Phishing

U.S.—Computer Emergency Readiness Team (CERT)

- Annual: Watch for tax season phishing campaign
- E.g., small businesses—Your tax payment didn't go through. Need to resend your EFT to IRS (actually, our phony website)

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Spam

Irrelevant or inappropriate email (or text or whatever messaging system comes next) messages sent to either:

- A large number of recipients
- The same recipient many times (email bombing)

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War Chalking, Driving and Walking

War chalking—Draw symbols in public places to indicate available Wi-Fi network access.

War driving—Seeking access to Wi-Fi while driving.

War walking—Seeking access to Wi-Fi while walking. May lead to war chalking.

In the old day: War dialing—dialing random phone #s to find network access.

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Cyber-Incident Response

A violation of organization's security policy

Response based on organizational protocol

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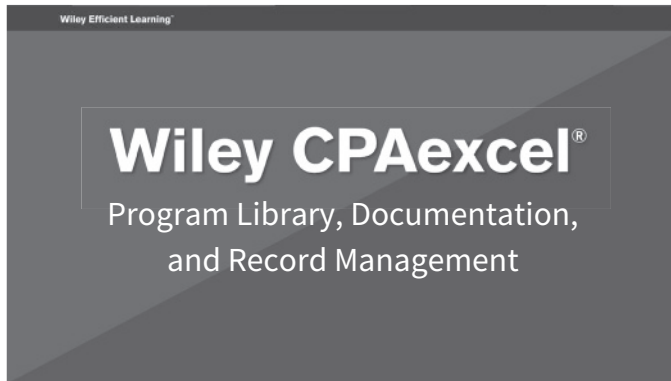
Cyber-Incident Response—Process

- Planning for and testing protocol
- Event detection procedures
- Event logging procedures
- Triage and incident analysis
- Containment and removal of threats
- Decision and action regarding event announcement or secrecy
- Incident recovery
- Closure
- Event reporting
- Monitoring and system revisions

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Processing Integrity (Input/Processing/Output Controls)

Program Library, Documentation, and Record Management



Source Program Library Management System (SPLMS)

- An essential change control (remember COSO?)
- Software *and* instructions for people.
- For new or changed programs, SPLMS manages migration from application development test environment to production library.
- SPLMS controls and validates program changes by comparing new to old code.



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Source Program Library Management System (SPLMS)

Four functions:

1. Store programs in the SPL (source program library)
2. Retrieve programs for updating and maintenance
3. Delete obsolete programs
4. Audit trail: document program changes

May be part of operating system or purchased separately

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Documentation—Why Document Accounting Systems?

Required:

1. By law, for example in the Foreign Corrupt Practices Act, and SOX
2. To build and evaluate complex systems
3. For training
4. For creating sustainable/survivable systems
5. For auditing (internal and external)
6. For process (re)engineering

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Types of Documentation

System

Program (also called “technical” by programmers)

Operator

User



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System Documentation

Overview of program, data files, processing logic, interactions with other programs and systems.

May include requirements, architecture and design.



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Program Documentation

Detailed description of inputs, logic, and outputs.

Includes program flowcharts, source code listings, record layouts.



Operator Documentation

Also called "run manual"

How to load and execute programs and data

Includes needed equipment, files, supplies, commands, error messages





What Type of Control is Documentation?

General or application?

Preventive, detective, or corrective?





General



Preventive

Record Retention and Destruction

Organizational policy and plan should dictate retention and destruction.

Obviously must follow applicable law and regulation (e.g., health care, criminal, credit check records).

A control risk: Failure to properly retain or destroy electronic documents.

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Lesson Quiz: Understanding



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Quiz: Understanding

What is program documentation?

- Detailed analysis of input data, logic, and output of software.
- Includes program flowcharts, source code listings, and record layouts.

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Quiz: Understanding

List six reasons why organizations document their accounting systems.

1. Required by law
2. facilitate building and evaluating complex systems
3. facilitate training
4. improve system survival and sustainability
5. enable system audits (e.g., trails)
6. enable process reengineering

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Quiz: Understanding

What is system documentation?

- Provides overview of program and data files, processing logic, and interactions with other programs and systems.
- Often includes narrative descriptions, flowcharts, and data flow diagrams.

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Quiz: Understanding

Define "source program library (SPL)."

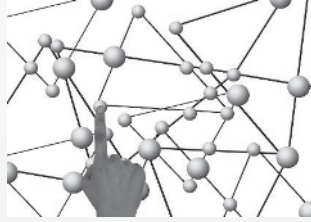
- The library of source code computer programs.
- Secures and separate these programs from live programs.
- Critical to the internal control system and to change management.

Define "source program library management system (SPLMS)."

- Functions include storing, retrieving, and deleting programs and documenting by whom, when, where, and how programs are changed.

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Lesson Quiz: Application



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Lesson Quiz: Application

Arthur "Boo" Radley likes to write computer code and he is very, very good at it. So good, in fact that a video game (Boo and the JayHacks) that he has written is now generating several million \$ in revenue each year for Mocking Jay Video Games. Mocking Jay is a start-up company, run by four video gamers that you've been asked to consult with regarding their accounting system. They are seeking financing to expand their operations. When you ask Boo about the documentation for his code, he shrugs and looks at his shoes. When you ask the other gamers in the company, they say "whatever man."

Why is it important to Mocking Jay to have adequate documentation of its best-selling games and of its accounting system?

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Lesson Quiz: Application

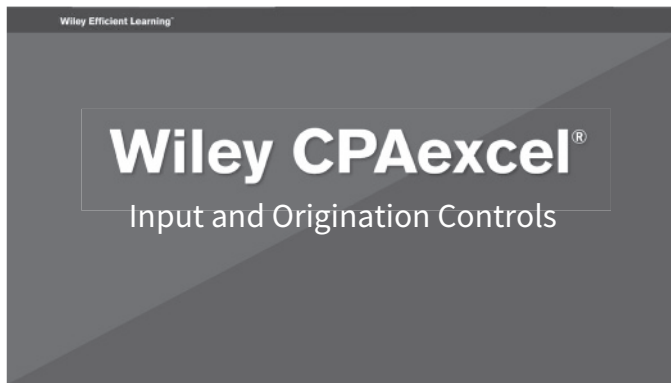
Company needs structure and accounting help.

Reasons to document:

1. Investors are unlikely to fund the company if the systems are undocumented
2. Build and evaluate complex systems
3. For training —new programmers
4. Creating sustainable/survivable systems —what if a programmer gets sick or leaves
5. For auditing (internal and external)
6. For process (re)engineering —changing and updating programs

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Input and Origination Controls



Learning Objectives

1. Describe the most important input application controls.
2. Match input controls to the risks that they will mitigate.
3. Give examples of the risks of inadequate input controls.
4. Explain the difference between input and origination controls.

Input and Origination Controls

- Ensure reliability of application program data and processes.
Understanding enables auditor to assess risks if absent or weak.
Some may function as input or processing controls (e.g., control totals).
Best "input" control is often to automate data entry, i.e., to not have (manual) input.
- Hence, growing use of term "origination" instead of "input."

Origination: Scanning Instead of Human Entry

Goals: Accuracy, Completeness, Efficiency

Example: Bar code (e.g., point-of-sale) scanners



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Audit (Control) Input Goals (EVAC)

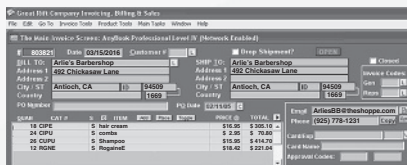
	Definition	Examples
Validity (V)	Input data are approved and represent actual economic events and objects.	1. Input data represent actual (not fictitious) transactions. 2. Only receipts supported by an actual check are input.
Completeness (C)	All valid events are entered.	All customer payments are input.
Accuracy (A)	Valid events are correctly entered.	Customer and invoice information are entered correctly.
Efficiency (E)	Input is done using minimal resources.	Scan instead of hand enter.

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OLRT (Online Real-Time) Systems Control: Closed Loop Verification

Use entered data to display additional (confirming data).

Goals: C (all data entered), A (entered data accurate), E



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Application Controls: Input

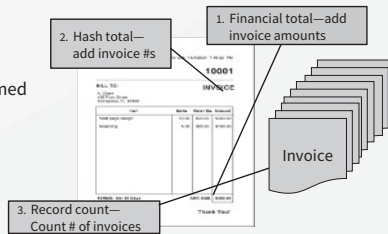
Examples Mostly Found in Batch Systems

Batch control total

- Financial total (\$)
- Hash total normally summed

Record count

- Goal: C, A



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Application Controls: Input

Examples found in both batch and OLRT systems:

- Automated data capture
- Check digit (discussed previously) (Goal: A)
- Sequence check
- Key verification
- Missing data check
- Field check (data type/data format check)
- Limit test
- Range tests
- Sign tests
- Valid code test (validity test)
- Reasonableness check (logic test)
- Preprinted forms and preformatted screens
- Default values

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Application Controls: Input

Sequence check: Confirm numerical sequence (of check or invoice numbers)

- Usually automated but may be manual

Goals:

- C (all valid are included)
- V (no invalid are included)



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Application Controls: Input

Key verification: Rekey (reenter) and compare critical data.

- Example: Require password entry twice.

Goal: Validity

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Completeness or Missing Data Check

Data in field? Can't continue until data is entered. **Goal:** Completeness

The screenshot shows a software window titled "Create Bill Company Invoicing - Billing & Sales". It contains a form for "The Matti Import Company: Anydesk Professional Level 10 (Network Assistant)". The form has several sections: "Customer ID" (000001), "Ship To" (Arlie's Barber Shop), "Address 1" (492 Chickasaw Lane), "Address 2" (492 Chickasaw Lane), "City / ST" (Antioch, CA 94509), "Country" (1669), "PO Number" (000001), and a table of items. The table has columns for "ITEM", "QTY", "PRICE", and "TOTAL". The items listed are: 18 CPU, 24 CPU, 26 CPU, and 12 NONE. The interface also includes a "Print" button and a "Close" button.

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Application Controls: Input

Field check (data type/data format check): Is data of correct type?

Examples: alphabetic, numeric, n characters

Goal: Accuracy

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Application Controls: Input

Limit tests: Numeric field with specified value(s)

Goals: Validity and accuracy

- **Range test:** Validate upper and lower limit
 - Example: Price per gallon of gas $\$2 < x < \$10$
- **Sign test:** # has correct sign (+ or -)
 - Example: # purchased > 0

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Application Controls: Input

Valid code test (validity test): Does entered account # exist? In database, called **referential integrity**

Goals: Validity and accuracy

Reasonableness check (logic test): Do two or more fields agree?

Example: Don't allow pay rate = "\$3,500" and Pay Period = "Hourly."

Goals: Validity and accuracy

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Application Controls: Input

Preprinted forms and preformatted screens:

↓ data entry errors, speed data entry

Goals: A, C, E

Default values:

Presupplied data values for fields.

Example: sales order date = current date

Goals: A, E

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Why are input controls more important than processing and output controls?

- Garbage in, garbage out (GIGO).
- If bad data enters the system, nothing good will come out the other end

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Lesson Quiz: Understanding

How does closed loop verification improve data input?

- Helps ensure valid and correct entry.
- E.g., after customer's account code entered, the system displays additional information about the selected customer.

Define "hash total."

- Totals of a field, usually an account code field, for which the total has no logical meaning, such as a total of customer account numbers in a batch of invoices.

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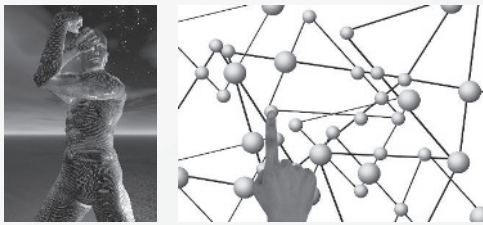
Lesson Quiz: Understanding

Define "automated data capture."

- Automated equipment, such as bar code scanners, to reduce manual data entry. Reducing human involvement reduces errors.

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Lesson Quiz: Application



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Lesson Quiz: Application

Lemony Snicket Publishing is considering moving to an automated document processing system in which accounting system documents and entries are automatically entered and routed, as specified in the system.

Why are such systems increasingly popular?

What are their virtues and benefits?

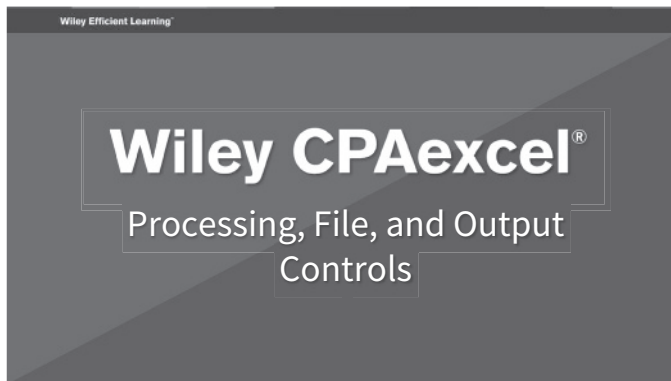
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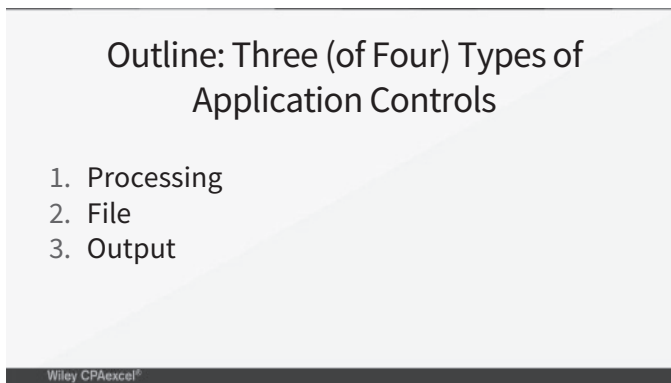
Lesson Quiz: Application

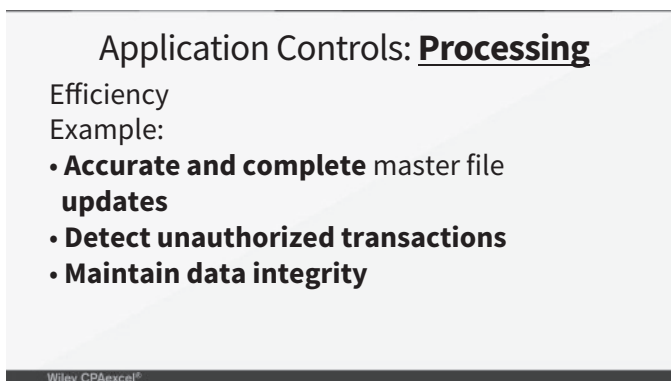
- Desirable to automate control processes where feasible.
- Automated data entry processes are more efficient and effective.
- Not clear what the applications or even the data are in this case.
- Mechanical processes are better (more efficiently) managed by computer systems than people.
- Technologies for such systems are improving rapidly (cheaper and more accurate).

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Processing, File, and Output Controls



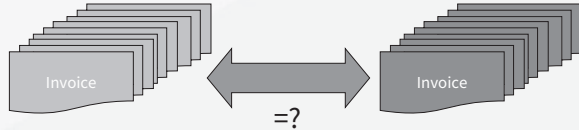




Application Controls: Processing (and Input)

Used in batch processing:

Run-to-Run Controls: Use batch totals (see input controls) to agree the batch from one procedure (run) to another



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Application Controls: Processing

Used mostly in OLRT processing:

Audit Trail Control:

- Transaction log = electronic audit trail

ID	Terminal	Seq	Type	Status	Trans ID	Doc ID	Doc Type	Doc Date	Doc Time
001	1234	00000001	100	OK	101	001	001	001	001
002	1234	00000002	100	OK	102	002	002	002	002
003	1234	00000003	100	OK	103	003	003	003	003
004	1234	00000004	100	OK	104	004	004	004	004
005	1234	00000005	100	OK	105	005	005	005	005
006	1234	00000006	100	OK	106	006	006	006	006
007	1234	00000007	100	OK	107	007	007	007	007
008	1234	00000008	100	OK	108	008	008	008	008
009	1234	00000009	100	OK	109	009	009	009	009
010	1234	00000010	100	OK	110	010	010	010	010
011	1234	00000011	100	OK	111	011	011	011	011
012	1234	00000012	100	OK	112	012	012	012	012
013	1234	00000013	100	OK	113	013	013	013	013
014	1234	00000014	100	OK	114	014	014	014	014
015	1234	00000015	100	OK	115	015	015	015	015
016	1234	00000016	100	OK	116	016	016	016	016
017	1234	00000017	100	OK	117	017	017	017	017
018	1234	00000018	100	OK	118	018	018	018	018
019	1234	00000019	100	OK	119	019	019	019	019
020	1234	00000020	100	OK	120	020	020	020	020

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Transaction Logs (Processing and Output)

May include data values, time, terminal number, IP address, user name

Importance

- Goals: Accuracy, completeness, validity
- Backup and recovery: Essential to checkpoint and restart, and rollback and recovery systems

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File Types

Master files
 Standing files (rarely changed master files)
 Transaction files
 System control parameter files

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Hardware Controls

Examples:

1. Check digit (parity bit)
2. Read after write check
3. Echo check
4. Boundary protection



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Hardware Controls: Parity Check

Also called parity bit (one form of a check digit)

0 or 1 included in byte to indicate if sum bits = odd or even

Example:

- Parity bit = 0 if sum = odd, 1 if sum = even
 7 bits: 0011010 → add a 0 as the 8th bit (sum (3) is odd), complete byte is: 00110100
 7 bits: 1011010 → add a 1 as the 8th bit (sum (4) is even), complete byte is: 01110101

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Hardware Controls: Read after Write Check

Verifies that data was correctly written to disk

How? Read and compare to source

Mostly used in local file operations

Example
in Windows

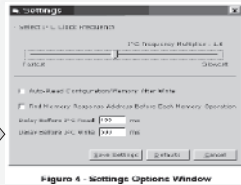


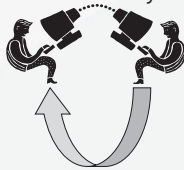
Figure 4 - Settings Options Window

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Hardware Controls: Echo Check

Echo check: Verify transmission by "echoing back" received transmission to sender

Primary use = telecommunications systems



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Hardware Controls: Boundary Protection

With multiple programs and/or simultaneous users

Prevents one program from overwriting data and instructions of another program



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Additional File Controls

- Internal labels—read by system (for removable storage)
- External labels—read by humans
- Version controls—protocols for ensuring use of the correct file version
- File access and updating controls—procedures to restrict file updates and access to authorized users

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Application Controls: Output

Control:

- Transaction logs of printed output (built into most systems)
- Access to sensitive reports through permissions and access controls (e.g., authorization matrix—see data controls lesson)

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Access Control (Outputs): Spooling Print Files

“Spooling” print files

- Send files to queue for printing, in order sent

Control issue: sensitive output

- E.g., sensitive product sales data
- E.g., require printer password entry before file is printed
- E.g., printed files are held by data control clerk for pickup

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Accounting System Cycles

The Accounting System Cycle: Introduction

Wiley Efficient Learning™

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The Accounting System Cycle:
Introduction

Introduction: What is the accounting cycle?

Accounting system accumulates and reports information on financial position of an entity.
The term “accounting cycle” is used in two different ways:
1. To categorize business and accounting activities.
2. A set of accounting procedures to accumulate and report financial information.

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The Accounting Cycle as a Set of Accounting Procedures

The simple way to characterize accounting cycle.
Usually learn in first accounting class.

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The Accounting Cycle as a Set of Accounting Procedures

Competent, timely execution of the following:

1. Analyze transactions and business documents
2. Journalize transactions
3. Post journal entries to accounts
4. Determine account balances and prepare a trial balance
5. Journalize and post adjusting entries
6. Prepare financial statements and reports
7. Journalize and post-closing entries.
8. Balance the accounts and prepare a post-closing trial balance
9. Repeat

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Another, Simple Way to Characterize Accounting Cycle

As data processing steps:

- Data capture (input)
 - steps 1 and 2 and the journalizing parts of steps 5 and 7
- Data storage and data processing
 - steps 3 through 5, and, 7 and 8
- Information output and reporting
 - step 6

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Accounting Cycles as Categories of Activity

More complicated, and interesting, view of accounting cycle.

Typically learned in introductory accounting systems.

Business activities as paired, give-get exchanges.

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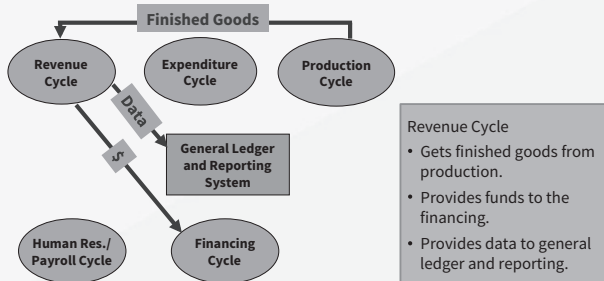
Accounting Cycles as Categories of Activity

Basic exchanges typically grouped into five major transaction cycles:

- Revenue cycle—Interactions with customers (give goods; get cash).
- Expenditure cycle—Interactions with suppliers (give cash; get goods).
- Production cycle—Give labor and raw materials; get finished product.
- Human resources/payroll cycle—Hire, utilize, and develop labor; give cash and benefits.
- General ledger, reporting, financing cycle—Give cash; get cash; report financial outcomes.
- Diverse transactions across cycles; similar transactions within a cycle.

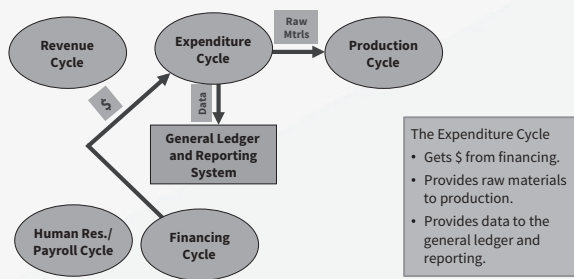
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The Revenue Cycle

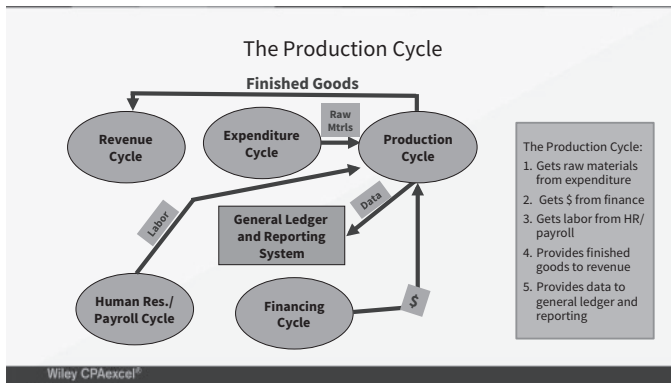


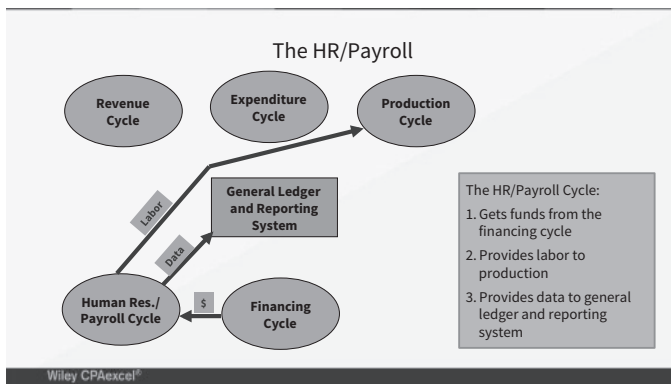
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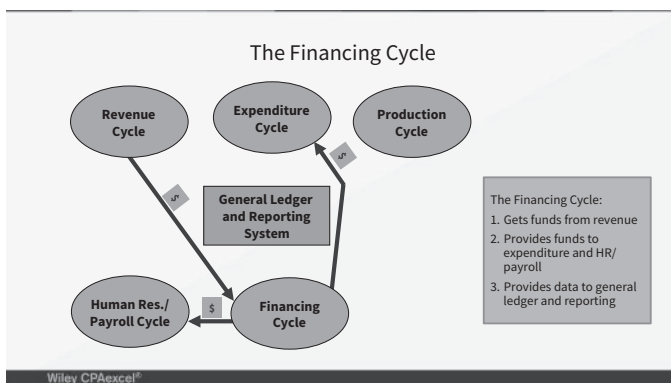
The Expenditure Cycle

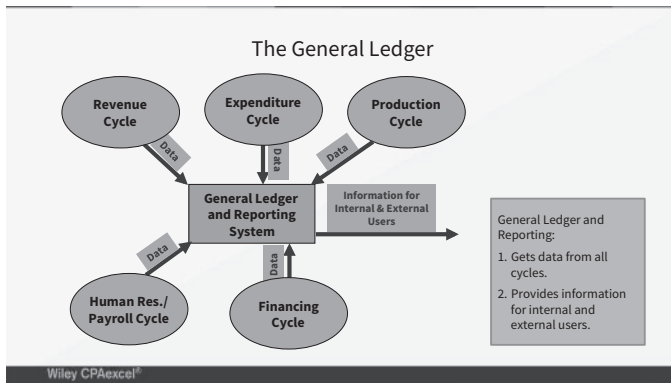


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But It's More Complicated Than That

Implementation of each transaction cycle can differ significantly across organizations.

Accounting software packages implement transaction cycles as separate modules.

- Different ERP systems group differing activities together into cycles.

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But It's More Complicated Than That

Not every organization needs every module. E.g., retail companies don't have a production cycle

Some organizations need extra modules.

- E.g., a not-for-profit organization, or a medical services company may have a "revenue" cycle that looks very different from that of a retailer or manufacturing company.



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Common Risks Across Cycles

Loss, Alteration, or Unauthorized Disclosure of Data

- Discussed in several other BEC lessons. E.g., file backups, file labels, access controls, modification of default settings on ERP systems to increase security; encryption, and secure transmissions.

Accounting system is not functioning as required by law, regulation, or organizational policy

- This risk, and related controls, are discussed in the lessons on monitoring internal controls.

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Control Goals Across Cycles

Completeness—All:

- Transactions are properly authorized
- Recorded transactions are valid
- Valid and authorized transactions are recorded
- Transactions are recorded accurately

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Control Goals Across Cycles

Safeguarding—Assets are safeguarded from loss or theft

Efficiency—Business activities are performed efficiently and effectively

Compliance—The organization complies with all applicable laws and regulations

Reporting—All financial disclosures are full and fair

Data Integrity—Accurate data is available when needed

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Accounting cycle"

- Systematic process of recording and processing financial transactions and events.
- A way of categorizing similar business and accounting activities.

Define "The human resources/payroll cycle"

- Records activity related to employees and payroll.
- Gets funds from the financing cycle, provides labor to the production cycle, and provides data to the general ledger and reporting system.

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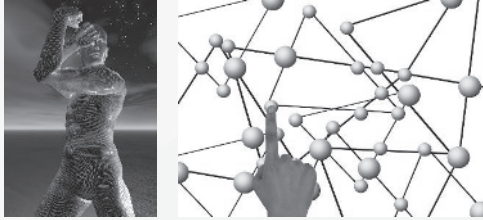
Lesson Quiz: Understanding

What is the "The financing cycle"?

- Gets funds from the revenue cycle, provides funds to the expenditure and HR/ payroll cycles, and provides data to the general ledger and reporting system.

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Lesson Quiz: Application



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Lesson Quiz: Application

Ignatius Reilly, raconteur and restaurateur, owns The Confederacy of N'Awlins restaurant chain. Presently, the restaurant's accounting system consists of Reilly's cousin (Jumpin' Jack) whose accounting competence is dubious, a pile of receipts, and a Radio Shack hand calculator, found on a filthy desk underneath empty whiskey bottles and cigarette butts. In a rare moment of clarity, Mr. Reilly calls and asks you about how the basic process and system of accounting works. You decide to introduce the accounting cycle, as a series of activities, or steps, to Mr. Reilly.

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Lesson Quiz: Application

- Been there, done that, with clients like this
- Tactfully suggest the need for more accounting expertise
- Sell your services!
- Explain the risks of no accounting system:
 - Loss, Alteration, or Unauthorized Disclosure of Data
 - Accounting system is not functioning as required by law, regulation, or organizational policy

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Lesson Quiz: Application

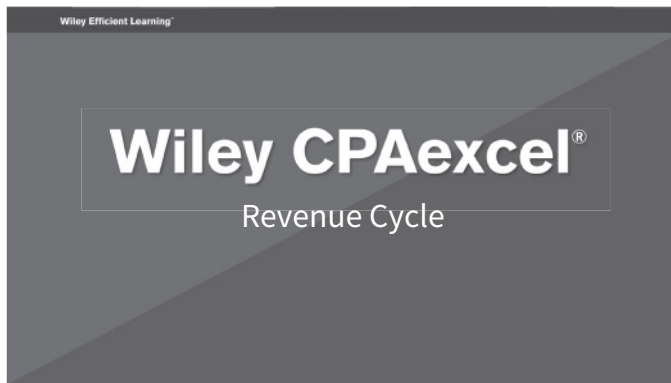
Relate this specifically to the restaurant business, i.e., a focus on production of meals and high-quality service.

The process:

1. Analyze transactions and business documents
2. Journalize transactions
3. Post journal entries to accounts
4. Determine account balances and prepare a trial balance
5. Journalize and post adjusting entries
6. Prepare financial statements and reports
7. Journalize and post-closing entries.
8. Balance the accounts and prepare a post-closing trial balance
9. Repeat

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Revenue Cycle



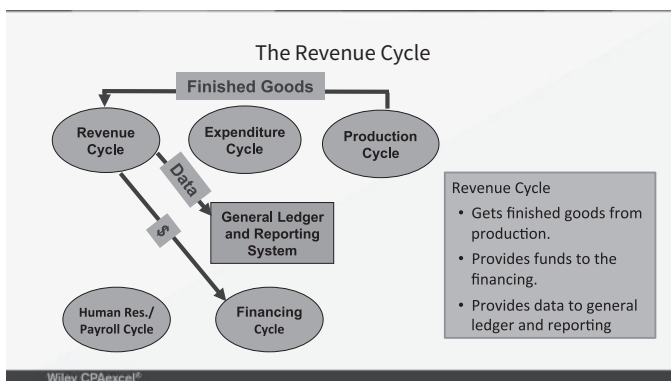
Money Makes the World Go Round

Businesses sell goods or services. Non-profit organizations solicit and receive donations.

These are core activities of revenue cycle.

Sell items (or receive pledges for donations) and to collect payments (on receivables or pledges).

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Revenue Cycle: Core Activities

Sales

- Receive customer orders (see lesson on “emerging issues in AIS” related to emerging payment systems).
- Approve customer credit/sales authorization.

Physical (or Virtual) Custody of Products or Services

- Fill the order and prepare for shipping (if a physical merchandise).
- Ship or deliver the product.

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Revenue Cycle: Core Activities

Accounts Receivables

- Bill (if needed)
- Manage receivables (e.g., returns and allowances, determine collectability of accounts)

Cash

- Collection and receipt of payments
- Reconciliations

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Inherent Risks of the Revenue Cycle

Is that revenue real? Revenue recognition

Are those receivables collectible?

Customer returns and allowances

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Is that Revenue Real? Revenue Recognition

To recognize in financial statements, revenue must be realized (or realizable) and earned.

Many revenue cycle frauds concern booking faked revenue or booking revenue prematurely. Typical fraud prematurely record revenue (e.g., the MiniScribe Corp. fraud).

Another fraud: Creation of fictitious customers who “buy” things (hence the goods are taken) but don’t pay for them.

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Are those Receivables Collectible?

Estimating the collectability of receivables is subjective. Where subjectivity exists, management may err in its self-interest.

An important revenue cycle fraud is “sales” to fictitious customers where the receivables are then written off.

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Customer Returns and Allowances—Appropriate?

E.g., estimating returns and allowances, particularly for new products or technologies, requires subjective estimates

- See earlier point about the direction of estimation errors (often in management’s favor)

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Relevant Stakeholders

- Customers—whose role is to buy products or services
- Establish that customers exist receive credit appropriately
- Outbound logistics providers—ship goods to customers

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Important Revenue Cycle Forms (in Electronic Systems), Documents (in Paper Systems), and Files

- See table
- Vocabulary word: “lading” as in “bill of lading”
- Archaic noun—the action or process of loading a ship or other vessel with cargo.
 - Used in a sentence —“After much sweat and toil, and Bill dropping a crate on his foot, the lading of the cargo ship was complete, and it set sail for New Jersey.”

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Important Revenue Cycle Files, Forms and Documents

File, Form or Document	Purpose	Comments and controls
Customer or sales order	Document order, including items, prices, and stock numbers	Point of sale documentation
Credit Check files	Document granting or denial of credit	Review for compliance, accuracy and completeness
Aged trial balance	Document receivables and give evidence of collectability	Are receivables collectable? Are they timely?
Picking list (physical goods)	Items to be pulled from warehouse	Increasingly automated and use bar code or RFID tagging
Packing list (physical goods)	Contents to be shipped	Increasingly automated and use bar code or RFID tagging

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Important Revenue Cycle Files, Forms and Documents

File, Form or Document	Purpose	Comments and Controls
Bill of lading (physical goods)	Specify terms of shipment.	Helps determine date goods were sold (cutoff). Can match goods to bill of lading to confirm receipt
Customer invoice	Client's bill	Useful in documenting existence of customer and receivable.
Remittance advice	Help match payments to invoices	Sent by customer to selling company to indicate payment
Customer statements (monthly)	Document orders and payments	Determine billings and collections (accuracy and existence).

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Accounting and Business Risks in the Revenue Cycle

- Sales issues
- Customer abandons order before completion
 - See “Emerging Technologies in AIS” lesson
 - Incomplete or inaccurate customer orders
 - Automate data entry.
 - Data input controls
 - Authorization, e.g., password or biometrics control
 - Input controls (see separate lesson)

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Accounting and Business Risks in the Revenue Cycle

- Sales issues
- Faked sales or sales inconsistent with policy
 - Controls include appropriate authorization and evidence
 - Required evidence of existence of customer
- Controls—confirmation and review of customer files

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Receivables and Account Collection Issues

Grant credit to undeserving customers, e.g., with poor credit

- Hire vendors to determine credit status. E.g., credit card and bank cards are examples of this strategy.
- Segregation of duties: credit-granting process is independent of sales.

Cash only businesses reduce sales by reducing uncollectible receivables

Failure to bill customers—Controls include:

- Segregation of duties in shipping and billing functions.
- Sequentially pre-numbered sales orders, enables identification of missing sales orders when matching to billings.
- Picking tickets, packing slips, and sales invoices.

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Receivables and Account Collection Issues

Receivables inappropriately written off

- Segregation of duties—Someone independent of sales and cash receipts authorized to write off accounts
- Access to terminal/system to write off accounts restricted by password, device or biometrics

Pricing based on price list master file

- Confirm accuracy of price lists (can be complicated)
- Check quantities on packing slip against quantities on sales order
- Bar code and RFID scanners to eliminate data entry and other errors

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Shipping Issues

Shipping errors—Ever receive the wrong item from eBay or Amazon? Were you happy?

Controls include:

- Online shipping systems that check quantities shipped; bar code scanners and radio-frequency identification (RFID) tags to record picking and shipping.
- Application controls, e.g., field checks and completeness tests.

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Cash and Cash Receipt Issues

Theft and loss of cash—this is not good

Controls include:

Segregation of duties

- e.g., two people opening e-mails/mail together
- remittance data sent to accounts receivable clerk, while cash and checks are sent to the cashier

Prompt documentation and restrictive endorsements of remittances.

Reconcile total credits to accounts receivable total debits to cash.

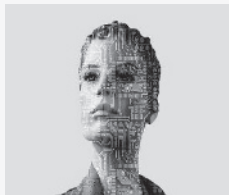
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Cash and Cash Receipt Issues

- Sending remittance list to independent party (internal auditing) to compare with validated deposit slips and bank statements
- Monthly statements to customers
- Cash registers that automatically record cash received
- A daily deposit of all remittances in the bank
- Independent bank reconciliations

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Bill of lading"

- Specify terms of shipment. Legal document between the shipper (e.g., company that makes a product) and the carrier detailing the type, quantity and destination of carried goods. Also, a receipt for shipment when the goods are delivered.

Define "Aged trial balance"

- Document time of sale of receivables and give evidence of collectability.

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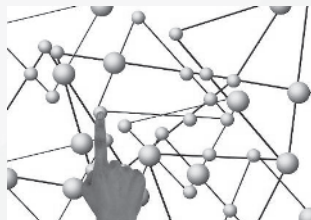
Lesson Quiz: Understanding

Define "Remittance advice"

- Sent by customer to selling company to indicate payment.
- Helps match payments to invoices.

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Lesson Quiz: Application



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Lesson Quiz: Application

“She sells seashells by the seashore” is a wholesale mail order business that is owned and run by Sheila and Shelley Shiling. The good news is that sales are great. The bad news is that most of the sales are on account, and, most of the accounts receivable are more than 90 days past due. What questions would you ask Sheila and Shelley to determine why the receivables may be past due?

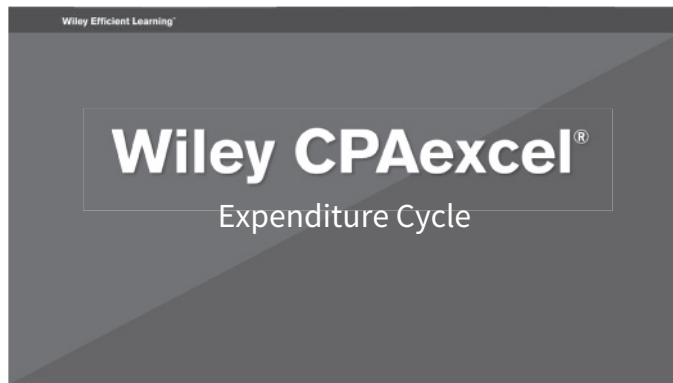
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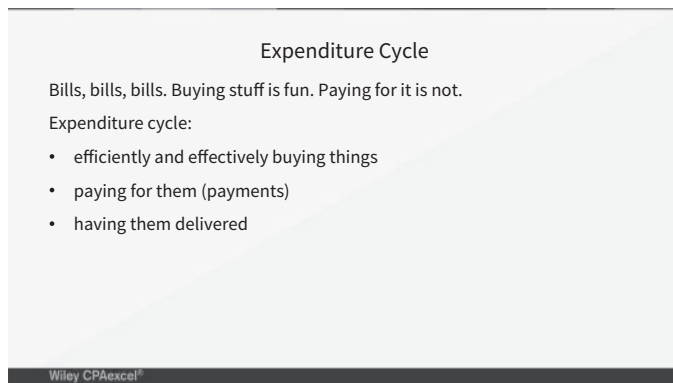
Lesson Quiz: Application

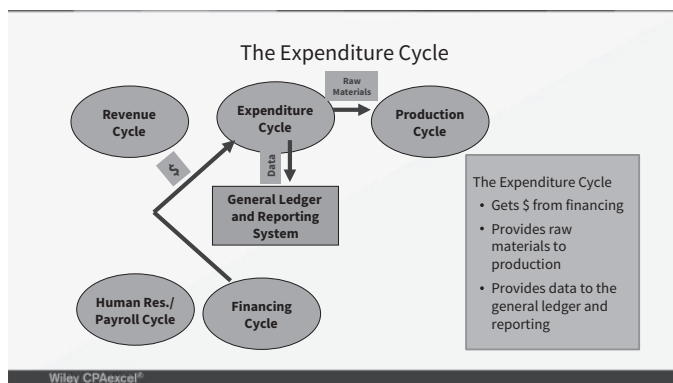
- How do you determine who can buy on account?
- Who grants credit? Who makes the sales? Are salespeople on commission?
- Who is billing the customers?
- Describe the billing process to me.
- Who is receiving the collections? Who is depositing the collections?
- Please show me a list of customer accounts, including contact information.

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Expenditure Cycle







Core Activities

Request and Authorize Purchase

- Request goods and services
- Authorize purchase

Acquire goods

- Purchase goods/services

Take Custody and pay for goods

- Receive goods and services
- Disburse cash

Return needed? If so, do and document it.

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Inherent Risks

We buy something. Should we capitalize or expense it?

- E.g., WorldCom fraud included capitalizing expenses (i.e., inappropriately recording expenses as assets).

Do we have unrecorded liabilities?

- E.g., do we have obligations (e.g., loans) to major shareholders or officers that are unrecorded?

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Relevant Stakeholders

Suppliers—supply products or services

- Establishing that suppliers exist and that bills are legitimate and accurate

Inbound logistics providers—deliver needed goods or services, e.g., Fed Express, Air Express, rail companies

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Important Forms (in electronic systems), Documents (in paper systems) and Files

File, Form or Document	Purpose	Comments and controls
Check or e-check	Pay vendor for what we bought	Often automated for small amounts. Larger amounts require more authorization
EFT (electronic funds transfers)	Documented through payment system	Only authorized EFTs are processed
Purchase order or requisition	Specify items ordered, freight terms, shipping address, + other info	Formally requests supplier to sell and deliver products

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Important Forms (in Electronic Systems), Documents (in Paper Systems) and Files

File, Form or Document	Purpose	Comments and controls
Vendor invoices	Request payment from customer	
Voucher or voucher package	Purchase order and receiving report	Indicates accounts debited and credited, who authorized
Open purchase orders	Purchases not yet received (and therefore not yet recorded)	Useful in testing for liabilities, recorded and unrecorded

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Important Forms (in Electronic Systems), Documents (in Paper Systems) and Files

File, Form or Document	Purpose	Comments and controls
Receiving report	Were goods received and in good condition? An inspection report.	Document receipt and condition of goods received.
Accounts (Vouchers) Payable Balances	Who do we owe? What do we owe them?	Useful in testing for liabilities, recorded and unrecorded

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Accounting and Business Risks and Controls

Request and Authorize Purchase

- Cash through vendor frauds (usually) perpetrated within the organization
 - Control vendor creation

Ordering unneeded or authorized goods or services

- Require formal process for purchasing E.g., of unauthorized purchasing of cloud computing services
- Integrated system (ERP) should track all orders and receipts

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Accounting and Business Risks and Controls

Acquire goods

- Purchasing Goods at Inflated Prices/of Inferior Quality / from Unauthorized Suppliers/that include kickbacks ("gifts" from suppliers to purchasing agents)
 - Require purchasing agents to disclose relationships
 - Use only approved suppliers
 - Control system specifies acceptable relationships to and gifts from suppliers
 - Periodic review (monitoring) of purchases and purchase orders

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Accounting and Business Risks and Controls

Take Custody

- Receiving Unordered or defective Goods
- Errors and Omissions in Counting Goods Received
- Receiving invoices for goods never ordered or received

Controls

- Separation of duties in receipt of goods
- Automated receiving system (bar code or RFID scans)
- Automated matching and monitoring of purchase order to goods received

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Accounting and Business Risks and Controls

Pay for goods

- Errors in Vendor Invoices (usually in their not your favor)
- Paying the Same Invoice Multiple Times
- Paying for Goods Not Received
- Recording and Posting Errors in Accounts Payable

Controls:

- Matching of received items to vendor invoices/budgetary controls and monitoring of costs compared to expected costs
- Using voucher system to authorize payment of invoices that are tracked through inspection process

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Accounting and Business Risks and Controls

Failing to Take Available Purchase Discounts

- Automate payment processes/monitor discounts taken and foregone.

Misappropriating Checks, E-checks, Cash, or EFTs

- Segregation of duties for payment preparation and approvals/vendor creation controls/processing controls over EFTs/see input, processing controls lessons.

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Accounting and Business Risks and Controls

Return of goods needed? If so, do it and document it.

- Tracking returns, particularly in retail sales, can be critical. Some major frauds through purchasing goods and returning them, in collusion with employees, to both get a refund and the goods.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Procurement"

- The act of obtaining or buying goods and services. The process includes preparation and processing of a demand as well as the end receipt and approval of payment.

Define "Capitalize"

- An accounting method used to delay the recognition of expenses by recording the expense as a long term asset.

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Lesson Quiz: Understanding

Define "Kickbacks"

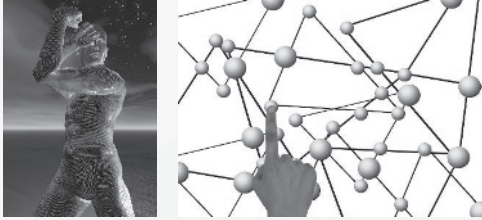
- Illegal payment to a recipient as compensation or reward for providing favorable treatment.

What are "Open purchase orders"?

- Purchases not yet received (and therefore not yet recorded).

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Lesson Quiz: Application



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Lesson Quiz: Application

“She sells seashells by the seashore” is a wholesale mail order business that is owned and run by Sheila and Shelley Shiling. Sheila has found that many of the goods that they order for sale are never received or are damaged when received. In addition, Sheila believes that the business is paying bills for invoices for goods received to companies who have never sold goods to “SSSBTS”. What questions would you ask to determine why these problems may be occurring?

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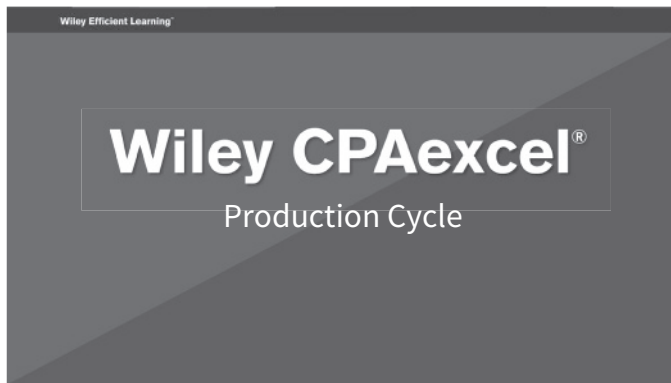
Lesson Quiz: Application

A starter list of questions:

- Who receives the goods? How do you record what is received?
- Who pays for goods?
- How is the receipt of goods documented?
- How are goods received linked to the invoices (bills) for them?
- Who is able to set up vendor accounts?
- How do you choose vendors?
- What is the process used to set up vendor accounts?

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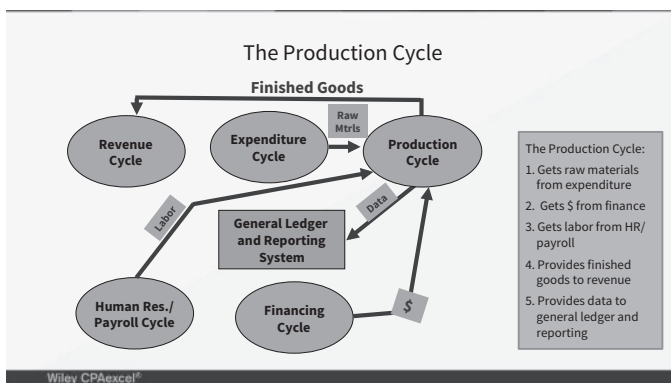
Production Cycle



Production Cycle

- Some organizations make physical goods and hold them in inventory, potentially as raw materials, goods in process, or finished goods.
- Production cycle is concerned with manufacturing physical products.
- Some aspects also apply to virtual (digital products).
- Include fixed asset management in this cycle.

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Core Activities

Forecast sales / Plan production/Product Design/Authorize production

- Manufacturing resource planning (MRP) and just-in-time (JIT) manufacturing systems help forecast materials needs and plan production.
- Master production schedule (MPS) specifies how much and when to produce.
- Production order authorizes manufacturing.

Move raw materials into production

- Materials requisition authorizes moving materials from storeroom to production.

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Core Activities

Production process:

- Receive raw materials into production.
- Production processes vary greatly by product and level of technology:
 - Computer-integrated manufacturing (CIM) use IT to automate production process.
 - Many production processes partially or fully integrated with robotics, i.e., the use of robots to execute production tasks.

Manage cost accounting processes:

- See the CPAexcel BEC lessons related to cost accounting
- Complete production process and deliver goods.

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Inherent Risks

Inventory manipulations

- Many frauds built on inflated or falsified inventory values.
- E.g., Phar-Mor Drugs fraud —> overstating inventory values and profits.

Inventory mark-downs

- E.g., has obsolete inventory been written down to its true (reduced) value? Do we have monitoring processes for periodic reviews?

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Relevant Stakeholders

Production workers—make the stuff that we sell

- Mostly discussed in HR cycle

Raw materials suppliers

- As in the expenditure cycle, establish that suppliers exist and that bills are legitimate and accurate

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Important Files, Forms and Documents

File, Form or Document	Purpose	Comments and controls
Bill of materials	Specifies part number, description and quantity of each component	Match goods produced to detect over or under use of materials.
Master Production schedule	Plan indicating how and when to produce	Result from sales forecasts, and production design and planning
Materials Requisition or Materials Transfer Ticket	Authorize moving raw materials from storeroom to production	Match to physical materials received

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Important Files, Forms and Documents

File, Form or Document	Purpose	Comments and controls
Move Tickets	Identify parts to be transferred, their destination, and the time of transfer.	May be a part of a scanning or RFID system
Operations list	Sequence of steps in making a product	Used in complex production processes
Inventory reports	For raw materials, goods in process, finished goods	May be online or (less often now) on paper

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Accounting and Business Risks and Controls—Inventory

Managing inventory levels to avoid stock outs (lost sales) and too much inventory (carrying costs)

- Increasing use of just-in-time methods (See CPAexcel BEC Inventory Management lesson)
- Inventory control and sales forecasting systems; online, real-time inventory systems; periodic physical counts of inventory
- regular review of sales forecasts and adjustment

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Accounting and Business Risks and Controls —Inventory

Inventory theft or destruction—controls include:

- Physically securing inventory and restricting access
- Documenting inventory transfers
- Releasing inventory for shipping only with approved sales orders
- Accountability—employees handling inventory should sign the documents or enter their codes online to ensure accountability
- Wireless communication and RFID tags provide real-time tracking
- Periodic counts of inventory, increasingly by RFID tags (a near continuous control)
- Insurance (self-insurance or third-party)

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Accounting and Business Risks and Controls —Fixed Assets

Major asset acquisitions are approved and supplied by approved vendors

- Major asset acquisitions approved by board (or top management, as appropriate) and properly controlled through capital budgeting techniques

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Fixed Assets Exist, are Properly Valued, and Haven't Been Stolen or Abused

- Detailed records document assets and accumulated depreciation.
- Depreciation properly calculated and posted.
- Retirements approved by appropriate management.
- Property disposition follows approved procedures.
- Physical control and security over assets.
- Periodic physical inspection of plant and equipment by individuals independent of property, plant, and equipment (e.g., internal auditors).

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Accounting and Business Risks and Controls —Fixed Assets

Written policies for capitalization versus expensing decisions exist, and are followed and monitored.

Under or over-investment in fixed assets

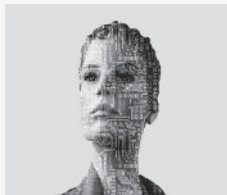
- System for monitoring fixed asset ownership, warranties, repairs that links to production planning
- Budgetary system integrates with fixed asset system

Fixed asset theft or destruction

- See control list related to theft or destruction of inventory—many of these procedures are relevant for fixed assets

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Manufacturing resource planning (MRP)"

- An integrated information system used by businesses. Manufacturing resource planning evolved from early materials requirement planning systems by including the integration of additional data, such as employee and financial needs.

Define "Just-in-time (JIT)"

- A manufacturing system in which materials or components are delivered immediately before they are required in order to minimize inventory costs.

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Lesson Quiz: Understanding

Define "Master production schedule (MPS)"

- Specifies how much of each product to produce and when to produce it.
- Define "Computer-integrated manufacturing."
- Use of IT to fully or partially automate the production process.

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Lesson Quiz: Understanding

Define "Bill of materials"

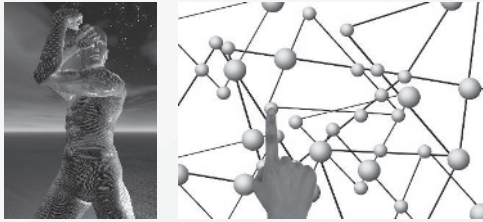
- Specifies part number, description and quantity of each component used in making finished product.

Define "Materials transfer ticket"

- Authorize moving raw materials from storeroom to production.

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Lesson Quiz: Application



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Lesson Quiz: Application

Chauncey Gardiner, Gardener's Supply manufacturers custom, high-end, expensive products for gardening customers (e.g., designer gardening aprons, diamond-embedded spades, gold-plated hoes). Chauncey has recently experienced a rash of disappearing "shrinking" inventory. Discuss some controls that Chauncey should consider related to its inventory.

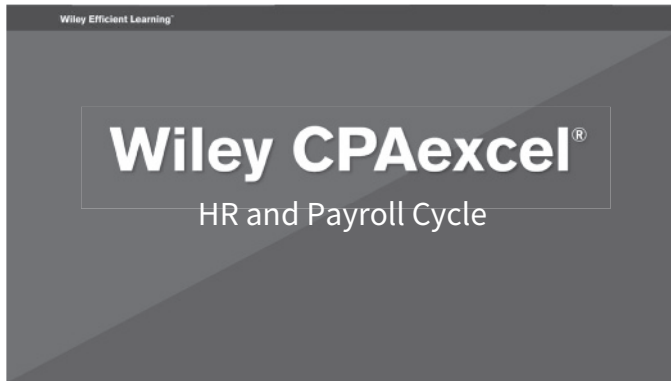
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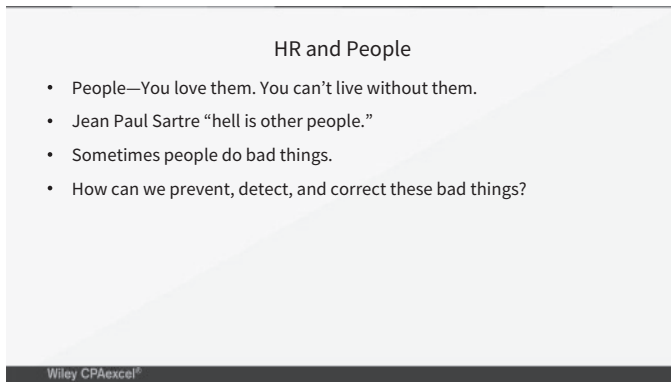
Lesson Quiz: Application

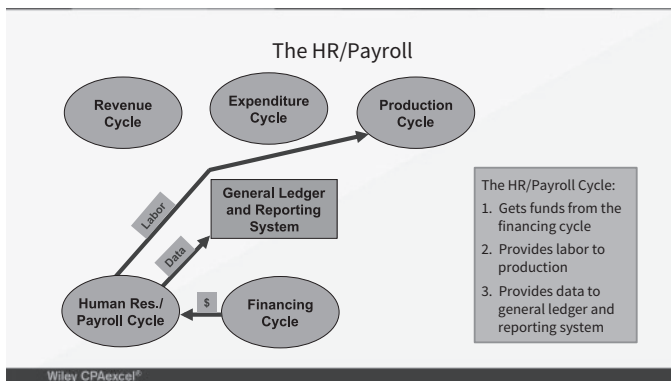
- Expensive items so consider significant investment in inventory security.
- Have a surveillance system?
- Need human guards?
- Tagging with RFID tags.
- Physically securing inventory and restricting access.
- Documenting inventory transfers.
- Releasing inventory for shipping only with approved sales orders.
- Accountability—employees handling inventory sign or enter codes to ensure accountability.
- Periodic (or electronic perpetual) counts of inventory.
- Insurance (self-insurance or third-party).

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HR and Payroll Cycle







Core Activities

Recruiting and hiring employees

Training and developing employees' skills

Supervision and Job assignments

- Timekeeping

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Core Activities

Salaries and benefits

- Compensation (Payroll)
- Employee benefits (e.g., medical, health, and life insurance, parking, fitness centers)
- Taxes on wages and benefits (leading to withholdings and lots of accounting complexities)
- Vacations and time off

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Core Activities

Monitoring and Evaluation

- Performance evaluation

Transitions

- Discharging employees, due to voluntary or involuntary termination
- Facilitating employee retirement

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Inherent Risks

- Fictitious or “ghost” employees don’t just occur in ghost stories!
- Hiring people who don’t exist can be fraud
 - Many famous frauds = terminated employees checks are received by “mountebanks” (i.e., an underused word meaning someone who tricks others out of their money)
- Good controls over underpaying people, i.e., the people themselves!
Weaker controls over overpaying

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Relevant Stakeholders

- Employees (obviously)
- Establishing that employees exist and that their bills are legitimate and accurate are important concerns
 - HR service providers, including HMOs, financial services companies, retirement companies, banks, credit unions, and life insurance companies
 - Federal, State and other governments: wage-related taxes

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Important Cycle Files, Forms and Documents

Document	Purpose	Comments and controls
Cumulative earnings register	Accumulates year-to-date pay and deductions	Review to match to pay rates and by supervisors to confirm hours
Workforce Inventory	List of employees by department	Trace to payroll records and identifying real humans. Review to ensure terminations are posted
Position control report	List of each position, job qualifications, budgeted salary, and position status (e.g., filled or vacant)	Similar function to workforce inventory

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Important Cycle Files, Forms and Documents

Document	Purpose	Comments and controls
Skills inventory report	List of employees and current skills	
US Form 941	Employer's quarterly federal tax return (shows wages subject to tax and amounts withheld)	
US Form W-2	Report of wages and withholdings for each employee	Often now posted to website

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Accounting and Business Risks and Controls

Recruiting and hiring employees

- Hiring unqualified or illegal employees—follow law, regulation, and organizational procedures for hiring
- Distinguish (according to law) employees from independent contractors

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Accounting and Business Risks and Controls

Training and developing employees' skills

- Retaining high-performing employees is critical to most organizations' success (e.g., public accounting). Organizations needs plans and policies to enable this.

Supervision and Job assignments

- Timekeeping—increasingly automated (e.g., scanned badge readers). Automating this function generally improves controls by reducing segregation of duties concerns.

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Accounting and Business Risks and Controls

Salaries and benefits

- Compensation—payroll activities
 - Compensation may be based on hours, self-reports, commissions, fixed salaries, or bonuses
- Payroll accounting activities
 - Often outsourced
 - Pay by direct deposit as accounting control
 - Payroll department validates and monitors employee records
 - Control goals: All payroll transactions must have proper authorization, be valid, be recorded, and be accurate.

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Accounting and Business Risks and Controls

Segregation of duties: If low automation, segregate:

- Timekeeping
- Payroll preparation
- personnel management
- paycheck distribution (use direct deposit instead!)

As automation increased, less segregation of duties needed

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Accounting and Business Risks and Controls

Monitoring and Evaluation

- Performance evaluation—should be regular, systematic, unbiased, and follow organizations' policies

Transitions

- Discharging employees, due to voluntary or involuntary termination
 - In some cases, must be a “pack up your things and be gone in an hour” ☹
- Facilitating employee retirement
 - Follow organizations' policies and procedures

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "Human Resources Management (HR)"

- The function within an organization that focuses on the recruitment of, *management* of, and providing direction for the people who work in an organization.

Define "Ghost employees"

- Someone in the payroll system, who does not work for the organization.

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Lesson Quiz: Understanding

Define "Workforce inventory"

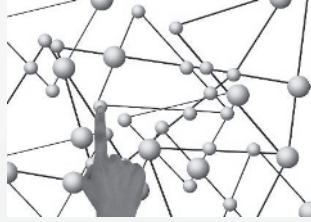
- List of employees by department, useful in tracing to payroll records and identifying that these are real humans. Important to review and monitor to ensure terminations are posted in a timely manner.

What is an "Cumulative earning register"?

- Accumulates year-to-date gross pay, net pay, and deductions by employee.

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Lesson Quiz: Application



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A COSO Example of Payroll Monitoring:

- The company: ~ 90% of medium-sized manufacturing company's employees are at plant sites.
- Implemented new payroll software and workflow to review and approve payroll.
- All bi-weekly payrolls are reviewed in detail at the plant sites and submitted to payroll department.
- Corporate payroll manager reviews plant payrolls for unusual fluctuations, such as increase/decrease in employee headcount, excessive overtime, etc.
- Any identified fluctuations are reviewed and require sufficient response and support prior to payroll processing.

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A COSO Example of Payroll Monitoring:

- The fraud: Monitoring revealed that plant accountant's was receiving excessive overtime pay, which occurred outside normal monthly plant closing cycle.
- Investigation revealed that the plant accountant had falsified overtime hours.
- Take-away: Review of indirect information (i.e., excessive and unexpected overtime) fluctuations enabled identification of control deficiency and fraud.
 - Typically, hours worked are a low to moderate fraud risk.

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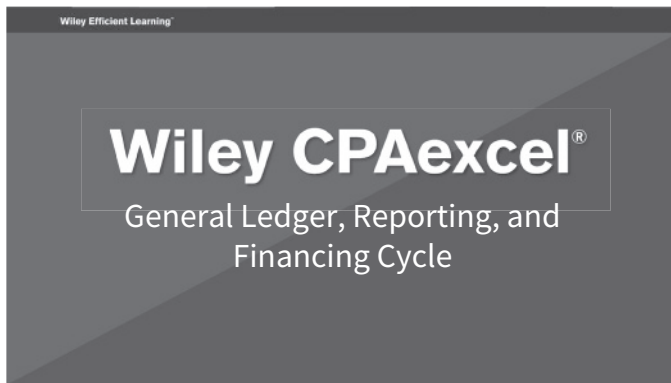
Lesson Quiz: Application

Question: Identify three inherent risks in payroll

- Fictitious or “ghost” employees
- Terminated employees who are still paid
- Controls over overpaying

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General Ledger, Reporting, and Financing Cycle



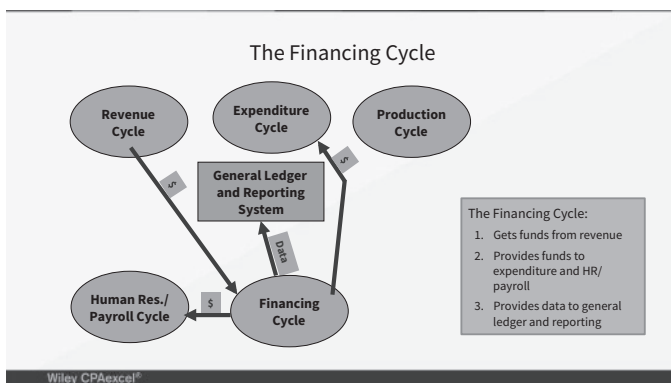
General Ledger, Reporting, and Financing Cycle

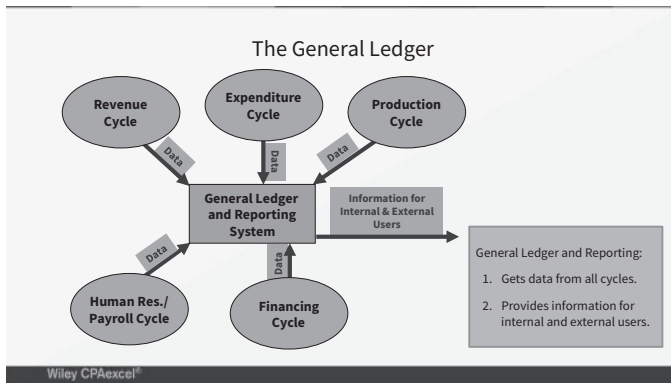
Generating timely, accurate financial reports is essential.

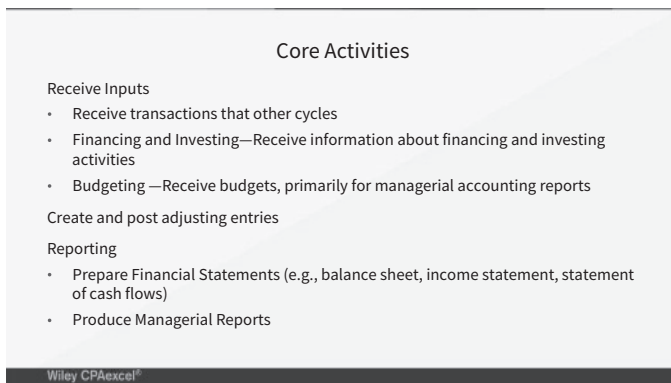
General ledger, reporting, and financing cycle activities is concerned with:

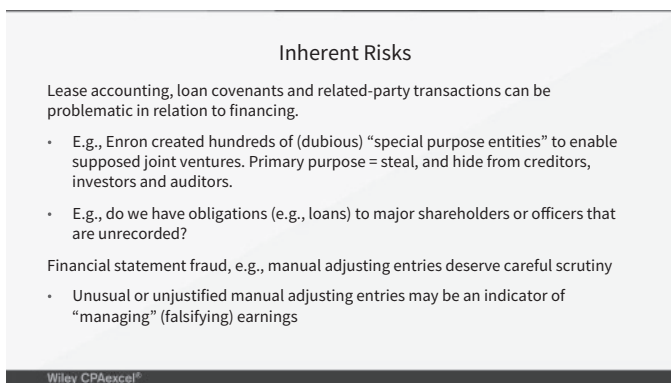
- Generating needed financing
- Completing accounting activities to generate financial reports

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Relevant Stakeholders

- Creditors
- Shareholders
- Regulators
- External Auditors

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Important Cycle Files, Forms and Documents

File, Form or Document	Purpose
General Ledger	Structure for accumulating accounting information based on chart of accounts.
General Journal	Journal for recording non-routine, including closing and reversing entries.
Financial statements	Report on the financial condition of the entity.

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Important Cycle Files, Forms and Documents

File, Form or Document	Purpose
Managerial accounting reports	Reports used internally in managing the entity.
Compliance reports	Reports for governmental agencies to comply with laws or regulations, e.g., related to environmental impact, securities.
Control and subsidiary accounts	Subsidiary accounts maintain the details + sum to control account balance.

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Relevant Controls

- Accounting policies and procedures are approved, documented, and consistent with law, regulation and organizational policies.
- Investment and financing activities are approved, documented, and consistent with law, regulation and organizational policies.

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Accounting and Business Risks and Controls

Journal entry risks

- Incorrect or fraudulent journal entries
- Transactions not recorded or not posted
- Inadequate authorization for journal entries
- Imbalances between debit and credit balance accounts

Control and subsidiary account risks

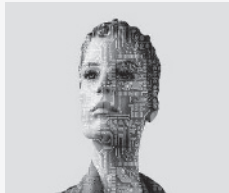
- Control accounts out-of-balance with subsidiary ledgers

Financial reporting

- Financial reports are inaccurate, unreliable or not timely.

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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Define "General Ledger"

- Structure for accumulating accounting information based on the chart of accounts, which is the listing of accounts available for recording accounting entries.

Define "Compliance reports"

- Reports for governmental agencies to comply with laws or regulations, e.g., related to environmental impact, securities.

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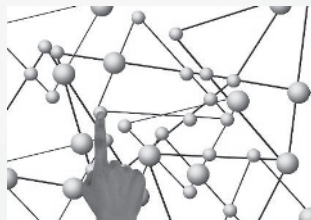
Lesson Quiz: Understanding

What are control and subsidiary accounts?

- Subsidiary accounts maintain the details but in the aggregate, sum to control account balance. E.g., accounts receivable control and subsidiary accounts.

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Lesson Quiz: Application



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COSO Example

Goal: Audit committee of a small, global manufacturing company directed internal audit to perform an annual review focusing on manual journal entries.

Focus: Potential for management override. Internal audit's review included number, dollar amount, preparer, business unit, and timing relative to month- and quarter-end.

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COSO Example

Analysis included :

- Reasonableness of significant entries (e.g., manual entries in traditionally automated accounts such as inventory),
- Review of appropriateness of individual performing the journal entry (e.g., senior executives or unauthorized personnel),
- Review of frequency of journal entries, particularly relevant to management authorization levels, identification of journal entries without descriptions, Potentially fraudulent entries.

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COSO Example

Organization created a profile of potential fraudulent entries from management override frauds that were perpetuated at other companies.

Internal audit statistically compares the manual journal entries against this profile.

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Lesson Quiz: Application

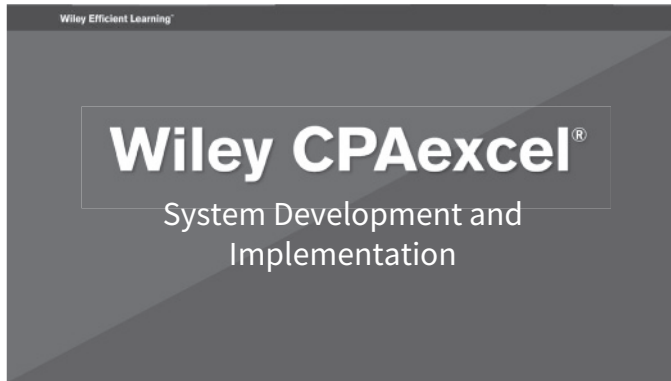
Why are manual journal entries an important focus for monitoring and evaluation?

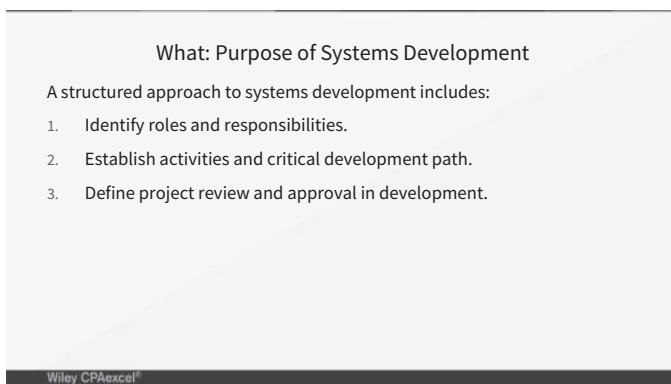
- Potential for fraud, earnings management, errors, and areas of disagreement with external auditors.
- Can review procedures discussed in the preceding case.

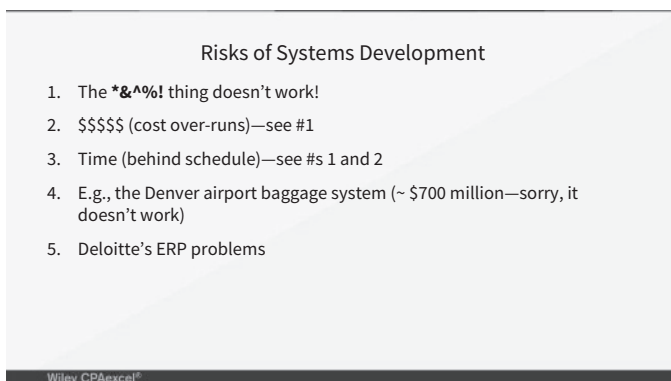
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Systems Development and Maintenance

System Development and Implementation







Reasons for Systems Development Failure

- Lack of senior management knowledge of, and support and involvement in, major IT projects
- Difficulty in specifying requirements
- Emerging technologies (hardware and software) may not work
- Lack of standardized project management and methods
- Resistance to change; lack of proper “change management”
- Scope and Project creep
- Lack of user participation and support
- Inadequate testing and training
- Poor project management—underestimation of time, resources, scope

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Methods of System Development

Traditional (systems development life cycle [SDLC])

- In this lesson

Agile development, prototyping, rapid application development (RAD)

- Build small prototypes

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Who: Four Roles in the SDLC

1. IT Steering Committee
2. Lead Systems Analyst
3. Systems Analysts and Application Programmers
4. End users

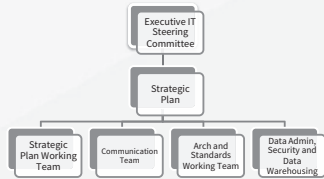


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Who: Roles in the SDLC

IT steering committee

- Purpose: review, approve and prioritize systems development proposals
- Include members from IT department and functional user areas



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Who: Roles in the SDLC

Lead systems analyst

- Manages development team(s) and projects
- Direct contact with end users
- Usually responsible for developing overall programming logic and functionality



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Who: Roles in the SDLC

Systems analysts and application Programmers:

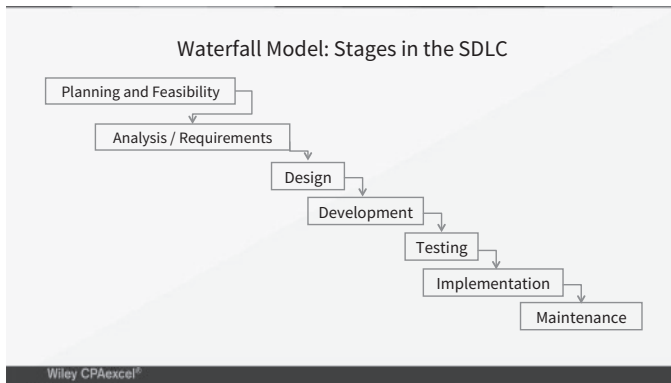
- Design, create and test system, programs, and controls in partnership with users

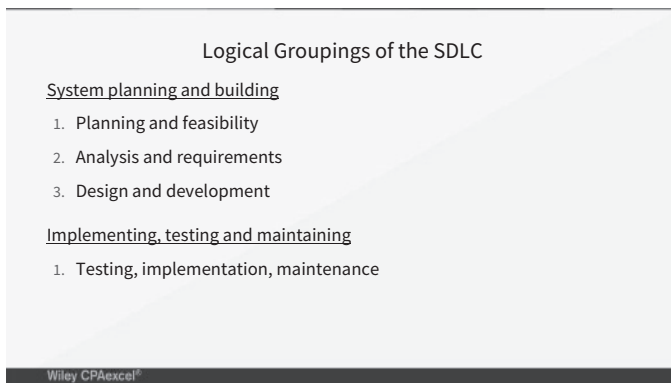
End users:

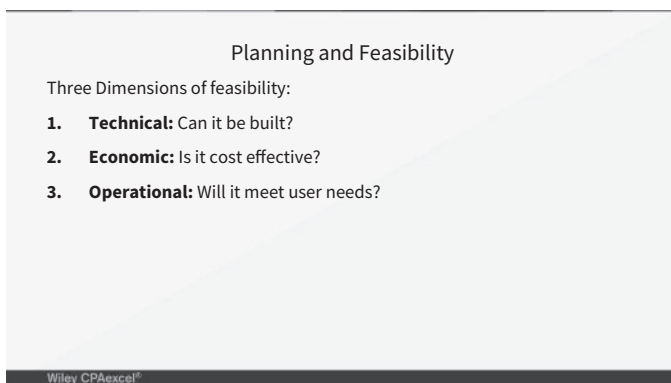
- Identify problems and often suggest first-pass solutions
- Moan and kvetch about the system



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Planning and Feasibility

If feasible, create **project plan**, include:

- Critical success factors: What must happen to succeed?
- Scope: Project purpose and most important goals
- Major risks: \$?, delivery date?, technology?
- Milestones and responsibilities: Who will do what, when?

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Analysis/Requirements

Systems analysts partner with end users to:

- Understand business processes and purposes
- Document system requirements
 - Requirements definition:
 - Document that identifies system functionality
 - Framework for system design and development
 - Parties sign to signify agreement on requirements

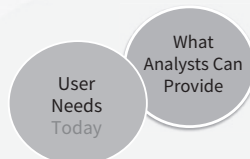


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Analysis/Requirements

Collaboration of IT personnel and end users to define system called:

Joint Application Development (JAD)



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Analysis/Requirements

Accountants/internal auditors role often includes:

- Prepare or evaluation RFPs (request for proposals) for hardware or software
- Vendor evaluations: reliability (financial and product), service commitment, training, tech support + documentation

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Design and Development

Design: Define systems' technical specifications. Two components:

1. **Technical architecture specification:**
 - Define hardware, systems software and networking technology of system
2. **Systems model specification:**
 - Graphical models (flowcharts, etc.) describing system components and processes
 - Create system menus and screen formats

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Design and Development

Development:

- Programmers use design specifications to develop the program and data files
- Purchase hardware and IT infrastructure specified in design

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Testing

Does system meet the design specifications in the requirements definition?

Test:

- With **both correct and erroneous data**
- At expected operational loads

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Testing

Types of testing:

- Individual processing unit: Each component works
- System testing: Modules work together
- Inter-system testing: System works with other systems
- User acceptance: System meets business needs

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Implementation

Includes:

- Data conversion (old data into new format)
- User training

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Maintenance

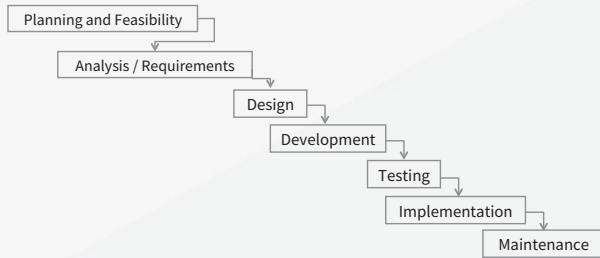
Monitor and update programs and/or procedures

- Remember Y2K?

System updates return to start of SDLC process

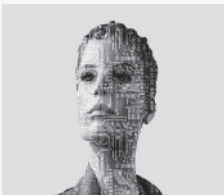
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Waterfall Model: Stages in the SDLC



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Lesson Quiz: Understanding



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Lesson Quiz: Understanding

Describe the pilot implementation method for new systems.

- Similar to phased implementation, except divide users into smaller groups and train by group (versus by modules).

Describe the "cold turkey" (also called the "plunge" or "big bang") implementation method for new systems.

- Old system is dropped and the new system is put in place all at once. Risky!

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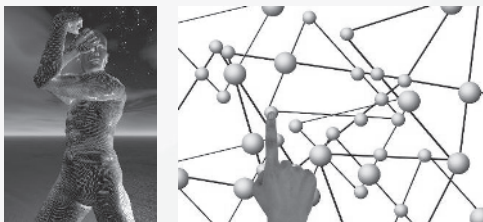
Lesson Quiz: Understanding

Describe the composition of the information technology steering committee.

- Selected from functional areas across the organization, including the IT department.
- Principal duty is to approve and prioritize systems proposals for development.

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Lesson Quiz: Application



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Lesson Quiz: Application

Fitzwilliam Darcy's Online Dating Service is considering undertaking a major systems development project to improve its AIS. Please explain to the Chief Finance Officer the role of each of the following in the systems development process when working on an accounting system:

- Accountants
- Information systems steering committee
- Project development team
- Systems analysts and programmers
- System users

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Lesson Quiz: Application

Accountants

- Potential roles: Economic analysis, financial reporting issues, identification of problems to be solved, auditing and system auditability issues, control design and monitoring, project monitoring

Information systems steering committee

- Oversight of project selection and prioritization of projects

Systems analysts and programmers

- Write and coordinate writing of code, project development

System users

- Identification of problems to be solved, work with developers to match solutions to problems

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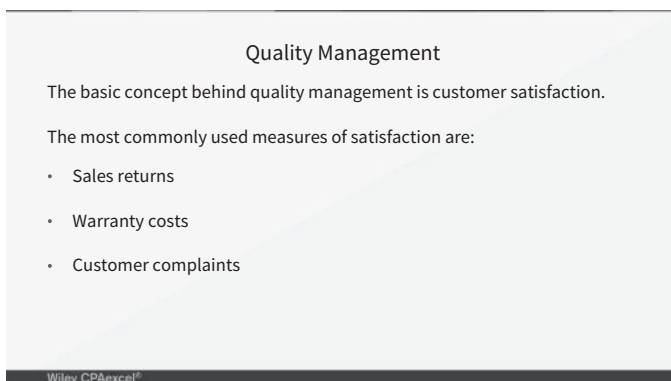
Operations Management

Financial and Non-Financial Measures of Performance

Quality Management







Quality Definitions

Quality of design—Meeting or exceeding the needs and wants of customers

Quality of conformance—Conforming to the design specifications

Both definitions are important. Design is important to customer satisfaction, while conformance is important to measurement

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Voluntary Costs of Quality

Prevention costs—Costs incurred to prevent the production of defective products

Appraisal costs—Costs incurred to identify defective products during the manufacturing process

- Inspection
- Tests of functionality

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Involuntary Costs of Quality

Internal failure costs—Costs of defective components and final products identified prior to delivery to the consumer

External failure costs—Costs caused by failure of products in the hands of the consumer

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Directional COQ Effects

When the overall quality of conformance is low, more of the total cost of quality is typically related to cost of failure.

Increases in the cost of prevention and the cost of appraisal are usually accompanied by decreases in the cost of failure and increases in the quality of conformance.

The most effective method of reducing the overall cost of failure is to increase efforts to prevent failures.

Increased spending on prevention potentially reduces both the cost of failure and increases the quality of conformance.

In general, efforts toward preventing defects are both cheaper than the cost of appraisal and cheaper than the cost of failure.

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Directional COQ Effects

Returning to the power cord example, if the company increases the quality of the power cord connection, thereby making the product less likely to fail, and makes no changes to product testing, the costs of failure due to this problem can possibly be eliminated completely, and the quality of conformance is greatly improved.

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Six Sigma

One Sigma = means 68%

Three Sigma = 99.7%

Six Sigma = 99.99997% perfect

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Six Sigma

- D – Define
- M – Measure
- A – Analyze
- I – Improve
- C – Control

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Kaizen

- Cause-and-effect analysis
- Fishbone diagrams
- Ishikawa diagrams

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Pareto Charts

- Ranks causes of process variations by the degree of impact on quality
- 80/20 rule
- Low-hanging fruit

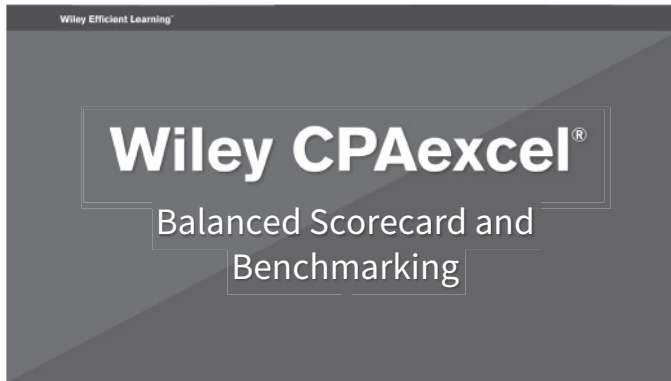
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Summary

- Quality Management
- 4 Cost of Quality Categories
- Work the Problems
- Use the Flashcards!

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Balanced Scorecard and Benchmarking



Balanced Scorecard

The balanced scorecard (BSC) is a performance management tool that helps an organization identify and evaluate critical success factors within the context of overall strategy.

The BSC integrates both financial and nonfinancial measures to provide a comprehensive view of overall performance.

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BSC Categories

- Financial
- Customer
- Internal business processes
- Learning, innovation, and growth

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BSC Process

Within each of the four classifications, the organization identifies its:

- Strategic goals
- Critical success factors
- Tactics
- Performance measures

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BSC Process Example

Aggressive hiring of employees with strong research and development skills should result in more new and improved products.

New and improved products should help the company penetrate new markets.

Penetration of new markets should lead to additional revenues, which should improve financial performance.

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Creating a BSC

1. Identify strategic objectives.
2. Do SWOT analysis (see Lesson: Strategic Management).
3. Develop operational tactics.
4. Develop performance measures for each tactic.

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Features of a Good BSC

Articulates a company's strategy by trying to map a sequence of cause-and-effect relationships through metrics.
Assists in communicating the strategy to all members of the organization.
Limits the number of measures used by identifying only the most critical ones.
Highlighting suboptimal trade-offs made by managers.

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Avoid . . .

Assuming the cause-and-effect linkages are precise.
Seeking improvements across all measures all the time.
Using only objective measures on the scorecard.
Failing to consider both costs and benefits of initiatives.
Ignoring nonfinancial metrics when evaluating employees.

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Benchmarking Definition

A process in which organizations compare their own processes and performance with the processes and performances of business leaders within or across competing industries

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Best Practices

The most efficient and effective means of accomplishing a task.

To identify best practices, an organization observes the practices of leading companies.

The organization compares best practices to its own processes and procedures to identify potential for improvement.

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Results of Best Practices

Because best practices change over time, benchmarking should be an ongoing process.

Benchmarking supports continuous learning and improvement.

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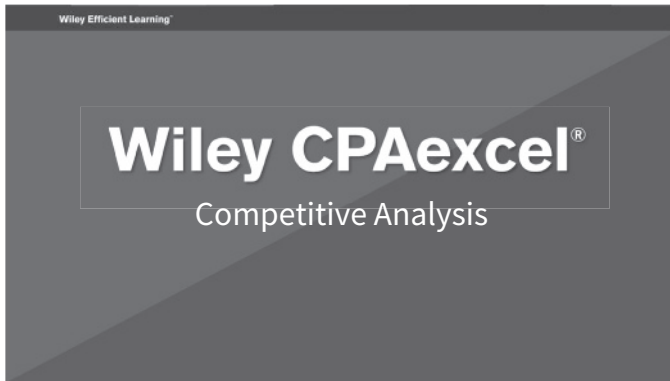
Summary

The BSC recognizes we need more than just financial metrics to gauge success.

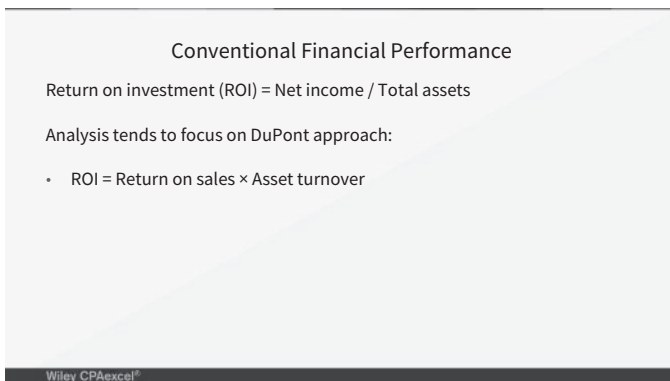
It seeks to monitor performance in the four areas of financial, customer, internal business processes, and learning and growth.

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Competitive Analysis







DuPont Approach to ROI

$ROI = \text{Return on sales (ROS)} \times \text{Asset turnover}$

$ROS = \text{Net income} / \text{Sales}$

- Evaluates the profitability of sales

$\text{Asset turnover} = \text{Sales} / \text{Total assets}$

- Evaluates the efficiency of assets

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Focus of ROI and Weaknesses

ROI is consistent with external financial analysis used to evaluate broad performance.

Weaknesses:

- Suffers from accrual distortions
- Suffers from the diluted hurdle rate problem

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Accrual Distortions

Accrual Accounting is Arbitrary—Accounting conventions are concerned with compliance (e.g., comparability, matching, etc.) not with economic performance.

Choices allowed by FASB, SEC, IRS, etc. are often arbitrary (e.g., SL or accelerated depreciation, FIFO or LIFO inventory).

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Diluted Hurdle Rate Example

Assume:

- Manager has current average return of 28%
- Prospective investment promises 25%
- Company requires (hurdle rate) at least 20%

Conclusion:

Manager will be unwilling to invest in an asset promising less than 28%, since it would penalize the managers personal incentive.

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Residual Income

Residual Income (RI) =

Operating income – (Required rate of return × Invested capital)

- RI is designed to eliminate diluted hurdle rate problem.
- RI is a general form of economic profit.
- RI recognizes the cost of capital and expresses answer in dollars (rather than a rate).

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Value-Based Management

Refers to relatively new financial performance metrics and the processes for using them

Two most popular metrics:

1. $EVA^* = NOPAT - WACC \times (\text{Total assets} - \text{Current liabilities})$
2. $CFROI = (CFO - ED) / \text{Cash invested}$

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Value-Based Management

EVA® is a specific form of RI that is often used for incentive compensation and investor relations.

- Candidates should be prepared to calculate this metric!

CFROI is a cash-based metric used for incentive compensation, valuation, and capital budgeting.

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VBM Themes and Concepts

Accrual-based metrics are discredited.

Cost of capital is increasingly emphasized.

Shareholder value as the primary element of interest is common.

Relating VBM to strategy and linking to drivers of success is common.

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Price Elasticity

Price elasticity of demand =

$$\frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$$

A price is considered **elastic** if the price elasticity of demand is > than 1.

A price is considered **inelastic** if the elasticity of demand is < than 1.

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Substitute and Complementary Products

If products A and B are substitutes, an increase in the price of A will cause an increase in the demand for B.

If products A and B are complements, an increase in the price of A will cause a decrease in the demand for product B.

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Elasticity of Pricing

If prices are relatively elastic (i.e., price elasticity > 1), then an increase in price will tend to decrease volume.

If prices are relatively inelastic (i.e., price elasticity < 1), then an increase in price will tend to increase revenue as volume remains unaffected.

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Key to Markups

The key to properly analyzing markups is to understand what the markup is based on.

Focus on specific language that communicates the basis for the markup.

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Markup Example

Given a sales target of 1,000 units, direct costs of \$50 per unit, and total costs of \$80,000, what is the target price necessary to achieve a 25% profit margin on direct costs? The desired profit is determined based on 25% of \$50,000 = \$12,500.

$$\text{Price (1,000 units)} - \$80,000 = \$12,500$$

$$\text{Price (1,000 units)} = \$92,500;$$

and the price would be \$92.50.

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Markup Example

Given the same set of facts above, what is the target price necessary to achieve a 20% profit margin on sales?

We know the following: Sales – \$80,000 = .20 (sales). So to find price we have:

$$\text{Price (1,000 units)} - \$80,000 = .20 (\text{Price}) (1,000 \text{ units})$$

$$.80 (\text{Price}) (1,000 \text{ units}) = \$80,000$$

$$800 (\text{Price}) = \$80,000$$

$$\text{Price} = \$100.00$$

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Exam Question

A company with a combined federal and state tax rate of 30% has the following capital structure:

Weight Instrument	Cost of capital
40% Bonds	10%
50% Common stock	10%
10% Preferred stock	20%

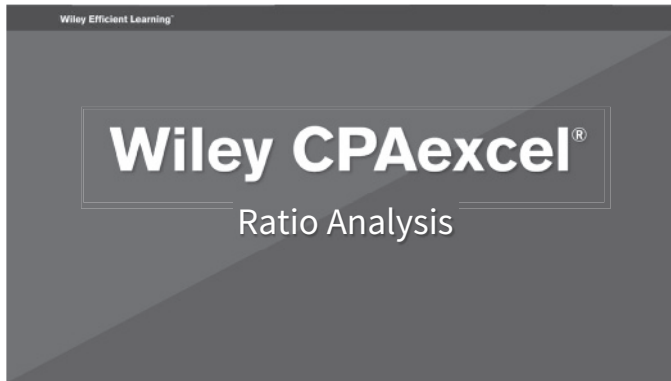
What is the weighted-average after-tax cost of capital for this company?

- A. 3.3%
- B. 7.7%
- C. 8.2%
- D. 9.8%

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Ratio Analysis



Ratio Analysis

Ratio analysis includes various metric types:

- Profitability/return
- Asset utilization
- Liquidity
- Debt utilization
- Market ratios

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Profitability and Return Metrics

Gross margin (GM) = Revenue – Cost of goods sold

Contribution margin (CM) = Revenue – Variable costs

GM is used for traditional external reporting while CM is used for planning purposes

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Gross Margin

Traditional income statement:

Sales	\$20,000	
COGS	<u>12,000</u>	← Manufacturing costs
GM	8,000	
SGA exp	<u>3,000</u>	← Non-manufacturing
EBIT	\$5,000	

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Contribution Margin

Contribution income statement:

Sales	\$20,000	
Variable	<u>7,000</u>	← Variable costs
CM	13,000	
Fixed	<u>8,000</u>	← Fixed costs
EBIT	\$5,000	

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Operating and Net Profit

Operating profit margin = Operating income / Sales

Profit margin AKA return on sales = Net income / Net sales

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Return on Investment

$\text{ROI} = \text{Net income} / \text{Average total assets}$

$\text{Return on equity} = \text{Net income} / \text{Common stockholders' equity}$

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DuPont Approach to ROI

DuPont formula = Return on sales (ROS) × Asset turnover, where

$\text{Profit margin or ROS} = \text{Net income} / \text{Sales}$

$\text{Capital or asset turnover} = \text{Sales} / \text{Total assets}$

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Residual Income

$\text{Residual Income (RI)} = \text{Operating income} - \text{Required rate of return (invested capital)}$

- General form of economic profit
- Alternative to ROI
- Prevents the diluted hurdle rate problem

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Asset Utilization

Receivables ratios:

- $\text{Receivables turnover} = \text{Sales on account} / \text{Average accounts receivable}$
- $\text{Days' sales in receivables} = \text{Average accounts receivable} / \text{Average sales per day}$
- Indicates the length of collection period

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Asset Utilization

Additional turnover ratios:

- $\text{Inventory turnover} = \text{Cost of goods sold} / \text{Average inventory}$
- $\text{Fixed asset turnover} = \text{Sales} / \text{Average net fixed assets}$

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Liquidity

$\text{Current ratio} = \text{Current assets} / \text{Current liabilities}$

$\text{Quick or acid test ratio} = (\text{Current assets} - \text{Inventory}) / \text{Current liabilities}$

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Debt Utilization

Debt to total assets = Total debt / Total assets

Debt to equity = Total debt / Total owners' equity

Times interest earned = Operating income / Interest expense

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Market Ratios

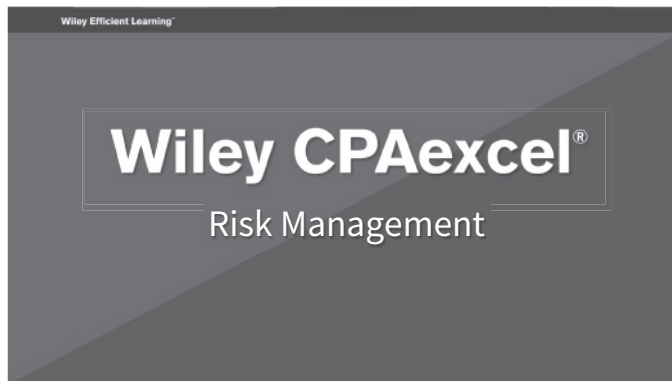
Price/earnings (PE) ratio = Market price per share / Earnings per share

Market-to-book ratio = Market value per share / Book value per share

- Book value per share = Common stock owners' equity / # of common shares outstanding

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Risk Management



Uncertainty and Risk Management

Managing risk is an endeavor that involves

1. Identifying the different types of risk that are relevant to the company.
2. Identifying ways to mitigate or eliminate that risk to achieve acceptable levels of risk exposure.

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Risk Type Focus

Strategic risk addresses long-term, broad-based exposure related to the overall strategy of the organization.

Operational risk is short-term in nature and includes process risk, shared services risk, foreign/off-shore risk, and credit/default risk.

Market risk is associated with economic events or natural disasters.

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Other Risk Management Approaches

- Structuring operating leverage to the company's advantage
- Providing contingency planning for disaster recovery and business continuity
- Using hedging and diversification to offset exposure
- Using insurance for risk mitigation/elimination
- Evaluating the level of uncertainty when estimating future costs and revenues

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Operating Leverage

More variable costs reduces the risk of not breaking even, while more fixed costs increases the contribution margin on sales allowing us to make a tradeoff between risk and return.

One way to quickly change the dominant portion of risk types is to lease assets rather than purchasing them and vice-versa.

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Contingency Planning

Methods for managing disaster recovery and business continuity:

- Safeguarding equipment
- Building in redundancy
- Backup procedures
- Insurance

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Hedging and Diversification

Hedging is used to offset future uncertainty with options and future contracts related to commodities, foreign currency, and other investment exposure to minimize price risk.

Diversification reduces general unsystematic and portfolio risk but does not completely offset risk as hedging does.

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Insurance

Insurance is used to decrease exposure to specific, known hazards.

Insurance is unique in the sense that it deals with **pure risk** (where there is only a risk of losing) as opposed to **speculative risk** where gain is also possible.

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Evaluating Uncertainty

Evaluating uncertainty involves estimating future costs and revenues and maintaining cost control as a risk management strategy.

Related to this are cost avoidance strategies, attempts to increase revenue using organizational strategy, and making distinctions between committed and discretionary costs for effective cost management.

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Performance Improvement Tools



Theory of Constraints

Determining where bottlenecks (constraints) exist and optimizing output by relaxing that constraint.

Constraints result from a variety of different resources (e.g., labor hours, machine hours, or square feet).

Optimization rule for product mix decisions:

- Maximize the contribution margin per unit of the constrained resource.

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Lean Manufacturing

Lean manufacturing blends the features of custom and mass production processes to make a small number of a high variety of products.

Goals of lean manufacturing include increasing quality, reducing waste, and minimizing resource consumption in the process.

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Lean Manufacturing

- Identify the steps in the value stream.
- Eliminate steps that do not increase customer value.
- Streamline the process.
- Continuously evaluate to reach for perfection.

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Lean Manufacturing

Lean manufacturing environment (pull-type):

- Flexible equipment
- Low setup times
- Highly-skilled laborers

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Lean and Demand Flow

The demand flow approach is embedded in lean applications to manage the process based on continuous flow planning and customer demand.

Originally derived from usage with JIT, demand flow is now more clearly associated with lean manufacturing approaches.

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Six Sigma

Six Sigma is a continuous improvement approach to systematically reduce defects.

The name reflects a level of quality that is virtually perfect (99.99966%).

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Six Sigma's Five Steps

1. Define the process
2. Measure the process
3. Analyze the process
4. Improve the process
5. Control the process

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Cost Accounting

Manufacturing Costs



Three Factors of Production

1. Direct Material—Significant raw materials and components that make up the finished product
2. Direct labor—Wages for work that directly converts raw materials into finished products
3. Manufacturing overhead—Cost of labor and supplies that support the production process but are not easily traceable to the finished product

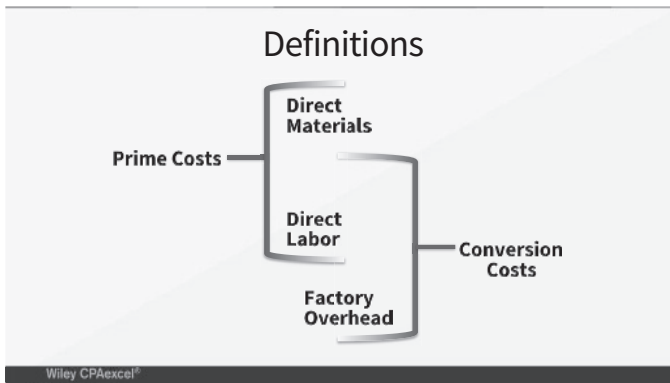
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Definitions

Prime costs—Direct material costs plus direct labor costs

Conversion costs—Direct labor costs plus factory overhead costs

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Product Costs

Product costs are also known as *inventoriable costs* or *manufacturing costs*.

They generally attach to physical product units and are expensed in the period in which the goods are sold.

Product costs can be associated with the production of specific revenues (i.e., cost of goods sold).

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Period Costs

Period costs cannot be matched with specific revenues (i.e., accountant's salary) and are expensed in the period incurred.

These costs are also called *selling and administrative costs*.

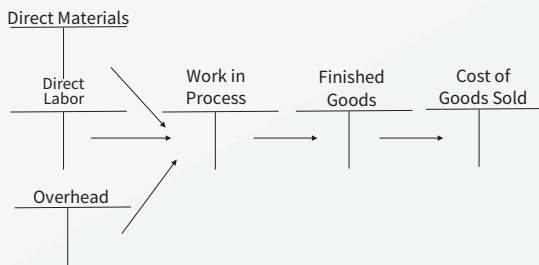
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Actual, Normal, and Standard Costing

Actual, normal, and standard costing are three traditional costing methods that provide different approaches to assigning the three inventoriable cost inputs: direct material, direct labor, and manufacturing overhead to the work in process(WIP), finished goods, and cost of goods sold accounts.

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Sequential Tracking Costing



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Actual, Normal, and Standard Costing

Actual costing is the simplest and most accurate method and waits until all the costs are known and then records them in the accounts.

Normal costing is a moderately simple and moderately accurate method where direct materials and direct labor are traced to WIP when the costs become known.

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Actual, Normal, and Standard Costing

Standard costing is a costing method that uses predetermined, estimated rates and quantities to record both direct costs and overhead.

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Traditional Cost Systems

	Actual	Normal	Standard
Manufacturing Overhead	$AQ \times AP$	$AQ \times POR$	$SQA \times SP$

Actual quantity of the allocation base

Standard quantity of inputs allowed for the actual units of outputs

Conceptually equivalent

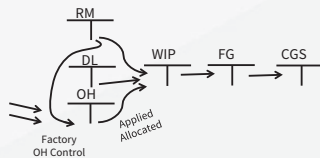
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Past Exam Question

(AICPA 900541BEC-TM-AR)

Indirect labor is a

- A. Prime cost
- Ⓑ Conversion cost
- C. Period cost
- D. Nonmanufacturing cost



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Past Exam Question (ACPA900541BEC-TH-AQ)

Which of the following is assigned to goods that were either purchased or manufactured for resale?

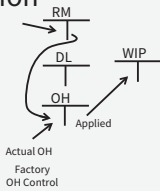
- A. Relevant cost
- B. Period cost
- C. Opportunity cost
- ④ D. Product cost

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Past Exam Question (ACPA900541BEC-TH-AQ)

In a traditional job order cost system, the issue of indirect materials to a production department increases

- A. Stores control
- B. Work in process control
- ④ C. Factory overhead control
- D. Factory overhead applied



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Spoilage, Cost, and Inventory Flow

Wiley Efficient Learning

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Spoilage, Cost, and
Inventory Flow

Spoilage and Scrap

There are two types of spoilage and scrap:

1.

Normal—Uncontrollable and unavoidable as part of the current manufacturing process

2.

Abnormal—Controllable and avoidable (e.g., when due to carelessness or inefficiency)

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Spoilage and Scrap

Normal spoilage is included in cost of goods sold as a routine cost of business

Abnormal spoilage is considered a period cost and is not included as a part of cost of goods sold.

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Treatment for Scrap

Scrap is material left over after production.

Any monies received from the sale of scrap can be used to reduce factory overhead, and thereby reduce cost of goods sold.

Alternatively, if the value of scrap is significant and is salable, it can be treated as Other sales in the revenue category.

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Job Costing and Scrap

Unless traceable to a job, the cost of normal spoilage is spread equally across all jobs.

Spoilage that is caused by the customer may be charged to the customer in the form of additional revenue.

An example would be an error on business cards where the customer supplied the wrong information.

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Process Costing and Scrap

Normal spoilage is spread over the good units produced.

Abnormal spoilage is removed from the costing system and treated as a period cost.

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Flow of Costs and Inventory

For manufacturing organizations, three distinct inventories are involved:

1. Raw materials
2. Work-in-process
3. Finished goods

This complex structure necessitates a good understanding of the cost of goods manufactured

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Schedule of Cost of Goods Manufactured and Cost of Goods Sold

For manufacturers, there are four sections, each of which adds something to the next section.

1. Direct materials
2. Total manufacturing costs
3. Cost of goods manufactured
4. Cost of goods sold

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Direct Materials

Section One:

Beginning inventory direct materials

+ Direct materials purchased

= Direct materials available

- Ending inventory direct materials

Direct materials used

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Total Manufacturing Costs

Section Two:

Direct material used
 + Direct labor
 + Manufacturing overhead
 Total manufacturing costs

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Cost of Goods Manufactured

Section Three:

Beg. inventory work in process (WIP)
 + Total manufacturing costs
 = WIP available
 - Ending inventory WIP
 Cost of goods manufactured

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Cost of Goods Sold

Section Four:

Beg. inventory finished goods inventory (FG)
 + Cost of goods manufactured
 = Goods available for sale
 - Ending inventory FG
 Cost of goods sold
 See the summary in the lesson outline!

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Past Exam Question (AICPA.120601BEC)

Based on the following data, what is the gross profit for the company?

Sales	\$1,000,000
Net purchases of raw materials	600,000
Cost of goods manufactured	800,000
Marketing and administrative expenses	250,000
Indirect manufacturing costs	500,000

	Beginning Inventory	Ending Inventory
Work in process	\$500,000	\$400,000
Finished goods	100,000	500,000

A. \$200,000 B. \$400,000 C. \$600,000 D. \$900,000

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Exam Question

In June, Delta Co. experienced scrap, normal spoilage, and abnormal spoilage in its manufacturing process. The cost of units produced includes:

- A. Scrap, but no spoilage.
- B. Normal spoilage, but neither scrap nor abnormal spoilage.
- C. Scrap and normal spoilage, but not abnormal spoilage.
- D. Scrap, normal spoilage, and abnormal spoilage.

AICPA.911144BEC.THAR

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Cost Behavior Patterns



Cost Behavior Patterns

Cost behavior refers to the operational cost concepts of **fixed** and **variable** costs.

Allows us to predict how costs change in response to changes in production or sales.

Exam questions are likely to reverse the relationship between changes in volume and changes in either total or unit cost.

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Relevant Range

This behavior is restricted by the *relevant range*, a range of production volumes where:

- Total fixed costs remain constant
- Unit variable costs remain constant
- Unit sales price remains constant

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High-Low Method

The high-low method provides a rough estimate of the fixed and variable cost components that comprise total costs.

The idea is to calculate the change in costs from two production volume extremes (the high value and the low value).

Fixed costs are determined by removing the variable cost component from the total cost.

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Example: High-Low Method

In July the Gibson Co. incurred total overhead costs of \$58,000 and made 6,200 units. In December it produced 3,200 units and total overhead costs were \$40,000. What are the total fixed factory costs per month and average variable factory costs?

$$\text{Rise/Run} = \frac{\$58,000 - \$40,000}{\$6,200 - \$3,200 \text{ Units}} = \$18,000 / \$3,000 \text{ Units} = \$6 \text{ per unit} = \text{Variable Cost}_{\text{Unit}}$$

$$TC = FC + VC_{\text{unit}} \times (Q)$$

$$\$58,000 = FC + \$6_{\text{unit}} \times (6,200 \text{ Units})$$

$$FC = \$20,800$$

$$TC = \$20,800 + \$6_{\text{unit}} (Q)$$

$$500 \text{ units}$$

$$TC = \$20,800 + \$6_{\text{unit}} (500 \text{ units})$$

$$TC = \$23,800$$



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Example: High-Low Method

Points to Remember:

1. Make sure you understand the concept of the *rise over the run*. That means that the numbers on the vertical Y-axis are the rise, so they are *always* on the numerator, while the numbers on the horizontal X-axis are the run, so they are *always* on the denominator.
2. The high/low points are specifically the highest and lowest units on the horizontal X-axis *only*.

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Example: High-Low Method

3. The calculation is based on the cost function that was developed using the previous equation, $\$58,000 = FC + \$6_{\text{unit}} \times 6,200 \text{ units}$. Now that you know the slope, if you know the equation, then you know how to solve for the fixed costs.

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Cost-Volume-Profit Analysis

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Cost-Volume-Profit Analysis

CVP Analysis

The CPA exam typically tests cost-volume-profit (CVP) by asking you to determine the **breakeven (BE)** point, **income**, or the effect on one or both of those.

In general, the effect on income is **opposite** of the effect on the break-even point.

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CVP Analysis—Basic Calculations

The basic BE model is the same as the Target Operating Income (TOI) model where TOI = 0.

TOI Units = (FC + TOI) / CM

BE Units = FC / CM

BE Dollars = FC / CM%

Where: CM = P – VC Unit CM% = CM / P

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Breakeven Example

Demo Co. has the following revenues and costs:

- Price: \$8
- Variable cost per unit: \$4
- Fixed costs: \$200,000

What is Demo's breakeven point in units?

What is Demo's breakeven point in dollars?

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Breakeven Example

Breakeven in units:

$$\text{Fixed costs} / \text{CM} = \$200,000 / (\$8 - \$4)$$

Breakeven in units = 50,000 Units

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Breakeven Example

Breakeven in dollars:

$$\text{Fixed costs} / \text{CM}\% = \$200,000 / [(\$8 - \$4)/\$8]$$

Breakeven in dollars = \$400,000

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Income and CVP Example

Using the same data as before:

- Price: \$8
- Variable cost per unit: \$4
- Fixed costs: \$200,000

What would be the result on income and the breakeven point if fixed costs increased to \$250,000 while sales of 100,000 units were maintained?

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Income and CVP Example

Effect on income:

CM @ \$4 × 100,000 =	\$400,000
FC	– 250,000
Operating income	\$150,000

Answer: Operating income decreased from \$200,000 to \$150,000.

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Income and CVP Example

Breakeven effect:

Units: Fixed costs / CM = \$250,000 / (\$8 – \$4)

Dollars: Fixed costs / CM% = \$250,000 / [(\$8 – \$4)/\$8]

Breakeven in units = 62,500 units

Breakeven in dollars = \$500,000

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Multi-Product CVP Example

Breakeven composite calculation:

	Product A	Product B
Contribution margin	\$5	\$20
Fixed costs = \$60,000		
Product mix: $\frac{2}{3}$ A and $\frac{1}{3}$ B		

What is the breakeven point in units for each of products A and B?

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Multi-Product Breakeven Example

Breakeven Composite Calculation:

	Product A	Product B
CM	\$5	\$20

Fixed costs = \$60,000
Product mix is $\frac{2}{3}$ A and $\frac{1}{3}$ B

What is the breakeven point in units for each of products A and B?

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CVP Analysis—Model Assumptions

Price, variable cost per unit, and fixed costs *behave as constants* (i.e., as defined).

Total costs can be divided into a *fixed* component and a component that is *variable* with respect to the level of output.

Cost behavior is assumed to be *linear* (i.e., straight line).

Volume is the *only driver* of costs and revenues.

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CVP Analysis—Model Assumptions

The number of *units produced equals* the number of *units sold* (i.e., no change in inventory).

The model applies to operating income (i.e., the CVP model is a *before-tax model*).

Assumptions are relevant since they apply only to a *relevant range* (the volume over which assumptions of the model are expected to be valid and the volume of expected operations).

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Common Size Calculations

Question: Martin Brothers has sales of \$400,000, variable costs of \$80,000, and fixed costs of \$20,000. What is Martin Brothers' breakeven point in sales dollars?

	Amount	%
+ Sales	+ \$400	100%
– Variable Costs	– \$80	??%
= Contribution Margin =	\$320	??%

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Common Size Calculations

To solve for contribution margin, merely divide \$80 by \$400 = 20% for variable costs. Then subtract to get a contribution margin of 80%.

	Amount	%
+ Sales	+ \$400	100%
– Variable Costs	– \$80	20%
= Contribution Margin =	\$320	80%

Next, use the formula for breakeven in sales dollars to calculate breakeven sales:

Breakeven point in sales dollars = \$20,000 / 80% = \$25,000

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Margin of Safety

The margin of safety indicates the difference between the current sales level and the breakeven point.

That is, the margin of safety indicates how much revenue can decrease before operating income becomes negative.

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Targeted Profit

When a targeted profit beyond breakeven is specified, simply add this amount to the fixed cost in the numerator.

Formula:

Sales in units = (Fixed costs + Targeted profit) / Contribution margin per unit

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CVP Analysis—Graphics

Exam questions often use breakeven charts and volume-profit charts to examine effects.

With these graphical representations, often you are to identify the breakeven point, certain cost patterns, and profit relationships.

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CVP Analysis—Graphics

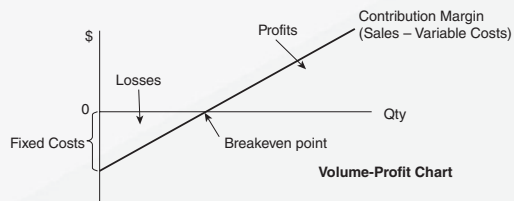
When working with the charts, it is important to keep in mind the assumptions of the model and its assumed nature of cost behavior.

Be sure you identify the type of chart being used so you aren't confused about what you are analyzing.

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CVP Analysis—Graphics

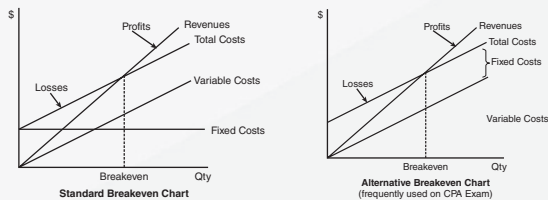
With the volume-profit chart, the slope of the profit line is equal to the contribution margin.



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CVP Analysis—Graphics

The standard breakeven chart is the one you are most likely to encounter.



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Exam Question

State College is using cost-volume-profit analysis to determine tuition rates for the upcoming school year. Projected costs for the year are as follows:

Contribution margin per student \$ 1,800

Variable expenses per student 1,000

Total fixed expenses 360,000

Based on these estimates, what is the approximate breakeven point in number of students?

A. 129

B. 200

C. 360

D. 450

AICPA.120610BEC

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Absorption and Direct Costing

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Absorption and Direct Costing

Absorption Costing

Absorption costing (also called full accrual costing) assigns all three factors of production to inventory:

1. Direct material
2. Direct labor
3. Variable *and* fixed manufacturing overhead

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Absorption Costing

For internal purposes, many companies use the contribution format for income statements, and use variable costing to calculate income.

The only difference between variable and absorption costing concerns the treatment of fixed manufacturing costs.

Absorption costing is required for external reporting purposes.

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Variable Costing

Variable costing (also known as direct costing) assigns only variable manufacturing costs to inventory:

1. Direct material
2. Direct labor
3. Only variable manufacturing overhead

Variable costing frequently is used for internal decision making but cannot be used for external reporting.

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Variable Costing Product Costs

Only *variable* manufacturing costs are treated as product costs with variable costing:

- Direct material
- Direct labor
- Variable factory overhead

Fixed manufacturing costs are treated as period costs and expensed in the period incurred.

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Manufacturing and Administrative Costs

Fixed selling and administrative costs are the same with either method.

Remember: The *only* difference between absorption and direct costing is treatment of fixed manufacturing costs.

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Absorption Costing vs. Direct Costing

	Absorption Costing	Direct Costing
Product Costs		
Direct materials and direct labor	\$700,000	\$700,000
Other variable costs	100,000	100,000
Depreciation of factory building	80,000	--
Other fixed overhead costs	18,000	--
Total inventoriable costs	\$898,000	\$800,000
Period Costs		
Depreciation of factory building	--	80,000
Other fixed overhead costs	--	18,000
Total Costs	\$898,000	\$898,000

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Exam Hint

- Questions on the CPA exam concern:
- Inventory valuation (product costing)
 - Calculation of variable costing (VC) and absorption costing (AC) income
 - Reconciliation of VC and AC income

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Absorption Costing Income Statement

Sales
Less Variable manufacturing costs—for units sold
Less Fixed manufacturing costs—for units sold
= Gross Margin
Less Variable selling and administrative
Less Fixed selling and administrative
= Operating income

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Treatment of Fixed Manufacturing Costs

Fixed manufacturing overhead is allocated to each item produced.

This means that if we produce more than we sell, a portion of the fixed manufacturing costs is capitalized as inventory.

That is, these costs are deferred as an asset and not expensed until the inventory is sold.

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Variable Costing Income Statement

Sales

Less Variable manufacturing costs—for units sold

Less Variable selling and admin. costs—for units sold

= Contribution margin

Less All fixed costs

= Operating income

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Absorption and Direct Costing

Popular Misconception: Variable selling and administration expenses are product costs.

This is **not** true.

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Absorption and Direct Costing

Popular Misconception:

Absorption costing and direct costing always produce different net incomes.

This is **not** true.

When the number of units sold equals the number of units produced, absorption costing and direct costing produce identical net incomes.

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Difference

Difference =
Change in inventory Level × Fixed manufacturing overhead per unit

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Summary

WHEN:	THEN:
Units Sold = Units Produced	AC Income = DC Income
Units Sold > Units Produced	AC Income < DC Income
Units Sold < Units Produced	AC Income > DC Income

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Income Reconciliation Example

Assume ending inventory is 5,000 units with a fixed cost per unit of \$10; and beginning inventory is 2,000 units with a fixed cost per unit of \$10. What is the difference in income between direct costing and absorption costing?

Answer: $5,000 \times \$10 = \$50,000$

Less $2,000 \times \$10 = \$20,000$

Equals $3,000 \times \$10 = \$30,000$

AC income > DC income by \$30,000

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Past Exam Question (AICPA 921133BEC-P2-AR)

Cay Co.'s 2005 fixed manufacturing overhead costs totaled \$100,000, and variable selling costs totaled \$80,000.

Under direct costing, how should these costs be classified?

	Period costs	Product costs
A.	\$0	\$180,000
B.	\$80,000	\$100,000
C.	\$100,000	\$80,000
D.	\$180,000	\$0

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Past Exam Question (AICPA 120603BEC)

Which of the following statements is correct regarding the difference between the absorption costing and variable costing methods?

- A. When production equals sales, absorption costing income is greater than variable costing income.
- B. When production equals sales, absorption costing income is LESS than variable costing income.
- C. When production is greater than sales, absorption costing income is greater than variable costing income.
- D. When production is LESS than sales, absorption costing income is greater than variable costing income.

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Job Costing

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Job Costing

Job Order Costing

Job order costing—Used for production of large, relatively expensive, heterogeneous (custom ordered) items

Costs are accumulated by job. This usually means grouping costs by customer.

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Sequential Tracking Costing

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graph LR; DM[Direct Materials] --> WIP[Work in Process]; DL[Direct Labor] --> WIP; OH[Overhead] --> WIP; WIP --> FG[Finished Goods]; FG --> CGS[Cost of Goods Sold]
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Job and Process Costing

Process costing—Used to accumulate costs for mass-produced, continuous, homogeneous items that are often small and inexpensive

Costs are accumulated by process. This usually means grouping costs by department or operation.

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Overhead Costs

Since overhead costs are not associated directly with specific units of production, an estimated overhead amount is applied to production based on a predetermined formula.

At the end of the period, the applied overhead is compared to the actual overhead and an entry is made to adjust any difference.

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Overhead Allocation and Disposal

1. Calculate the predetermined overhead rate (POR).

$$\frac{\text{Budgeted factory overhead costs}}{\text{Estimated cost driver activity level}}$$
2. Allocate (i.e., apply) overhead by multiplying the Step 1 rate by the "actual" units of the allocation base
3. Dispose of over-/under-applied overhead. Take the difference between allocated OH and actual OH to cost of goods sold (COGS).

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Overhead Allocation Example

Assume OH is applied based on DL hours:	
Budgeted direct labor hours (DLH)	500,000
Budgeted overhead (OH) dollars	\$250,000
Actual direct labor hours	600,000
Actual overhead dollars	\$350,000
Compute POR: $\$250,000 / 500,000 \text{ DLH} = \$0.50 \text{ per DLH}$	
Apply OH: $\$0.50 \times 600,000 = 300,000$	
Dispose of difference in applied vs. actual OH: $\$350,000 - 300,000 = \$50,000 \text{ to COGS}$	

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Additional Reminders

Make sure that you know which type of overhead to use in these calculations and when to use them.

Make sure you multiply the POR by **actual** units in Step 2.

Make sure you know what step goes with what time of the year.

Finally, the terms *estimated* and *budgeted* mean the same thing here. Also, the terms *allocated* and *applied* mean the same thing.

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Exam Question

Birk Co. uses a job order cost system. The following debits (credits) appeared in Birk's work in process account for the month of April 2005:

April	Description	Amount
1	Beg Inventory	\$ 4,000
30	Direct materials	24,000
30	Direct labor	16,000
30	Factory overhead	12,800
30	To finished goods	(48,000)

Birk applies overhead to production at a **predetermined rate of 80%** of the direct labor cost. Job No. 5, the only job still in process on April 30, 2005, was charged with **direct labor of \$2,000**. What was the amount of **direct materials** charged to Job No. 5?

- A. \$3,000.
- B. \$5,200.
- C. \$8,800.
- D. \$24,000.

AICPA_920544BEC-P2-AR

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Exam Question

On January 1 Maples had two jobs in process: #506 with assigned costs of \$10,500 and #507 with assigned costs of \$14,250. During January three new jobs, #508 through #510, were started and three jobs, #506, #507, and #508, were completed. Materials and labor costs added during January were as follows:

<u>Job number</u>	<u>Materials</u>	<u>Labor</u>
506	\$0	\$2,000
507	0	1,500
508	4,000	3,600
509	3,800	2,000
510	2,600	3,100

Manufacturing overhead is assigned at the rate of 200 percent of labor. What is the January cost of goods manufactured and transferred from work-in-process?

- A. \$25,300
- B. \$35,850
- C. \$42,950
- D. \$50,050

AICPA.130732BEC

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Process Costing

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Process Costing

Process Costing

Process cost questions are likely to focus on the calculation of equivalent units under different cost flow assumptions (i.e., FIFO vs. Weighted average).

Process costing is used to accumulate costs of mass-produced, continuous, homogeneous items that are often small and inexpensive.

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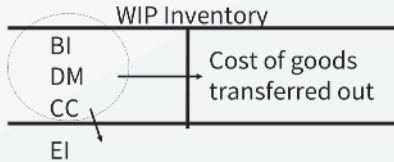
Cost Allocation Process—Complications

1. Partially completed items in beginning and ending inventories.
2. The three factors of production may be at different levels of completion.
3. Some costs do not occur uniformly across the process.
4. The choice of inventory evaluation methods affects the flow of costs.

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Job and Process Costing

Process accounting problem: It is necessary to allocate manufacturing costs to ending work in process (WIP) and cost of goods transferred out of WIP.



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Three Steps in Process Costing

1. Determine equivalent units (EU).
2. Compute cost per EU.
3. Determine (a) cost of goods transferred out of WIP and (b) ending WIP inventory.

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Step 1: Equivalent Units

We have to compute *equivalent units* for both direct materials and for conversion costs.

Equivalent units are equivalent only on the basis of cost!

We usually assume that conversion costs are incurred evenly throughout production and that direct materials costs are not incurred evenly; however, this is not always the case.

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Step 1: Equivalent Units

By definition, one equivalent unit represents the cost of one whole unit in terms of cost.

Equivalent units are computed as a convenience to express the representative number of units that would comprise the cost of incomplete units in WIP inventory.

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Step 2: Cost per Equivalent Unit

The second step is to divide the cost for direct materials (DM) and conversion costs by the equivalent units.

This provides a cost per equivalent unit for both DM and conversion costs.

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Step 3: CGTO and Ending WIP Inventory

Use the cost per equivalent unit to value the work in process and cost of goods transferred out (CGTO).

This step combines the first two by requiring that (1) the appropriate equivalent units be multiplied by (2) the cost per equivalent unit to value WIP EI and CGTO.

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Cost Flow Assumption

Deciding which equivalent units number to use

The cost flow assumption determines which equivalent units figure to use:

- Weighted average—Assumes that prior period costs and current period costs are averaged together
- FIFO—Assumes that prior period costs and current period costs are treated separately

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Weighted Average vs. FIFO

The only difference between the two methods is the treatment of beginning inventory.

With weighted average, the beginning inventory costs are averaged with the current period.

With FIFO, the beginning inventory value is treated as a lump sum and is added to the current period costs.

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Allocation of Costs

Note: Regardless of the cost flow assumption, all costs must be allocated either to ending work-in-process inventory or to finished goods.

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Process Costing Example

Cost Flow Assumption	Equivalent Units	Costs to Allocate
Weighted Average	6,200	\$3,240
FIFO	5,200	\$2,600

What is the unit cost using the weighted average cost flow assumption?

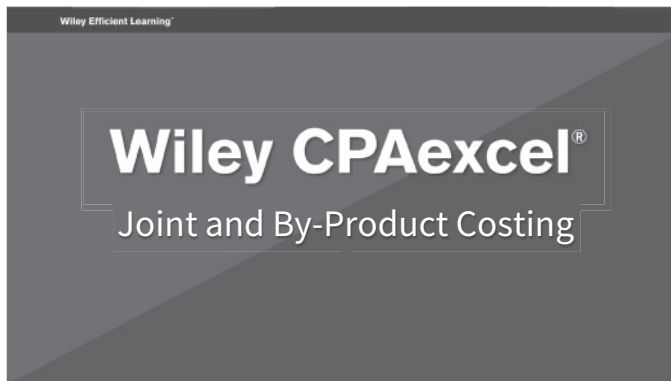
$\$3,240 / 6,200 = \$0.52 \text{ per Unit}$

What is the unit cost using the FIFO cost flow assumption?

$\$2,600 / 5,200 = \$0.50 \text{ per Unit}$

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Joint and By-Product Costing



Joint and By-Products Defined

Joint products and by-products are the result of a single manufacturing process that yields multiple products.

Two or more products of *significant sales value* are said to be joint products when they:

- Are produced from the same set of raw materials
- Are not separately identifiable until a **split-off point**

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Joint Cost Terminology

Split-off—The point at which products manufactured through a common process are differentiated and processed separately.

Joint costs—Costs incurred prior to split-off; must be allocated to the joint products.

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Joint Cost Terminology

Separable costs—Additional processing costs incurred beyond the split-off point.

Separable costs are attributable to individual products; they are *not* allocated to the joint products.

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Cost Allocation Methods

Joint costs may be allocated to the joint products in several ways. The most common methods are:

- Physical volume method
- Sales value at split off method
- Net realizable value method
- Constant gross margin percentage method

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Relative Physical Volume Method

Costs are allocated based on the quantity of products purchased.

The total volume of all products is established (pounds, feet, gallons, etc.), each product's pro rata share is determined, and the joint costs are allocated based on that proportion.

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Relative Sales Value Method

Relative sales value—Costs are allocated based on the relative sales values of the products either at split-off or after additional processing.

When significant markets exist for the products at the split-off point, the relative sales value of each product is used to allocate costs.

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No Market Value at Split-off

When there is no market at split-off, the ratio of the net realizable value of each product to the total net realizable value is used to allocate costs (i.e., final market value *less any additional separable processing costs* of each product) to the total net realizable value is used to allocate costs.

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By-Products

By-products—Differ from joint products in that they have relatively insignificant sales value when compared to the main product(s).

Costing—Because of their relatively insignificant sales value, by-products usually are not allocated a share of the joint costs of production.

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By-Product Costing

Net proceeds from the sale of by-products are used to reduce the cost of the main products.

No revenue is recognized from the sale of the by-products.

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Example 1

By-product cost treatment as other revenue

From each batch produced, Sam obtains 1000 gallons of product A, 200 gallons of product B, and 20 gallons of a by-product. The by-product can be sold for \$4 per gallon.

- Management chooses not to assign any cost to the by-product and it is not inventoried.
- All production cost is allocated to the main products, A and B.
- The by-product's cost is recorded as miscellaneous revenue.

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Example 2

By-product cost treatment as a reduction in production cost

From each batch produced, Sam obtains 1000 gallons of product A, 200 gallons of product B, and 20 gallons of a by-product. The by-product can be sold for \$4 per gallon.

- By-product value is recognized at the time of production.
- The by-product's net realizable value (\$80) is deducted from the joint products' total cost prior to allocation.
- By-product inventory would be carried at NRV.

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Scrap

Scrap—A remnant of the production process that has some, but very little, recovery value. Scrap is seldom processed beyond the split-off point.

The net proceeds from sale of scrap are used to reduce overhead costs (credit to factory overhead control).

If scrap is identified with a particular direct material, it may be offset against that cost.

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Sales and Direct Cost Variance Analysis

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Sales and Direct Cost Variance Analysis

Standard Costing/Variance Analysis

Standards are developed for each factor of production (materials, labor, overhead) and may be used to value inventories (raw materials, work in process [WIP], finished goods [FG]) and cost of goods sold (COGS).

Variances are analyses of differences between standard costs and actual costs:

- Nonmaterial variances—Write off to COGS.
- Material variances—Allocate to ending WIP, FG, and COGS.

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Materials and Labor Variances

Variance analysis divides the total difference between actual costs and standard costs into:

- Differences due to the cost of the resource (price per pound, labor rate per hour, etc.), and
- Differences due to the quantity used (gallons, pounds, feet, labor hours, etc.)

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Materials and Labor Variances

Variances are best calculated by the standard amount minus actual amount.

Variances calculated in this manner produce negative numbers, which represent unfavorable variances, and positive numbers, which represent favorable variances.

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Names of Variances

Variances due to the difference between actual and standard price:

- PRICE or RATE Variances

Variances due to the difference between actual and standard quantity:

- QUANTITY or EFFICIENCY Variances

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Variance Analysis Format

	Qty/Hrs	×	Price/Rate	=	Total
+ Standard	???	×	???	=	Total standard cost
– Actual	(???)	×	(???)	=	(Total actual cost)
= Difference	???		???	=	Total variance

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Variance Analysis Format

Note that the amount listed for the standard quantity/hour is always the standard quantity allowed (SQA) for *actual production*.

SQA is the standard input per unit multiplied by the *actual* finished goods units produced.

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Efficiency/Quantity Variance

Definition: The difference in quantities is multiplied by the standard price.

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Rate/Price Variance

Definition: The difference in rates/costs is multiplied by the actual quantity used.

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Total Variance

Definition: The sum of the price/rate variance and the usage/efficiency variance often is referred to as the **flexible budget variance**.

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Sales Variances

Sales variances occur due to:

- Differences in the expected and actual number of units sold
- Differences in the expected and actual product mix sold

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Sales Mix Variance

The sales mix variance quantifies the effect on contribution margin resulting from selling different proportions of products with differing profit margins.

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Sales Quantity Variance

The sales quantity variance is due to selling a different number of units than expected at the weighted-average unit contribution margin for the sales mix.

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Sales Volume Variance

The sales volume variance is the net of the sales mix and quantity variances.

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Direct Cost Variance Calculation

Standard labor for one unit is 2 hours at \$14.50 per hour. Actual units produced were 15 units; actual labor charges were 40 hours at \$14.10 per hour. Calculate the labor rate and efficiency variances for Product A.

AQ × AP	AQ × SP	SQA × SP
40 hours ×	40 hours ×	30 hours ×
\$14.10 =	\$14.50 =	\$14.50 =
\$564.00	\$580.00	\$435.00
\$16.00 favorable Rate Variance	\$145.00 unfavorable Efficiency Variance	
\$129.00 unfavorable Total Variance		

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Example—Sales Variance Calculation

Mercury Corp.'s master budget showed planned sales revenue of \$400,000 on sales of 100,000 units. Actual sales were 90,000 at \$4.50 per unit. What were Mercury's sales price, sales quantity, and total sales variances?

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Example—Sales Variance Calculation

Answer:

Sales price variance = $(\$4.50 - \$4.00) 90,000 \text{ units} = \$45,000 \text{ Favorable}$

Sales quantity variance = $(90,000 \text{ units} - 100,000 \text{ units}) \$4.00 = \$40,000 \text{ Unfavorable}$

Total variance = $\$45,000 \text{ Favorable} - \$40,000 \text{ Unfavorable} = \$5,000 \text{ Favorable}$

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Summary

Know the basic calculations of sales variances:

Direct cost variances

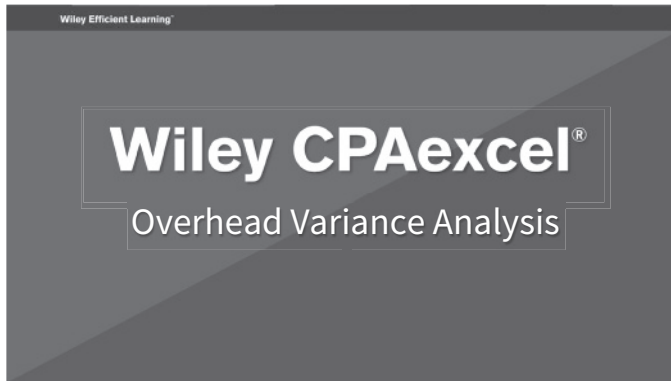
Sales variances

Standard costing

Formula and 3-column approach

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Overhead Variance Analysis



Complications of Overhead

Separate variances must be calculated for variable overhead variances and for fixed overhead.

Applied overhead costs will change solely as a result of changes in cost driver consumption and do not represent true changes in overhead consumption.

Only some overhead variances are controllable by the production supervisor.

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Variable Overhead

Variable overhead varies with the level of production.

The variances reflect both differences in:

- Unit cost of variable overhead
- Quantities of variable overhead used

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Calculation

Spending variances are calculated in a manner similar to rate-type variances.

Efficiency variances are calculated in a manner similar to quantity-type variances.

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Variable Overhead Example

Bennington City Manufacturing allocates overhead to production based on machine hours. The following information is available regarding its variable overhead for the current quarter:

Variable overhead rate per machine hour:		\$0.25
Standard machine hours per unit:	3 hours	
Planned production	1,500 units	
Planned machine hours (3 hours × 1,500 units)	4,500 hours	
Actual machine hours	4,700 hours	
Actual units produced	1,700 units	
Standard machine hours allowed for actual production (3 hours × 1,700 units)	5,100 hours	
Actual variable cost		\$1,269
What are the variable overhead variances?		

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Variable Overhead Example Answer

	Quantity	×	Rate	=	Total
Standard	5,100	×	\$.25	=	\$1,275
– Actual	4,700	×	\$.27*	=	\$1,269
= Difference	400		(\$.02)		\$6.00

*Derived from given information: Actual Overhead/Actual

Quantity $\$1,269 / 4,700 = .27$

Efficiency variance: $400 \times \$.25 = \$100.00$ favorable

Spending variance: $(\$.02) \times 4,700 = (\$94.00)$ unfavorable

Total Variance = $\$100.00 + (\$94.00) = \$6.00$ favorable

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Spending and Efficiency Variance

Spending variance—Variance due to price changes in indirect material and labor, and poor budget estimates.

- It is a controllable variance

Efficiency variance—Variance due to variations in the efficiency of the base used to allocate overhead (i.e., direct labor hours, direct labor dollars, etc.).

- It is *often* a controllable variance.

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Fixed Overhead

The variances in fixed overhead result from differences between:

- Actual fixed costs and budgeted fixed costs and
- Budgeted fixed costs and fixed costs applied based on standard quantity allowed for actual production

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Volume Variance

Volume variance is the variance due to differences in the actual activity level attained (at standard) and the estimated/budgeted total fixed costs.

It is a measure of the cost of failure to operate at the estimated activity level and in an uncontrollable variance.

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Budget (Spending) Variance

Variance due to price differences in the total fixed overhead costs and the budget.

The difference between the estimated total fixed overhead and the actual total fixed overhead.

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Fixed Overhead Example

Budgeted fixed overhead is \$40,000. The fixed overhead is applied to production based on direct labor hours (DLH): 0.5 DLH are required to produce each unit, and the company has budgeted production of 100,000 units. Actual production is 120,000 units, and actual fixed overhead is \$38,000.

What is the fixed overhead budget variance and the fixed overhead volume variance?

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Fixed Overhead Example Answer

Fixed overhead application rate = $\$40,000 / (100,000 \text{ Units} \times 0.5 \text{ DLH per Unit}) = \$0.80 \text{ per DLH}$

Standard quantity allowed for actual production = $120,000 \text{ Units} \times 0.5 \text{ DLH} = 60,000 \text{ DLH}$

Fixed overhead volume variance = $\$40,000 - (\$0.80 \times 60,000) = \$40,000 - \$48,000 = \$8,000 \text{ Favorable}$

Fixed overhead budget variance = $\$38,000 - \$40,000 = \$2,000 \text{ Favorable}$

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Four-Way Variance Method

Comprised of the two variable overhead variances (efficiency and variable spending) and the two fixed overhead variances as described.

Usually two or three of these variances are combined.

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Three-Way Variance Method

Combines the variable overhead spending variance and the fixed overhead budget (spending) variance into a single variance.

Often referred to as the *total spending variance*.

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Two-Way Variance Method

Combines the total overhead spending variance and the fixed overhead budget (spending) variance into a single variance.

Often referred to as the *controllable or flexible budget variance*.

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Summary

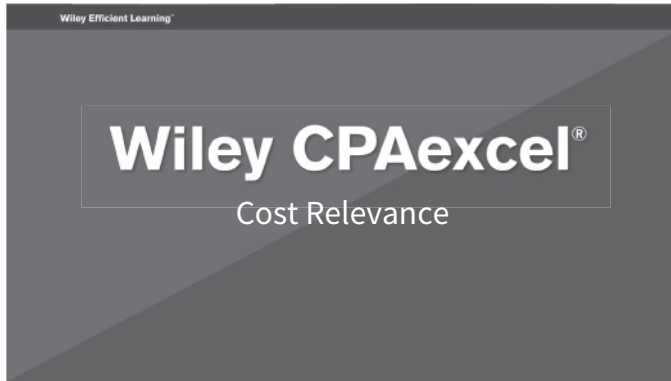
Analysis of overhead is complicated for fundamentally three reasons:

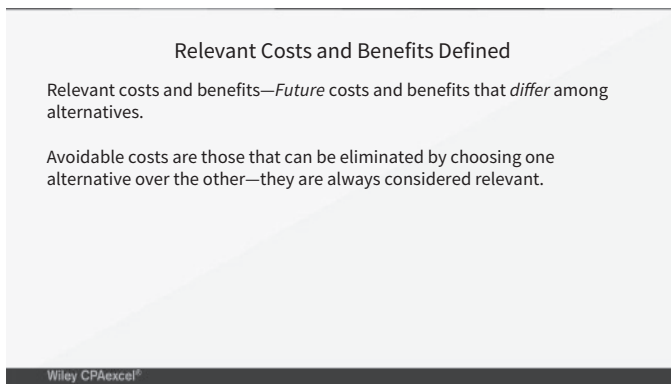
1. No universal way of representing overhead in terms of units
2. Overhead variances include both fixed and variable costs.
3. Issues related to flexible budgeting and standard costing tend to complicate things further.

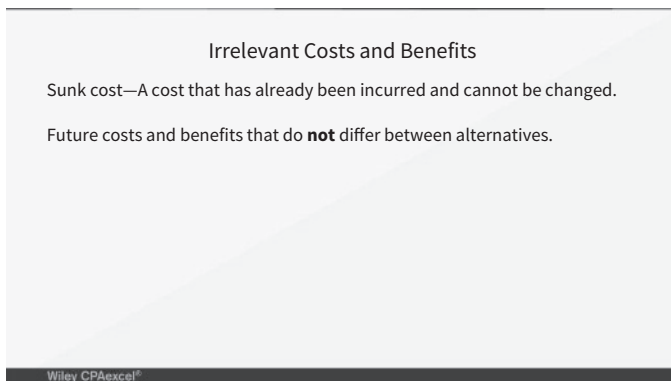
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Process Management

Cost Relevance







Other Concepts

Accounting cost—Costs that can be found in the fundamental books of record (e.g., the general ledger)

Opportunity cost—The benefit forgone that results from choosing one alternative course of action rather than another

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Fixed Cost

Fixed costs aren't equivalent to unavoidable costs. Unavoidable costs can't be changed, but fixed costs can change.

Remember that fixed costs are fixed with respect to output.

Fixed costs are always fixed with regard to the volume of units produced or sold.

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Marginal and Incremental Cost

Marginal cost is the cost of producing one more unit.

Incremental cost is the difference between two decision alternatives.

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Special Decisions

- Sell or process further
- Keep or drop a product line or company segment
- Make or buy a product or component
- Accept or reject a special order

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Sell or Process Further Decisions

When making this decision, the only relevant facts are the differential future costs and benefits:

- The separable costs incurred beyond the split-off point, and
- The difference between the revenue that can be earned at split-off and the revenue that can be earned after further processing.

Joint costs are not relevant.

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Sell or Process Further Example

Assume that a butcher shop buys a side of beef for a joint cost of \$200. The beef will be split into premium meat and hamburger meat, which can be sold as is or processed further into steaks and ground hamburger.

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Sell or Process Further Example

Premium meat and hamburger meat can be sold "as is" for \$250 and \$100, respectively.

Further processing cost is:

- \$50 for the steaks
- \$60 for the ground hamburger

Final sales value after further processing is:

- \$400 for the steaks
- \$125 for the ground hamburger

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Relevant Solution Information

Incremental revenue:

- Steak $\$400 - \$250 = \$150$
- Ground hamburger $\$125 - \$100 = \$25$

Incremental cost:

- Steak = \$50
- Ground hamburger = \$60

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Sell or Process Further Solution

Relevant cost solution:

- Steak $\$150 - \$50 = \$100$
- Ground hamburger $\$25 - \$60 = <\$35>$

Recommendation: Process the premium meat into steak for an additional profit of \$100; but sell the hamburger meat at the split-off point to avoid a \$35 loss on additional processing.

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Keep or Drop Decision Considerations

Some of the costs charged to the product or segment may not be eliminated if the product or segment is eliminated.

Changes in one part of the organization may impact other parts of the organization.

There may or may not be alternative uses for the resources freed up by elimination of the product or segment.

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Keep or Drop Decision Example

(000's)	Tax	Audit	Total
Sales	\$200	\$800	\$1,000
– Variable costs	\$25	\$500	\$525
Cont. margin	\$175	\$300	\$475
– Fixed costs	\$200	\$100	\$300
Income (loss)	(\$25)	\$ 200	\$175

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Keep or Drop Decision Solution

(000's)	Tax	Audit	Total
Sales	\$0	\$640	\$640
– Variable costs	\$0	\$400	\$400
Cont. margin	\$0	\$240	\$240
– Fixed costs	\$150	\$100	\$250
Income (loss)	(\$150)	\$ 140	(\$10)

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Further Analysis

The scenario described in the previous example (e.g., the line that may be dropped initially shows a net loss but further analysis reveals that the line contributes positively to the total organization's performance).

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Important Keep or Drop Facts

Elimination of a losing segment will also eliminate any contribution margin provided by the losing segment.

Some costs are avoidable and some are not.

There may be unintended negative consequences on other remaining segments.

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Special Decisions

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Special Decisions

Special Order Relevant Costs

The only relevant costs are the costs directly attributable to the special order and, if the company is operating at capacity, the opportunity costs associated with production that must be cancelled in order to complete the special order.

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Special Orders with Excess Capacity

If the special order can be completed using existing capacity, only sales revenues and the (avoidable) variable costs of producing the order need to be considered.

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Special Order Example

Schwindle Bike manufacturing fabricates bicycle frames and uses them in the production of finished bicycles. They have recently received an offer from a major customer to purchase 500 finished bicycles for \$150 each. Assuming the following cost information and adequate excess capacity to complete the order, what are the relevant costs and benefits? What should they do?

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Cost to Produce and Sell

Direct material	\$40
Direct labor	\$18
Variable manufacturing overhead	\$22
Fixed manufacturing overhead	\$40
Variable selling and administrative expenses	\$50
Fixed selling and administrative expenses	\$20
Total cost per unit	\$190

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Relevant Special Order Cost

Direct material	\$40
Direct labor	\$18
Variable manufacturing overhead	\$22
Variable selling and administrative expenses	\$50
Total cost per unit	\$130

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Relevant Cost Assumptions

Although the total production cost of a bicycle is \$190, since excess capacity is available, the relevant cost of the special order to the company is assumed to be only the \$130 of avoidable variable costs. Fixed costs are assumed to be unavoidable. Thus, these costs do not differ whether the special order is accepted or rejected.

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Special Order Solution

Given that the special order offer was for \$150 per bicycle and the relevant cost to manufacture and sell the bicycles is \$130, the company should accept the special order.

The decision to accept is based on relevant cost data since the additional revenue would be useful in contributing to the coverage of the unavoidable fixed costs.

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Special Order without Excess Capacity

When no excess capacity exists, acceptance of a special order means that other units must be removed from the production schedule to make room for the special order.

The forgone profits related the units that were removed from production represent an opportunity cost and must be included in the profitability analysis of the special order.

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No Excess Capacity Example

Assume the same data as in the prior bicycle example except that there is no excess capacity and bicycles are already being sold to regular customers for \$200. In this case, what costs and benefits would be relevant to the analysis? What should the company do?

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No Excess Capacity Relevant Costs

The relevant costs do not differ since variable costs are still assumed to be avoidable and fixed costs are still assumed to be unavoidable.

However, the forgone revenue from the regular customers that is lost is considered an opportunity cost of the transaction and is considered relevant.

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No Excess Capacity Solution

With the same costs and a decrease in revenue of $\$200 - \$150 = \$50$ per bicycle, the special order should not be accepted.

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The Outsourcing (Make or Buy) Decision

The decision of whether to outsource production—to make or buy a component—is based on comparative analysis of the external purchase costs and the *relevant costs* of internal production.

The easy part of this analysis is the buy price, which is usually given.

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Outsourcing Example

Schwindle Bike manufacturing fabricates bicycle frames and uses them in the production of finished bicycles. They have recently received an offer from a major supplier to provide 1,000 finished bicycle frames (their entire annual projected needs) for \$30 each. Assuming the following cost information, what are the relevant costs and benefits to the decision? What should they do?

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Cost of Fabrication

Direct material	\$10
Direct labor	\$5
Variable manufacturing overhead	\$6
Fixed manufacturing overhead	\$5
Total cost per frame	\$26

We assume that \$2 of Fixed OH can be avoided.

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Relevant Costs of Fabrication

We assume that the relevant costs are the variable cost outlays and the avoidable fixed costs of \$2 per unit.

Thus, the relevant cost per unit for the analysis is \$23 per unit.

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Outsourcing Decision Solution

In this case, based on financial data alone, we would consider the offer to supply the fabricated frame of \$30 to be more than the \$23 of cost the company is currently incurring to fabricate the unit.

The decision would thus be to continue the manufacturing of the frame internally and reject the supplier's offer.

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Outsourcing Decision Solution

One additional consideration would be the qualitative aspects of the make or buy decision.

Is the supplier's quality level adequate? Is it better than the in-house quality levels achieved given specialization of production?

Qualitative issues must be carefully evaluated in consideration of the consistency with organization and product strategy.

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Transfer Pricing

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Transfer Pricing

Transfer Pricing Defined

Transfer price—The price charged by the selling division to the buying division.

Three types:

1. Cost based—Cost of production

2. Negotiated—Price that is mutually agreeable

3. Market based—Price on the open market

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Establishing Goal Congruence

When both managers act in their individual best interests, the organization as a whole may suffer, resulting in suboptimization.

For this reason, senior management usually establishes the method for setting transfer prices to promote goal congruence.

Goal congruence occurs when the department and division managers make decisions that are consistent with those of the organization as a whole.

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General Transfer Pricing Rule

This transfer pricing rule helps to ensure goal congruence:

- Transfer price per unit = additional outlay cost per unit + opportunity cost per unit
- Additional outlay cost – Incremental production costs incurred by selling unit
- Opportunity cost – Benefit forgone as a result of selling internally rather than externally

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Issue of Capacity

When the selling unit is operating at full capacity, the transfer price should be equal to the market price.

When the selling division has excess capacity, the transfer price should be equal to the additional costs incurred to produce each unit.

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Negotiated Transfer Prices

The buying division's maximum price will be equal to the minimum price for the item on the open market.

The selling division's minimum price will be equal to:

- Its direct costs if it has excess capacity; or
- Its market price if it does not have excess capacity.

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Cost-Based Pricing

Under cost-based pricing, the transfer cost is determined by the production costs associated with the selling division.

Cost-based pricing provides a simple, easy-to-understand method to set transfer prices and is used extensively in practice.

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Dual Pricing

Dual pricing is an attempt to eliminate the internal conflicts associated with transfer prices by giving both buying and selling divisions the price that “works best” for them.

Unfortunately, by giving both buying and selling divisions prices that enhance their profitability, much of the value of pricing as an incentive for divisions to control costs is lost.

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Other Considerations

Transfer pricing can be an important tool for reducing tax liability.

Because taxes and import duties vary among countries, the transfer price used to value products can have a significant effect on the amount of taxes and duties paid.

Transfer pricing can provide tax benefits for international companies (and sometimes between states) by attempting to declare profits in the country or state that has the lowest marginal tax rates.

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Summary

Transfer pricing approaches:

- Market price
- Cost-based price
- Negotiated price
- Goal congruence issue has the ability to impact incentive compensation

General rule when establishing a transfer price:
 additional outlay per unit + opportunity cost per unit

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Summary

If excess fixed capacity exists:

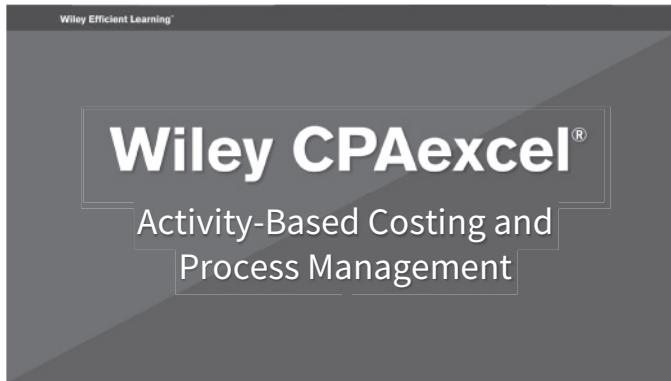
Seller needs to cover their incremental outlay costs as a floor in transfer price negotiations

Dual pricing—top management provides a different, preferred price for buyer and seller.

Income tax effects for transfer pricing—strive to position tax incidence where marginal rate is the lowest.

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Activity-Based Costing and Process Management



Purpose of Activity-Based Costing

Activity-based costing (ABC) is a method of assigning overhead (indirect) costs to products.

ABC is an alternative to the traditional, volume-based, plant-wide approach to allocation.

ABC uses process-based drivers and multiple cost pools to significantly improve the accuracy of product cost allocation.

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Activity-Based Costing Terminology

Activities—Procedures that cause work

Cost drivers—Measures that are closely correlated with the way in which an activity accumulates costs

Cost center—An area where costs are accumulated and then distributed to products (e.g., accounts payable, product design, and marketing)

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Activity-Based Costing Terminology

Cost pools—A group of costs that are associated with a specific cost center

Value-adding costs—Costs that contribute to the product's ultimate value

Non-value-adding costs—Costs that do not contribute to the product's value

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Activity-Based Costing Cost Hierarchy

Activities are commonly grouped into one of four categories:

1. Facility-level activities
2. Product sustaining-level activities
3. Batch-level activities
4. Unit-level activities

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Activity-Based Costing Cost Assignment

An activity cost pool is comprised of the costs of resources consumed by a particular activity.

The next step is to identify cost drivers that can be used to allocate the costs to products.

ABC results in a larger number of smaller cost pools that can be more closely aligned to products.

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Activity-Based Costing Compared

In general, compared to traditional, volume-based costing, ABC tends to shift costs away from high-volume, simple products to lower-volume, complex products.

In comparison, traditional systems tend to over-cost high-volume products and under-cost low-volume products.

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Effects of Adopting ABC

More precise measures of cost
More cost pools
More allocation bases

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Traditional vs. ABC Allocation

Actual overhead amounted to \$650,000.
Actual direct labor hours totaled 110,000.

$\$600,000 / 100,000 \text{ DLH} = \$6 \text{ per DLH} = \text{POR}$
 $\$6 \times 110,000 \text{ DLH} = \$660,000 = \text{Allocated OH}$

Actual vs. allocated was \$650,000 vs. \$660,000.

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Volume-Based Allocation

For the current volume-based approach, YRU uses a predetermined factory overhead rate based on direct labor hours (DLH). For the current year, YRU budgeted overhead of \$600,000 based on a volume of 100,000 DLH. Actual overhead amounted to \$650,000 with actual DLH totaling 110,000. Given this information, YRU would allocate factory overhead as follows:

$$\textcircled{1} \frac{\$600,000}{100,000 \text{ DLH}} = \$6 \quad \textcircled{2} \$6 \times 110,000 \text{ DLH} = \$660,000$$

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ABC Allocation

Activities	Cost Driver	Budgeted Cost	Budgeted Activity		Actual Activity	
Moves	Distance of Moves	\$40,000	500 miles	= \$80 x	400 miles	= \$32,000
Setups	Number of Setups	\$60,000	300 setups	= \$200x	280 setups	= \$56,000
Disposal	Lbs. of Disposal	\$180,000	90,000 lbs.	= \$2x	100,000 lbs.	= \$200,000
Batches	Number of Batches	\$320,000	1,000 batches	= \$320x	800 batches	= \$256,000
						\$544,000
	Total Cost	\$600,000				

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Process Management

Process management place to achieve an understanding of the work that takes place in an organization

Processes can be defined as a series of activities conducted to accomplish a defined objective

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Key Objectives

1. Increase manager understanding.
2. Promote the elimination of waste.

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Business Process Re-Engineering (BPR)

BPR is a process analysis approach that results in radical change.

The idea behind BPR is to make an extreme transformation.

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Outsourcing, Shared Services, and Offshore Operations

Outsourcing, shared services, and offshoring are important process management tools.

Each of these methods has its own characteristics and its own set of risks that result from its use.

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Outsourcing, Shared Services, and Offshore Operations

Outsourcing is contracting a business process to an external provider.

Shared services provide an essential business where previously it had been provided by multiple parts of the organization.

Offshoring is where a process is moved to a foreign country.

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Planning Techniques

Budgeting

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Budgeting

Budgeting

Budgeting is a fundamental tool for planning and control.

The budget process produces a series of related budgets that culminate in the master budget, the overall plan of operation for the organization.

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Budgeting Process

The budgeting process begins with a sales forecast.

The sales forecast expresses planned sales in dollars and in units.

These estimates flow forward to the cash budget and the production budget.

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Master vs. Flexible Budget

The master budget is a comprehensive plan for the overall activities of a company.

The master budget is developed for a specified level of activity.

It is a static budget.

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Master vs. Flexible Budget

A flexible budget is adjusted when actual sales deviate from the planned sales.

This helps analyze actual results by comparing them with expected results at the actual level of activity.

Flexible budgets are most frequently used for manufacturing and sales activities.

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Flexible Budgeting

When actual results deviate from planned activity, revenues and variable costs are changed to reflect the actual activity level:

- Revenue is adjusted by multiplying the new quantity by the sales price.
- Total variable costs are adjusted by multiplying the new quantity by the variable cost per unit.
- Total fixed costs remain the same as long as volume remains within a relevant range, thus no adjustment is needed.

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Flexible Budgeting

The justification for flexible budgeting is that the company may have produced a different budget had they known the actual volume produced/sold.

Removing the volume variable from the picture allows a comparison on the basis of what the budget “would have” looked like at the actual volume level.

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Example: Production Purchases Budget

Beginning inventory for the year is 27 units.
Ending inventory for each month should be 30% of the next month's sales.
Consider the Sales budget facts below:

Sales budget in units	
January	70
February	90
March	50
April	60

How many units should the company produce in January?

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	January	February	March
<i>Beg Inv FG</i>	27	27	
<i>CGM = Produced</i>	<u>70</u>	78	
<i>Goods Available</i>	97	105	
<i>- End Inv FG</i>	27	15	
<i>Cost of Goods Sold</i>	70	90	50
	(.3 × 90)	(.3 × 50)	

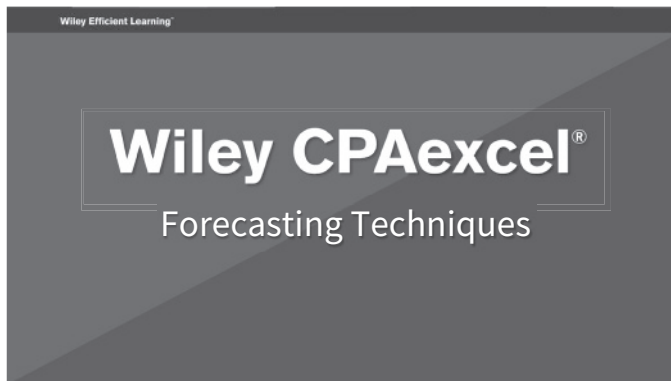
Example: Production Purchases Budget

How many units of direct material (DM) should the company purchase in February if each FG unit takes 2 units of DM to produce, and they have no beginning inventory in January and they want to maintain an inventory of 10 DM units?

	January	February	March
<i>Beg Inv FG</i>	27	27	
<i>CGM = Produced</i>	<u>70</u>	78	
<i>Goods Available</i>	97	105	
<i>- End Inv FG</i>	27	15	
<i>Cost of Goods Sold</i>	70	90	50
<i>Beg Inv DM</i>	(0.3 × 90)	(10.3 × 50)	
<i>+ DM Pur</i>	150	156	
<i>DM Available</i>	150	166	
<i>- End Inv DM</i>	10	10	
<i>DM Used</i>	140	156	
	(70 × 2)	(78 × 2)	

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Forecasting Techniques



Probability Analysis

Probability analysis is used to determine the likelihood of a specific event occurring when several outcomes are possible.

A probability for each outcome is assessed.

The probability of a particular outcome is always between 0 and 1 (never and always).

Expected Value Calculation

The expected value is the long-run average outcome.

Expected value is determined by calculating the weighted average of the outcomes:

- Multiply the value of each outcome by its probability and then sum the results.

Expected Value Example

The useful life of a machine is not known, but there is a 20% probability of a 5-year life, a 50% probability of a 6-year life, and a 30% probability of a 7-year life.

What is the expected life of the machine?

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Expected Value Example

Years Life		Probability	Expected Value
5	×	.2	= 1.0 year
6	×	.5	= 3.0 years
7	×	.3	= 2.1 years
		1	6.1 years expected life

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Joint Probability

Joint probability is the probability of an event occurring given that another event has already occurred.

Joint probability is determined by multiplying the probability of the first event by the conditional probability of the second event.

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Joint Probability Steps

1. For each combination of events, multiply the probability of the first event by the conditional probability of the second event.
2. Sum the results for all the event combinations.
3. Divide each result for each event combination by the total of all the event combinations.

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Variance Analysis

Variance analysis measures the dispersion of values around the expected value.

The smaller the variance, the more tightly clustered the observations.

Smaller variances usually are associated with less risk.

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Correlation Analysis

Correlation analysis measures the strength of the relationship between two or more variables.

The correlation coefficient (R) measures the strength of the relationship.

The correlation coefficient can have values from -1 to 1.

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Coefficient of Determination

The coefficient of determination (R^2) indicates the degree to which the behavior of the independent variable predicts the behavior of the dependent variable. The closer R^2 is to 1, the better the independent variable predicts the dependent variable.

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Regression Analysis

Regression analysis predicts the value of one factor (the dependent variable) based on the value of one or more other factors (the independent variables).

Linear regression analysis is frequently used in cost accounting to evaluate the strength of the relationship between costs and cost drivers.

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Regression Equation

$$y = A + Bx$$

where:

y = dependent variable

A = y intercept

B = slope of the line

x = independent variable

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Summary

- Expected value and regression are two forecasting methods likely to be tested.
- Practice the expected value computations and the regression calculations.
- Be familiar with the regression equation's terms, the correlation coefficient (R) and the coefficient of determination (R^2).

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Summary

Questions will be focused on:

- Defining elements in the regression equation
- Evaluating the significance of values for the Correlation Coefficient (R) and the Coefficient of Determination (R^2)

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