Budgeting & Financial Control

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General Administrative Points:

1. Welcome
2. Fire Alarms & Emergency Exits
3. Keep mobile phones on silent mode please
4. Please fill the Registration Form
5. Any questions before commencing?

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- Understanding accounting principles and methods
- Management accounting versus financial accounting
- The relationship between business management and financial management
- How budgeting fits into the bigger picture
- How cost management improves an organisation's financial position
- Key aspects of managing working capital

Course Outline
Day 2 – CAPITAL BUDGETING AND INVESTMENT APPRAISAL

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- Budgeting for non-financial measures -introducing the Balanced Scorecard

Instructor Profile

Mr. Manjit Biant is a Senior Consultant with EuroMaTech specializing in Accounting which includes Finance & Business including Finance for Non Finance Managers, IFRS, IPSAS, Risk Anaylisis & Strategy Management, Forensic Accounting & Auditing and Corporate Governance.

His degree in Business Administration included a placement year with Deloitte Haskins & Sells, one of the top five Accountancy firms at the time. He proceeded to continue his career with the newly merged firm Coopers & Lybrand Deloitte. He worked in Financial Services for a number of years with Lloyds TSB and AMP(UK Financial Services).

He went on to work for Hays PLC as a Commercial Accountant, then finally decided to run his own business and get street experience, putting his entrepreneurial skills to the test. After selling his business at a young age, he now enjoys semi-retirement, working as a part-time lecturer, free-lance trainer, business consultant & Internet Marketing Coach.

Manjit has had extensive training in the Thompsett Project Management program, Quality Management Techniques and Customer care implementation. Manjit has conducted courses in Europe, Africa, USA and the Middle East.

Day 1

THE NEED FOR FINANCIAL CONTROL IN BUSINESS

THE NEED FOR FINANCIAL CONTROL IN BUSINESS

- Understanding accounting principles and methods
- Management accounting versus financial accounting
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- How budgeting fits into the bigger picture
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- Key aspects of managing working capital

Understanding accounting principles and methods

Understanding Financial Statements

- Fundamental requirement
  - Show “true and fair view”
  - Prepared in accordance with:
    - Generally Accepted Accounting Principles
    - Financial Reporting Standards
    - Standard Statement of Accounting Practice

Understanding Financial Statements

- Four basic accounting concepts
  - Going concern concept
  - Accruals concept
  - Consistency concept
  - Prudence concept

Understanding Financial Statements

- Various accounting policies
  - Sales income recognition
  - Depreciation of fixed assets
  - Stocks and work in progress
  - Research and development

What is Finance?

- Finance is the study of how people and businesses evaluate investments and raise ***capital*** to fund them. (-- *How to get and use money)*
- Three questions addressed by the study of finance
  1. What long-term investments should the firm undertake? (*capital budgeting decisions – how to spend the money?*)
  2. How should the firm fund these investments? (*capital structure decisions -- How to get the money?*)
  3. How can the firm best manage its cash flows as they arise in its day-to-day operations? (*working capital management decisions – how to manage cash (liquid) money?*)

The Goal of the Financial Manager

- The goal of the financial manager must be consistent with the mission of the corporation.
  - To maximize firm value shareholder's wealth (as measured by share prices).
- While managers have to cater to all the stakeholders (such as consumers, employees, suppliers etc.), they need to pay particular attention to the owners of the corporation, i.e., shareholders.
- If managers fail to pursue shareholder wealth maximization, they will lose the support of investors and lenders. The business may cease to exist and ultimately, the managers will lose their jobs!

Corporate Mission Statements: Examples

- "To achieve sustainable growth, we have established a vision with clear goals: Maximizing return to shareholders while being mindful of our overall responsibilities" (part of Coca-Cola's mission statement)
- "Our final responsibility is to our stockholders …when we operate according to these principles, the stockholders should realize a fair return" (part of Johnson & Johnson's credo)
- "Optimize for the long-term rather than trying to produce smooth earnings for each quarter" -- Google.

The Four Basic Principles of Finance

1. Money has a time value.
   - A dollar received today is more valuable than a dollar received in the future (due to interests, investment returns,…)
2. There is a risk-return trade-off.
   - One *shall* take extra risk only if one expects to be compensated for extra return.
3. Cash flows are the source of value.
   - Profit is an accounting concept designed to measure a business's performance over an interval of time.
   - Cash flow is the amount of cash that can actually be taken out of the business over this same interval.
4. Market prices reflect information.
   - Investors respond to new information by buying and selling their investments.

Three Accounting Principles

1. **The revenue recognition principle**: Revenue should be included in the income statement for the period in which:
   - Its goods and services were exchanged for cash or accounts receivable; or
   - The firm has completed what it must do to be entitled to the cash.
2. **The matching principle**: Expenses are matched with the revenues they helped produce.
   - For example, employees' salaries are recognized when the product produced as a result of that work is sold, and not when the wages were paid.
3. **The historical cost principle:** Most assets and liabilities are reported in the financial statements at historical cost, i.e., the price the firm paid to acquire them. The historical cost generally does not equal the current market value of the assets or liabilities.

Management accounting versus financial accounting

Accounting Discipline Overview

- Management accounting—measures, analyzes, and reports financial and nonfinancial information to help managers make decisions to fulfill organizational goals. Management accounting need not be GAAP compliant.

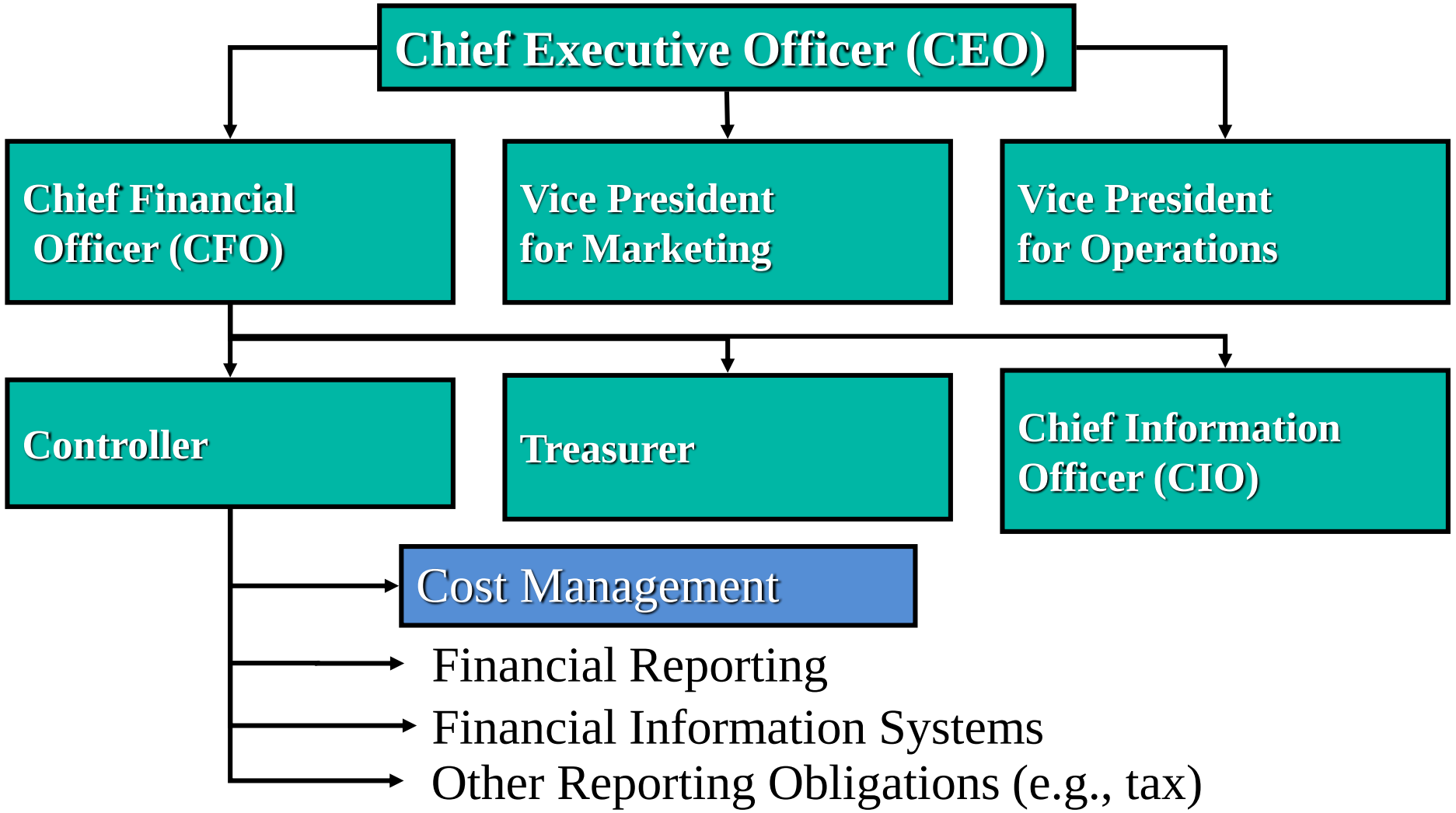
- Financial accounting—focuses on reporting to external users including investors, creditors, banks, suppliers, and governmental agencies. Financial statements must be based on GAAP.

Accounting Discipline Overview

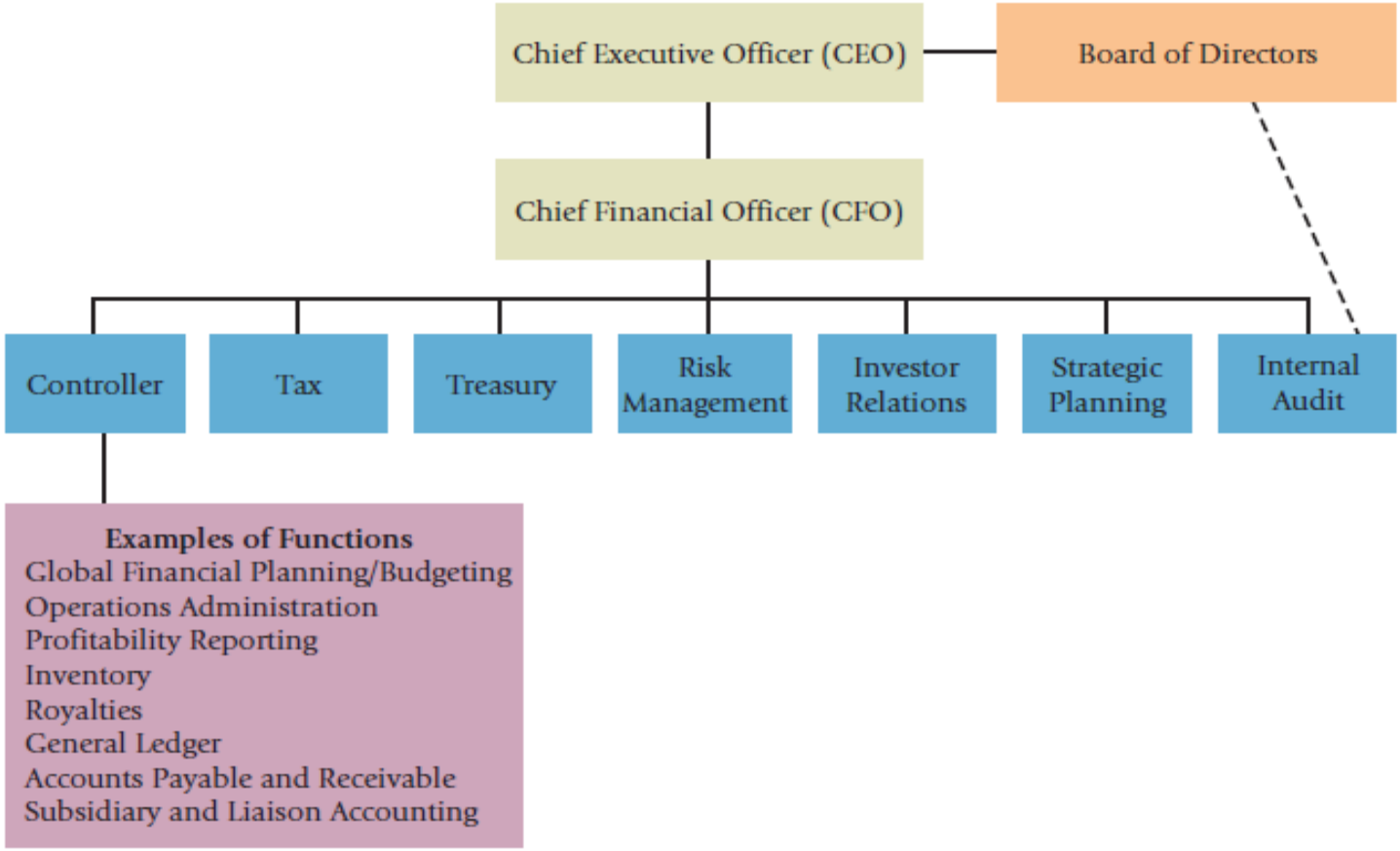
- Cost accounting – measures, analyzes and reports financial and nonfinancial information related to the costs of acquiring or using resources in an organization.

- Today, most accounting professionals take the position that cost information is part of management accounting; therefore, the distinction between the two is not clear-cut, we often use the terms interchangeably.

Typical Organization Chart



A Typical Organizational Structure and the Management Accountant



Cost Management vs.Financial Reporting

- **Financial reporting**
  - External users
  - Emphasis on accuracy and compliance
- **Cost management**
  - Internal users
  - Emphasis on usefulness and timeliness, key characteristics of decision-relevant information
- **Challenge for controller to reconcile these potentially conflicting roles**

Major differences between management and financial accounting

	Management Accounting	Financial Accounting
Purpose of information	Help managers make decisions to fulfill an organization's goals	Communicate organization's financial position to investors, banks, regulators, and other outside parties
Primary users	Managers of the organization	External users such as investors, banks, regulators, and suppliers
Focus and emphasis	Future-oriented (budget for 2014 prepared in 2013)	Past-oriented (reports on 2013 performance prepared in 2014)
Rules of measurement and reporting	Internal measures and reports do not have to follow GAAP but are based on cost-benefit analysis	Financial statements must be prepared in accordance with GAAP and be certified by external, independent auditors
Time span and type of reports	Varies from hourly information to 15 to 20 years, with financial and nonfinancial reports on products, departments, territories, and strategies	Annual and quarterly financial reports, primarily on the company as a whole
Behavioral implications	Designed to influence the behavior of managers and other employees	Primarily reports economic events but also influences behavior because manager's compensation is often based on reported financial results

The relationship between business management and financial management

Strategy and Management Accounting

- Strategy specifies how an organization matches its own capabilities with the opportunities in the marketplace.

  There are two broad strategies: cost leadership or product differentiation

- Strategic cost management—describes cost management that specifically focuses on strategic issues.

Strategy and Management Accounting

Management accounting helps answer important questions such as:

- Who are our most important customers, and how can we be competitive and deliver value to them?
- What substitute products exist in the marketplace, and how do they differ from our own?
- What is our most critical capability?
- Will adequate cash be available to fund the strategy or will additional funds need to be raised?

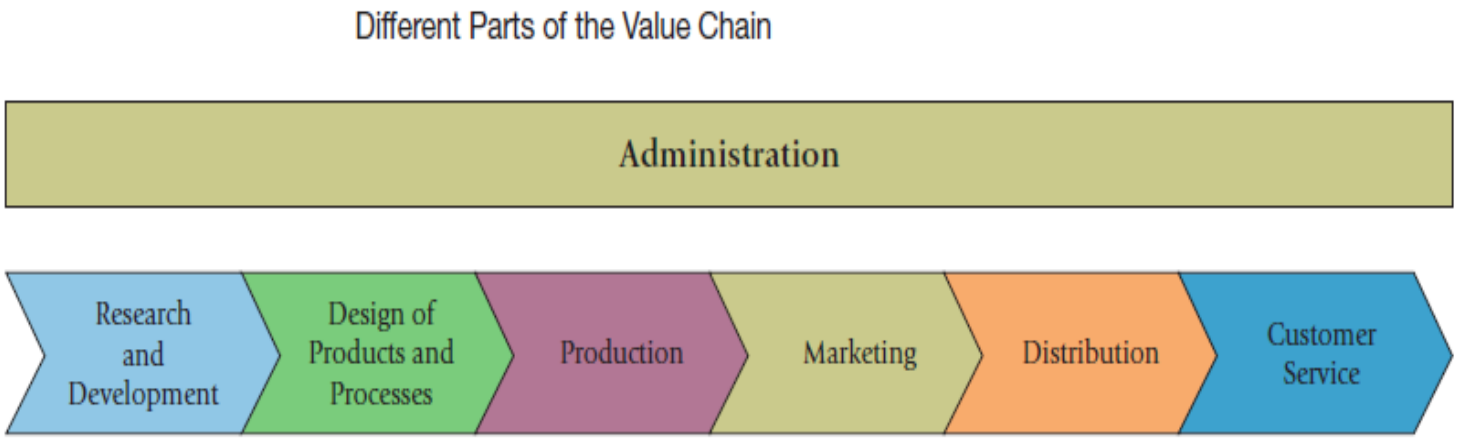
Management Accounting and Value

- Creating value is an important part of planning and implementing strategy.
- Value is the usefulness a customer gains from a company's product or service. The entire customer experience determines the value a customer derives from a product.

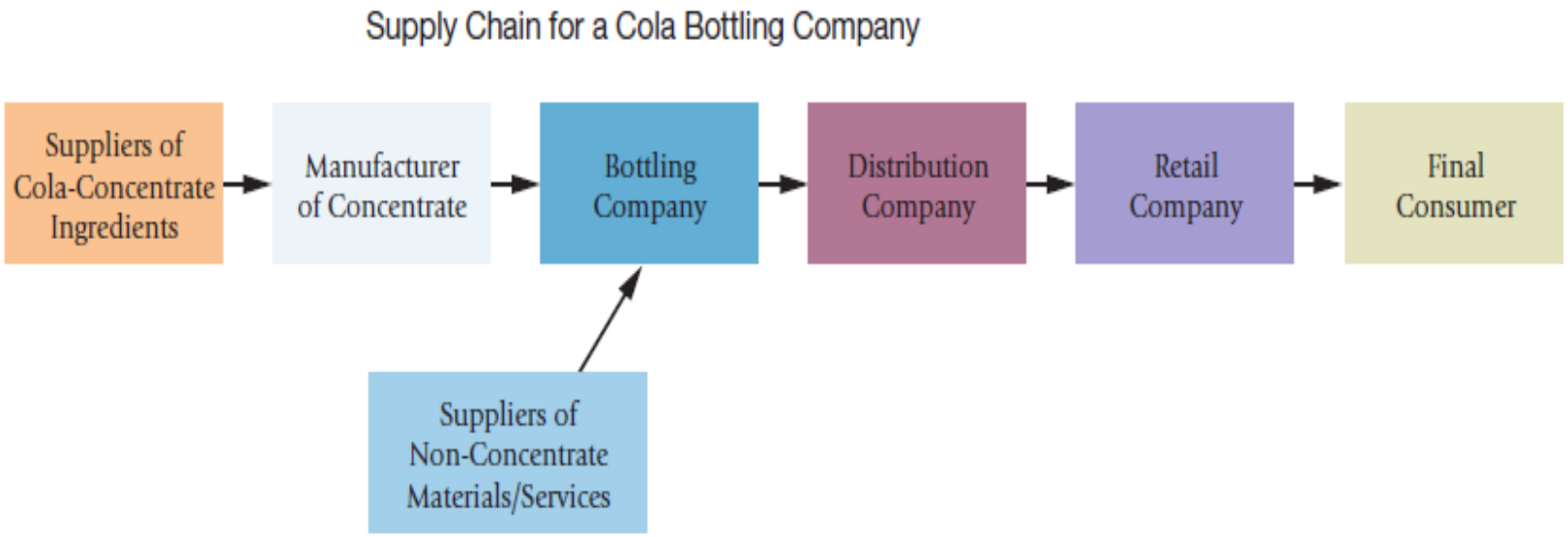
Management Accounting and Value

- The Value chain is the sequence of business functions in which a product is made progressively more useful to customers.
- The Value chain consists of:
  1. Research & development
  2. Design of Products and Processes
  3. Production
  4. Marketing
  5. Distribution
  6. Customer service

The Value Chain Illustrated



A Value Chain Implementation



Supply-chain analysis

- Production and Distribution are the parts of the value chain associated with producing and delivering a product or service.
- These two functions together are known as the Supply-Chain
- The supply chain describes the flow of goods, services and information from the initial sources of materials, services, and information to their delivery regardless of whether the activities occur in one organization or in multiple organizations.

Key Success Factors

- Customers want companies to use the value chain and supply chain to deliver ever-improving levels of performance when it comes to several (or even all) of the following:
  - Cost and efficiency
  - Quality
  - Time
  - Innovation
  - Sustainability

A Five-Step Decision Making Process in Planning and Control

1. Identify the problem and uncertainties.
2. Obtain information.
3. Make predictions about the future.
4. Make decisions by choosing between alternatives.
5. Implement the decision, evaluate performance, and learn.

Planning and Control Systems

- Planning selects goals and strategies, predicts results, decides how to attain goals, and communicates this to the organization.
  - Budget—the most important planning tool-is the quantitative expression of a plan of activity by management and is an aid to coordinating what needs to be done to execute that plan.
- Control takes actions that implement the planning decision, evaluates performance, and provides feedback and learning to the organization.

Management Accounting Guidelines

Three guidelines help management accountants provide the most value to the strategic and operational decision- making of their companies:

- Cost–benefit approach: benefits of an action/purchase generally must exceed costs as a basic decision rule.
- Behavioral and technical considerations: people are involved in decisions, not just dollars and cents.
- Different Costs for Different Purposes: Managers use alternative ways to compute costs in different decision-making situations.

How budgeting fits into the bigger picture

Budgeting fundamentals

- Budgeting is the process used to develop:
  - A formal written statement
  - Of managements plans for the future
  - Expressed in financial terms

What is a Budget?

- A concrete road map indicating where an organization is going.
- An economic, planning, political, legal and social document.
- Links the financial resources and human behaviour necessary to achieve policy objectives.
- An instrument for allocating resources.

The Budget as an Instrument

- **Planning Instrument** – sets goals, priorities, strategies and identifies programmes that will take place.
- **Political Instrument** – involves competing interests
- **Social Instrument** – provides a vehicle to grant and deny privileges and disburse burdens and benefits.
- **Economic Instrument** – offers potential for affecting growth and productivity
- **Legal Instrument** – grants the rights, responsibilities and power that regulate the budget format, timing and process.

Purposes of Budgeting

- To minimize uncertainty and make the future more predictable

- What is wanted, how much of it is available, and when is it available

Purposes of Budgeting

- Policy Direction
- The Budget as a Marketing tool
- Mutual Contracts
- Communication
- Motivation
- Monitoring of Service
- Resource Allocation
- Accountability Instrument

Purpose of budgets

- **Planning:**
  Necessitates setting of goals and establishing actions needed to attain goals.
- **Organising:**
  Involves the allocation of resources.
- **Leading:**
  Two main aspects are communicating & motivating.
- **Controlling:**
  Process of setting standards, measuring current performance and taking remedial action if needed.

Behavioral aspects of budgeting

- To maintain supportive and cooperative relationships with staff.
- The use of punishment (authoritarian style) tends to encourage attempts to ‘beat the system’.
- Padding the budget means overestimating costs and/or underestimating revenue.
- Participation in the budgetary process tends to result increased productivity and satisfaction.

Advantages arising out of staff participation

- Improved communication.
- Greater understanding of what is involved.
- Opportunity to thrash out problems.
- Increased acceptance.
- Improved commitment.

Factors affecting behaviour

- Targets perceived by employees as being too difficult.
- Targets that do not provide any challenge.
- Insufficient flexibility.
- Narrow-minded managers.
- Emphasis on financial goals to the detriment of non-financial goals.

Attributes of a Good Budget

- Indicate the direction of financial policies for a specified period.
- Shows the effect of budget requests on tax rates or charges.
- Explains the proposed expenditure of estimated revenues.
- Identifies the level of services to be produced based on projected revenue.
- Facilitates the control of expenditure.
- Motivates employees to achieve objectives.
- Assesses the impact of goods and services on the target audience.

Budgeting Process

- What are the objectives?
- What activities will be involved?
- What resources will be required?
- What will the resources cost?
- Where will the funds come from?
- Is the result realistic?

The Budgeting Process

- Some good practice:-
  - » Clarity
  - » Timetable
  - » Budget Headings
  - » Estimating Costs
  - » Contingencies
  - » Forgotten Costs

Developing the Budget

- Planning, Needs Assessment, Priorities
- Preparation, Guidelines, Forecasts, Developing PM's
- Legislative/regulatory reviews
- Execution of Programmes
- Audit and Evaluation

Budgeting as a Management Tool

- Performance Measurement
- Benchmarking
- Other Measures
- Budgeting & Productivity

Budgeting as a Management Tool

- 8 keys to successful Performance Measurement
  - » Clear & Consistent top management support
  - » Clear framework understood at ALL levels
  - » Effective internal/external communication
  - » Clear accountability for all results
  - » PM should provide relevant, concise and timely info.
  - » Compensation/reward must be linked to PM
  - » PM should always stress the positive aspect of achievement
  - » Share results

Budgeting as a Management Tool

- Types of Performance Measures
  - » Need
  - » Demand
  - » Workload
  - » Efficiency/Productivity
  - » Effectiveness
  - » Sustainability

Budgeting & Productivity

- Productivity – the ratio of outputs to inputs

- “Productivity is a measure of how well resources are brought together in organisations and utilized for accomplishing a set of results” Mali

Budgeting & Productivity

- Productivity Index
  - Output obtained/Input expended = Achieved Performance/Resources Consumed=Effectiveness/ Efficiency

Budgeting & Productivity

Function	Demand/Need	Workload	Output
Social Services	No of cases requiring service	No of cases to be served	No of Cases Served
Efficiency	Effectiveness	Sustainability	Goal
Cost per Case served	% of eligible cases served	Extended period over which cases were served	Ability to provide for individual needs

Public v. Private Budgeting

- Strategic Resource Allocation
  - » Pricing and Markets
  - » Budget in the Public Sector
  - » Control
  - » Stability vs. Dynamic

Contrast Private & Public Budgeting

- Pricing and Markets System
- Control
- The Budget-Accountability Continuum

Forecasts

- Adjustment of future expectations based on recent actual performance.
- May or may not include adjustments to the budget
- Art and Science – facts and assumptions

Forecasts

- When constructing your forecast as a minimum you should include the following:
  - Projected revenue/Sales forecast
  - Anticipated costs
  - Estimated Assets and Liabilities
  - Expected Cash flow

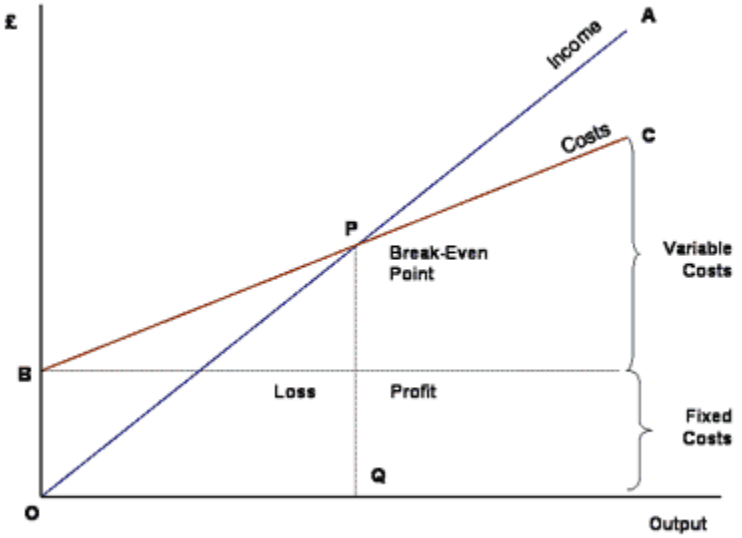
Assumptions/Limiting Factors

- Constraint in working Capital
- Approvals
- Future economic outlook
- Demand and Competition

Sensitivity Analysis

- One Way sensitivity analysis
- Parameters and Key Drivers
- Two way sensitivity analysis
- Probabilistic analysis

Break-even Analysis



Costs

- Fixed
- Semi Fixed or Step Cost
- Variable
- Semi Variable

Costs

- Responsibility Accounting/ Centres
  - » Cost Centre
  - » Revenue Centre
  - » Profit Centre
  - » Investment Centre

Zero Based Budgeting

- Background of ZBB
- Where should ZBB be implemented?
- ZBB V Line Item

Zero Based Budgeting

Incremental

Operating budget estimated

Accepts existing base

Emphasis is on the $ as the main driver

Little effort in looking at alternatives

Results in a “take it or leave it” budget

ZBB

Operating budget developed by evaluating current activities & alternatives

Assumes a clean slate

Initiating emphasis is on purposes and activities and priorities

New approaches examined

Results in trade-off options

Incremental Budgeting

- Characteristics
- Advantages
- Disadvantages
- Conclusions

Incremental Budgeting

- Advantages
  - » Stable and Predictable
  - » Consistent for Managers
  - » Relatively Simple to operate
  - » Less conflict between departments
  - » Impact of change can be seen quicker

Incremental Budgeting

- Disadvantages:-
  - » Assumes activities and methods will be always the same
  - » No incentive for innovation
  - » No real incentive to reduce costs
  - » May become out of date
  - » Perpetuates past inefficiencies
  - » Budgetary slack may be built in and never reviewed

Rolling Budgets

- Why Rolling Budgets
- Benefits
- Flexible Rolling Budgets

Types of plans

- Long term: 5 to 10 years
- Medium term: 1 to 5 years
- Short term: up to 1 year

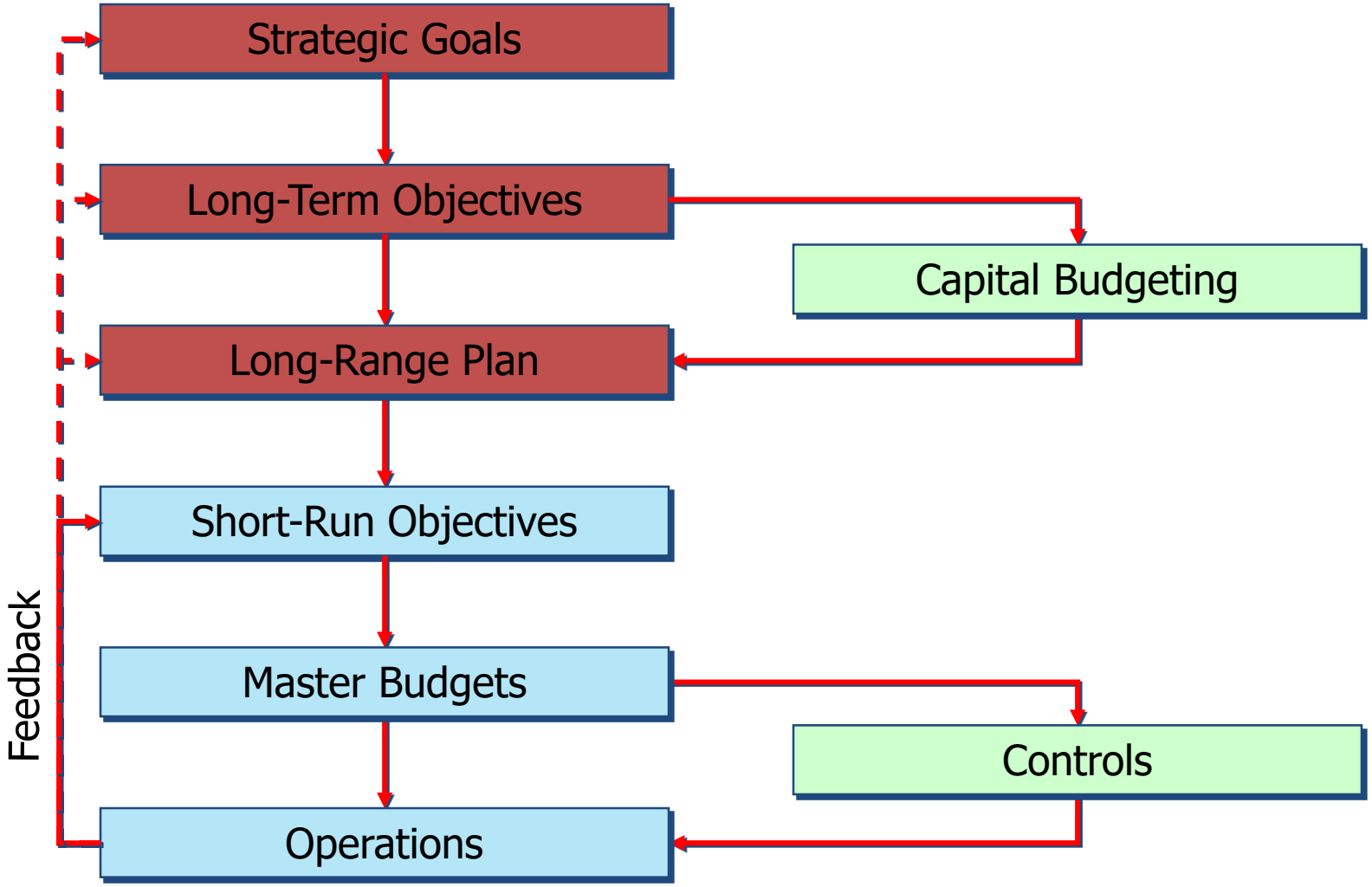
Benefits of budgets

1. Forces managers to do **planning.**
2. Realistic performance targets.
3. Basis for **controlling** what happens within the organisation.
4. Helps **coordinate** the activities of the various centres that make up the business.
5. **Communication** – managers exchange information on ideas, etc.
6. **Motivating** tool – if the process involves staff.

Limitations of budgets

- Only estimates, not statements of facts.
- No substitute for sound management practices.
- Need to be amended if circumstances change.
- Preparation does not guarantee success.
- Aspects of people's behaviour may undermine the value of the process.

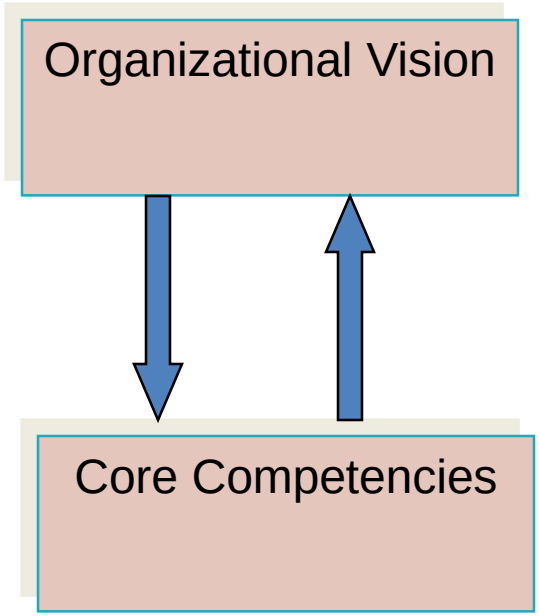
Budget Relationship



Organizational Vision and Core Competencies

- The organizational vision is the core purpose and ideology of the organization.
- Determining the organizational vision precedes all other management decision making.
- Management must also isolate the organization's core competencies – its strengths relative to competitors.

Organizational Vision and Core Competencies



The organizational vision and the core competencies are closely related.

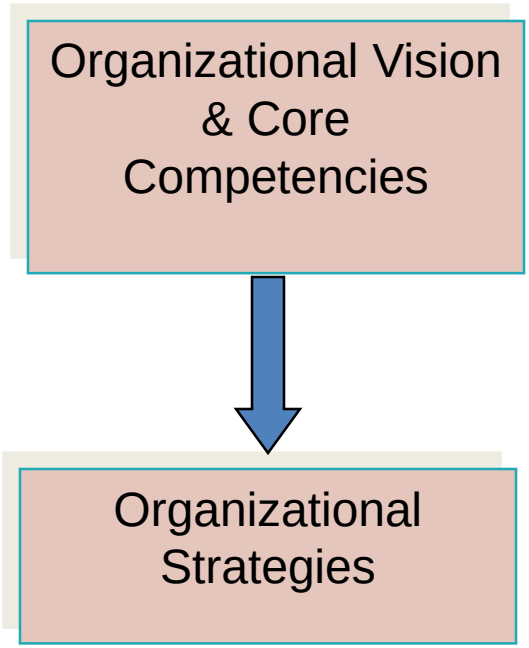
The organization's strengths should help shape the vision.

The vision should help locate the organization's strengths.

If you were starting an accounting practice, what would be your organizational vision?

What do you think would be your core competencies?

Organizational Strategies



Organizational strategies are the tactics that managers use to work toward the organizational vision while taking advantage of the core competencies.

These strategies are long-term in nature.

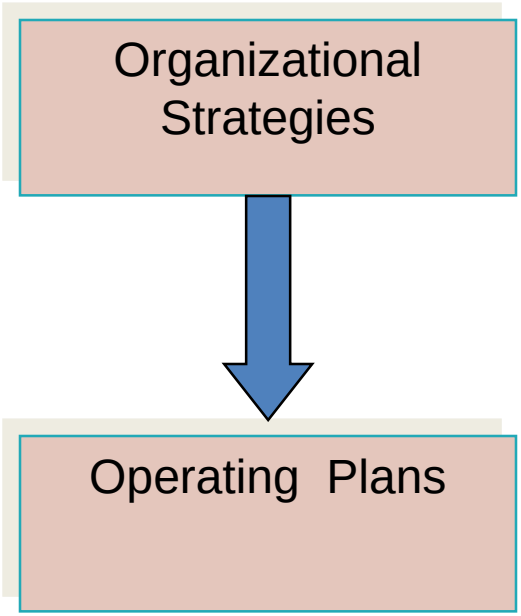
Examples include organization structure, financial structure, and long-term resource allocation strategies.

If you were starting an accounting practice, what would be some of your organizational strategies?

How do these work toward your organizational vision?

How do they take advantage of your core competencies?

Operating Plans



Operating plans are the short-term implementations of the organizational strategies.

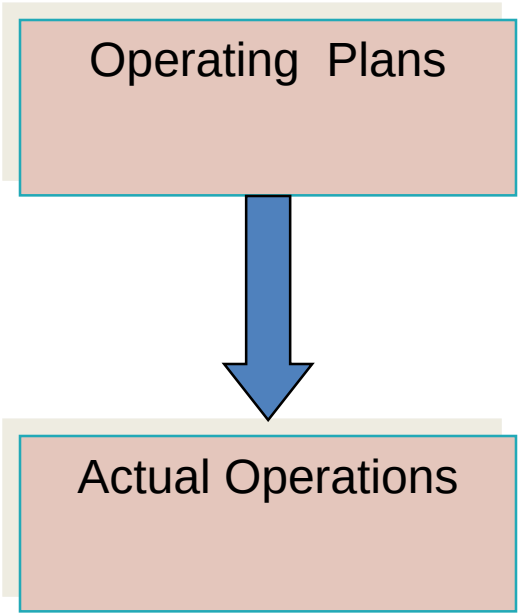
Operating plans usually include budgeted goals for revenues and expenses.

Examples include schedules for employees and procedures for daily relationship management decisions with suppliers.

If you were starting an accounting practice, what would be some of your operating plans?

How do these relate to your organizational strategies?

Actual Operations



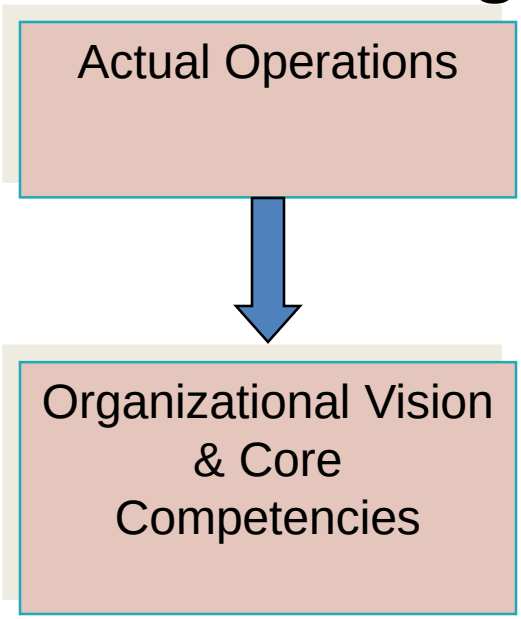
Actual operations are the actions taken and the results achieved.

The organization's information system measures the results of actual operations.

Examples include number of units sold, advertising expense, and the wage expense for the period.

If you had an accounting practice, what would information would you want to collect about the results of your actual operations?

Monitoring and Motivating Performance



Managers use the results of actual operations to monitor performance and ensure that it is in line with the organizational vision.

Managers may find that the results of actual operations make them re-think the organizational vision or their view of the organization's core competencies.

If you had an accounting practice, can you think of an example of a measure of actual operations and how you would use it to motivate performance?

Can you think of an example of a measure of actual operations that might make you redefine your organizational vision or your view of your core competencies?

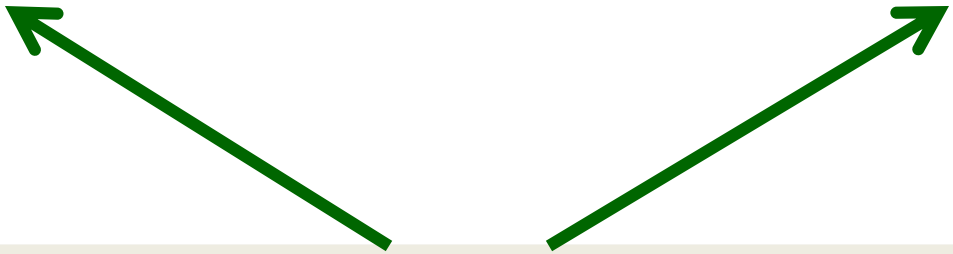
Management Control Systems

- Belief Systems
  - Vision, Mission, Core Values Statements
- Boundary Systems
  - Code of Conduct, Procedure Manuals, Compliance Actions
- Diagnostic Control Systems
  - Measure, monitor, and motivate employees against preset goals
- Interactive Control Systems
  - Recurring information and reports to evaluate performance and direct actions

Financial, Managerial, and Cost Accounting

Financial accounting prepares reports most frequently used by decision makers external to the organization.

Managerial accounting prepares reports most frequently used by decision makers internal to the organization.



Cost accounting includes both financial and nonfinancial information and is used for both financial and managerial accounting.

Strategic Cost Management and the Balanced Scorecard

- Strategic cost management is an approach to reducing costs while strengthening the organization's strategic position.
- The balanced scorecard can be used to formalize strategic cost management efforts by detailing financial and nonfinancial benchmarks for all segments of the organization.
- Examples of such benchmarks include:
  - Personnel can reduce costs by completing all hiring within 20 days of initial interview.
  - Production can reduce costs and improve quality if Engineering can reduce the number of processes in the production process.

What Information is Relevant for Decision Making?

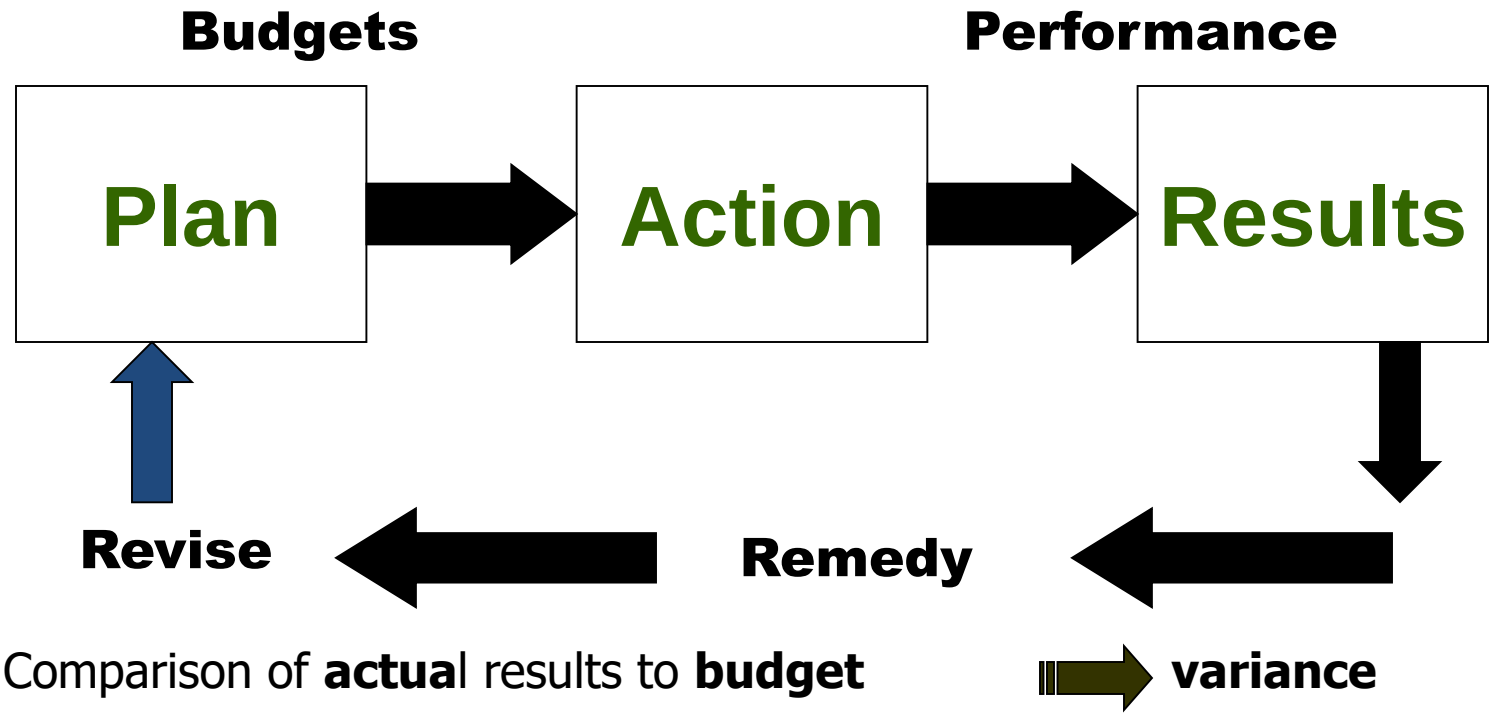
- Information is relevant if:
  - *Differs* across the alternatives, and
  - Is about the *future*.
- Relevant information can be quantitative or qualitative
- Information is irrelevant if:
  - *Does not vary* with the option chosen or action taken

Irrelevant information is NOT useful in decision making!

How cost management improves an organisation’s financial position

The planning cycle

Budgets are the mechanism by which management control of an organisation becomes possible.



Definition of Management Accounting: a Focus on Strategy

Management accounting is a profession that involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization's strategy.

Introduction to Strategy

- **Success comes from developing and implementing an effective strategy aided by management accounting methods**
  - Clear mission statement
  - Strategy is a roadmap to achieve a company's mission
- **Management accountants can help a company be successful**
  - Key to success is having decision-relevant information

Cost Management Information

- **Serves all management functions**

- **Information a manager needs to manage effectively**
  - Financial and nonfinancial
    - Financial information alone shows a short-term focus
  - Developed under the direction of the controller for the Chief Financial Officer (CFO) of the organization

Cost Management vs. Financial Reporting

- **Financial reporting**
  - External users
  - Emphasis on accuracy and compliance
- **Cost management**
  - Internal users
  - Emphasis on usefulness and timeliness, key characteristics of decision-relevant information
- **Challenge for controller to reconcile these potentially conflicting roles**

Four Functions of Management

Cost management information is assembled to aid management in the following functions:

- Strategic management
- Planning and decision-making
- Management and operational control
- Preparation of financial statements

Management Functions

Strategic management

- Most important management function
- Involves identifying and implementing goals and action plans to maintain a competitive advantage
- Monitoring of Critical Success Factors (CSFs) is necessary
- Critical to a firm's success due to global competition and rapidly changing markets

Management Functions (continued)

Planning and decision-making

- Information is needed to support recurring decisions such as scheduling production and pricing
- Information is needed for short-run planning (budgeting) and profit planning (Cost-Volume-Profit analysis)

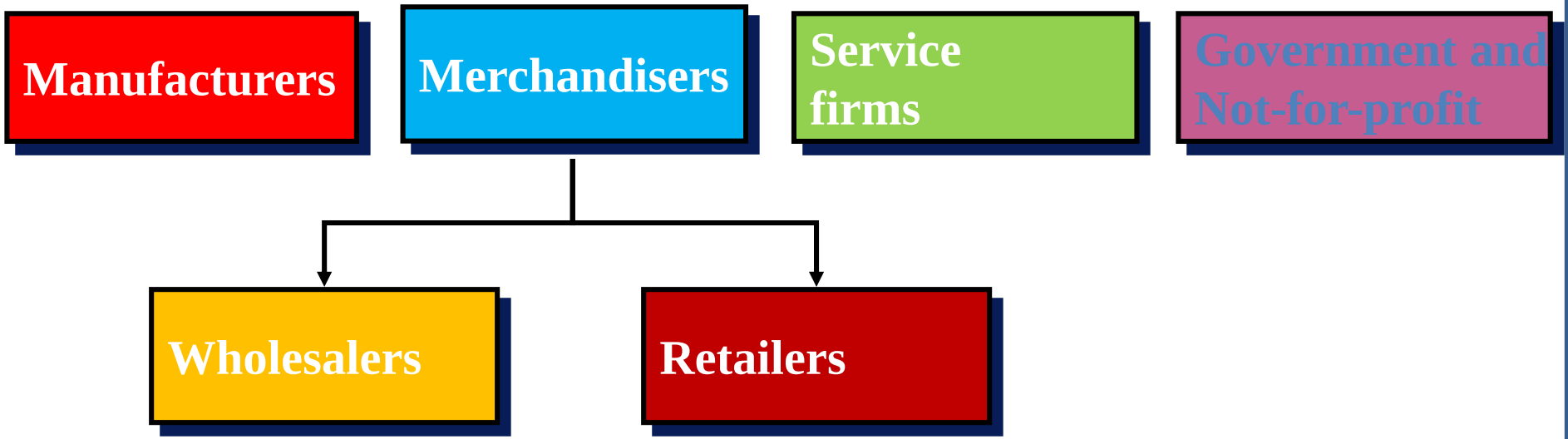
Management and operational control

- Information is needed to identify inefficient operations and reward effective management practices

Preparation of financial statements

- Information is needed to guarantee compliance with regulatory reporting requirements

Types of Organizations



Changes in the Contemporary Business Environment

1. **Shift to a global business environment**
   - Economic interdependence and increased competition
2. **Lean Manufacturing**
   - Just-in-time (JIT) inventory methods, inventory reduction and quality control
   - Emphasis on *speed-to-market* (i.e., time-based competition)
   - Flexible manufacturing systems

Changes in the Contemporary Business Environment

3. Importance of information technology

- Increased use of the internet has reduced processing time and facilitated information exchange

4. Focus on the customer

- Consumers expect functionality, quality and customization
- Shorter product life-cycles have intensified competition

Changes in the Contemporary Business Environment

5. **Shifts in management organization**
   - The focus has shifted from financial measures and hierarchal command-and-control organizations to nonfinancial measures and flexible organizational structures
6. **Social, political, and cultural considerations**
   - Changes include a more diverse workforce, a renewed sense of ethical responsibility, and increased deregulation of business

The Strategic Focus of Cost Management: Kaplan's Phases for Developing Cost Management Systems

Stage One	Cost-management systems are basic transaction reporting systems
Stage Two	Cost-management systems focus on external reporting–decision-usefulness of cost-management data is limited
Stage Three	Cost-management systems track key operating data and relevant cost information for decision-making
Stage Four	Strategically relevant cost-management information is an integral part of the system

How do the Changes in The Contemporary Business Environment Affect Cost Management?

The management accountant's role:

- Provide strategically relevant cost management information to help the organization keep up with the ever-changing environment
- Thirteen Contemporary Management Techniques developed and employed by the management accountant

Competitive Strategies

- A firm succeeds by implementing a set of policies, procedures, and approaches to business called a strategy
- Strategy must have a long-term focus and adapt to the changing environment
- Cost management information should be used to develop and monitor strategic information

Michael Porter: Strategic Positioning

- **Cost Leadership**—outperform competitors by producing at the lowest cost, consistent with quality demanded by the consumer
- **Differentiation**—creating value for the customer through product innovation, product features, customer service, etc. that the customer is willing to pay for

Competitive Strategies

Aspect	Cost Leadership	Differentiation
Strategic Target	Broad cross section of the market	Focused cross section of the market
Basis of competitive advantage	Lowest cost in the industry	Unique product or service
Product line	Limited selection	Wide variety
Production emphasis	Lowest possible cost and essential features	Innovation in differentiating products
Marketing emphasis	Low price	Premium price and innovative features

The Five Steps of Strategic Decision Making

1. Determine the Strategic Issues Surrounding the Problem
2. Identify the Alternative Actions
3. Obtain Information and Conduct Analyses of the Alternatives
4. Based on Strategy and Analysis, Choose and Implement the Desired Alternative
5. Provide an On-going Evaluation of the Effectiveness of implementation in Step 4.

Contemporary Management Techniques

1. The Balanced Scorecard and Strategy Map
2. The Value Chain
3. Activity Based Costing and Management
4. Business Intelligence
5. Target Costing
6. Life Cycle Costing
7. Benchmarking
8. Business Process Improvement
9. Total Quality Management
10. Lean Accounting
11. The Theory of Constraints
12. Sustainability
13. Enterprise Risk Management

Contemporary Management Techniques

1. The Balanced Scorecard and the Strategy Map

- **The Balanced Scorecard (BSC)**
  - An accounting report that addresses a firm's performance in four areas: financial, customer, internal business processes, and innovation and learning
- **The Strategy Map**
  - The strategy map is a method, based on the balanced scorecard, which links the four perspectives in a cause-and-effect diagram.

Contemporary Management Techniques

2. The Value Chain

- An analysis tool used to identify the specific steps required to provide a competitive product
- Helps identify steps that can be eliminated or outsourced

3. Activity-Based Costing and Management

- Activity-Based Costing (ABC) improves the tracing of costs to individual products and customers
- Activity-Based Management (ABM) improves operational and management control

Contemporary Management Techniques

4. Business Intelligence

- an approach to strategy implementation in which the management accountant uses data to understand and analyze business performance.

5. Target Costing

- Target Cost = Market-determined price – Desired Profit
- A method that has resulted from intensely competitive markets

Contemporary Management Techniques

6. Life-Cycle Costing

- Costs should be monitored throughout a product's life cycle – from research and development to sales and service

7. Benchmarking

- Process by which a firm identifies its CSFs, studies the best practices of other firms in achieving these CSFs, and institutes change based on the assessment results

Contemporary Management Techniques

8. Business Process Improvement

- This technique involves managers and workers committing to a program of continuous improvement in quality and other CSFs

9. Total Quality Management (TQM)

- A technique by which management develops policies and practices to ensure the firm's products and services exceed customer's expectations

Contemporary Management Techniques

10. Lean accounting uses value streams to measure the financial benefits of a firm's progress in implementing lean manufacturing.

11. The Theory of Constraints (TOC)

- Helps firms improve *cycle-time* (i.e., the rate at which raw materials can be converted to finished products)

Contemporary Management Techniques

12. **Sustainability** means the balancing of the company's short and long term goals in all three dimensions of performance – social, environmental, and financial.
13. **Enterprise risk management** is a framework and process that firms use to managing the risks that could negatively or positively affect the company's competitiveness and success.

Relevant Cash Flows

- Relevant cash flows are future cash flows that differ across the alternatives.
  - also called incremental cash flows
  - also called avoidable cash flows
- Irrelevant cash flows are:
  - non-incremental and unavoidable cash flows
  - do not vary among alternatives
- Must look at the cash flow relevance to the decision being made
  - Electricity costs *are relevant* to the decision to open a business or not
  - Electricity costs *are not relevant* in the decision to lease or buy a building for your business

What Information is Relevant for Decision Making?

You have a small computer repair company and are deciding whether to replace your old copy machine or repair it. In the list of information below, identify which data are relevant to this decision and which are irrelevant.

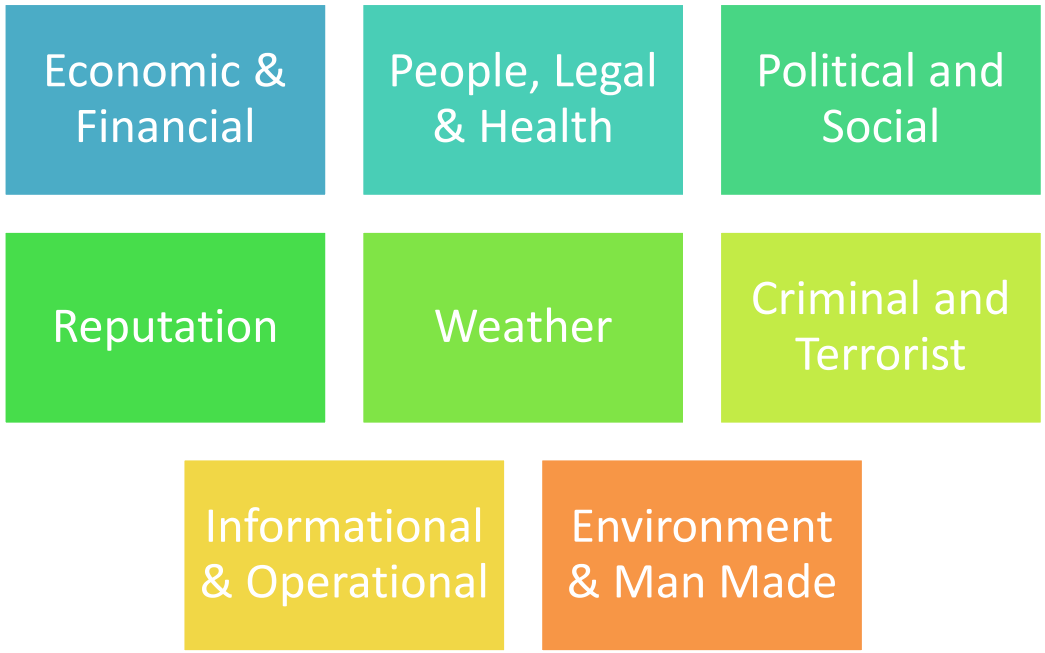
- The purchase price of the copy machine was $1200.
- The repair costs are $320.
- The copy machine can make 20 copies per minute.
- If you repair it, the machine will use less toner than it does now.
- You make approximately 1000 copies per month.
- The repair won't fix the broken stapler.
- The repair carries a one-year warranty.
- The copy machine was a gift from your spouse.

Relevance of Income Statement Information

- Income Statements include:
  - Period costs
  - Product costs (recorded as cost of goods sold)
- Many business decisions require the incremental cost to produce a unit
- Cost per unit on the income statement includes both fixed and variable costs
- Including fixed costs does not represent the true incremental cost of a unit

Impact of Business Risk on Decision Making

- Business Risk is the possibility an event will occur and interfere with the organization's strategic goals



- The existence of business risk can cloud management's decision making process

Uncertainties, Biases, and Decision Quality

- Uncertainties are issues and information about which there is doubt.
- Biases are preconceived notions adopted without careful thought.
- Decision quality refers to the characteristics of a decision that affect the likelihood of achieving a positive outcome.
- Both uncertainty and bias reduce decision quality.

Uncertainties and Biases in Information

- Uncertainties come from many sources and can be exogenous or endogenous.
  - The future is always uncertain.
  - Managers may be uncertain that the right information was captured in a report.

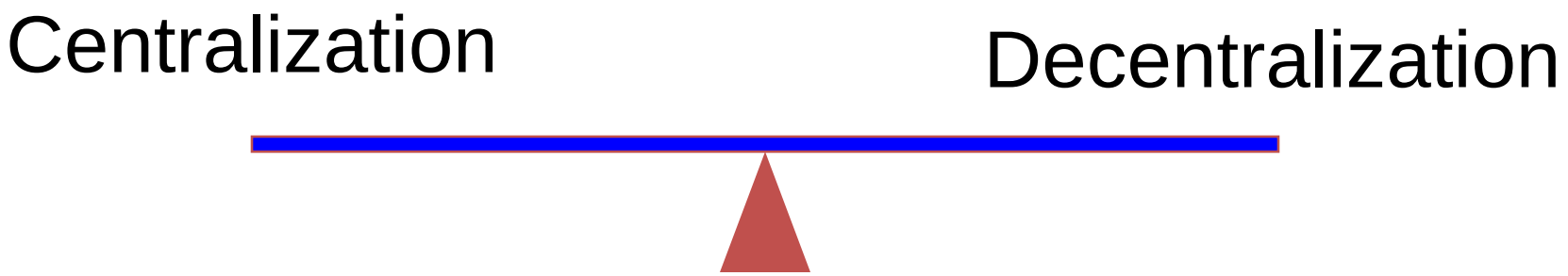
- Biases can come from many sources.
  - The decision maker may be biased towards or against a particular alternative (predisposition bias)
  - The methods used to collect information could have introduced bias (information bias)
  - The decision maker may exercise an error in judgment or processing information (cognitive bias)

Organizational Strategy

- Organizational Structure
- Core Competencies
- Organizational Constraints
- Organizational Culture
- Environmental Constraints

Organizational Strategy

- Organizational Structure



Organizational Strategy

- Organizational Structure
- Core Competencies
  - A higher proficiency than the competitors
  - Technological innovation
  - Engineering
  - Product development
  - After-sale service

Organizational Strategy

- Organizational Structure
- Core Competencies
- Organizational Constraints
  - Monetary Capital
  - Intellectual Capital
    - Human Capital
    - Structural Capital
    - Relationship Capital

Organizational Strategy

- Organizational Structure
- Core Competencies
- Organizational Constraints
- Organizational Culture
  - An organization's norms
    - internal and external
    - formal and informal

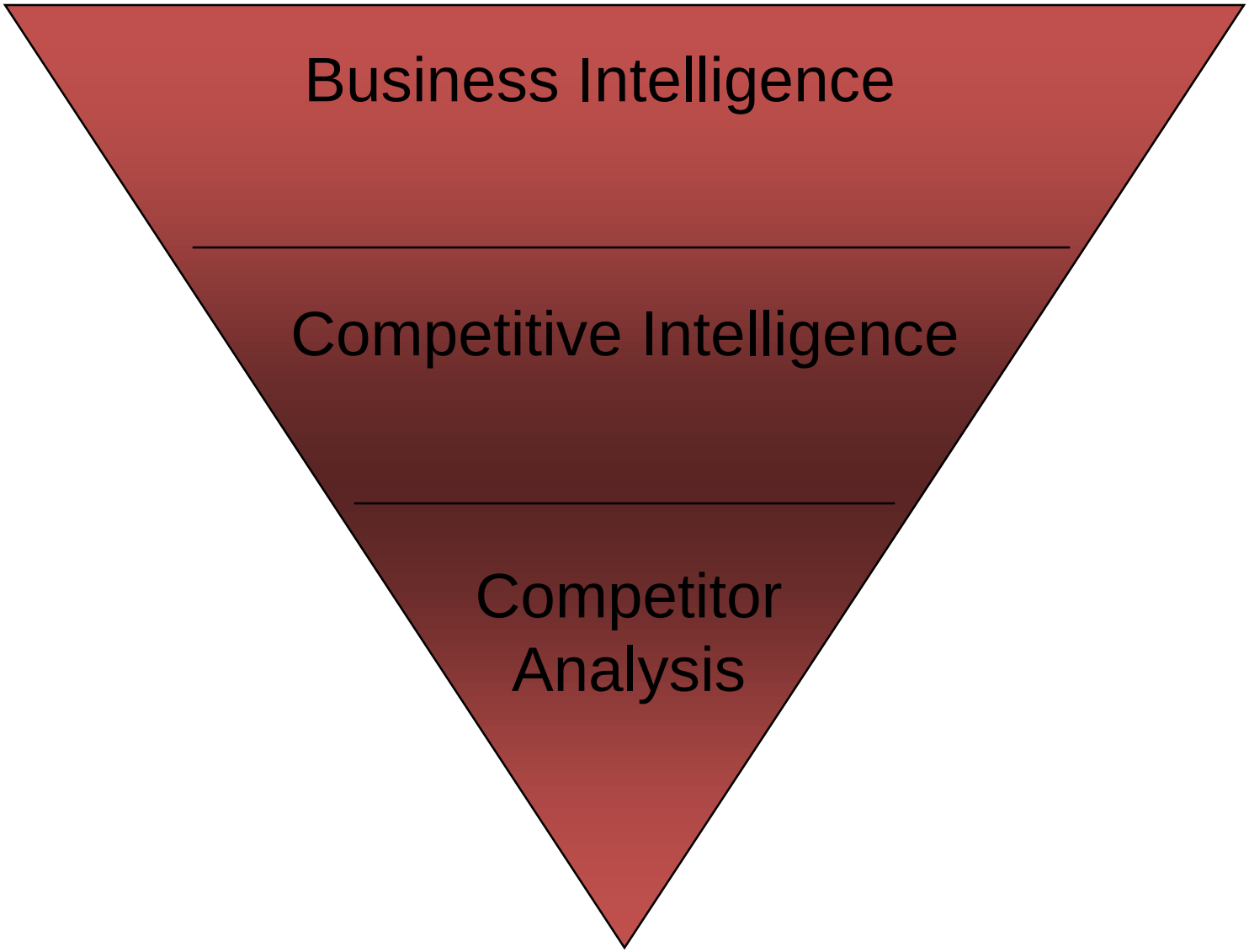
Organizational Strategy

- Organizational Structure
- Core Competencies
- Organizational Constraints
- Organizational Culture
- Environmental Constraints
  - Limitations on strategy caused by external differences in culture, competitive market structures, fiscal policy, laws, or political situations

Business Intelligence System

Formal process for gathering and analyzing information and producing intelligence to meet decision-making needs

- Information about internal processes
- Knowledge of markets, technologies, and competitors



Levels of Intelligence Gathering

Business Segments

- Segment Mission relates to Product Life Cycle
  - Build
  - Hold
  - Harvest

Accounting Information

- Strategic Resource Management
  - Planning for deployment of resources to create value for customers and shareholders
- Value Chain—Foundation of SRM
  - Set of processes that convert inputs into products and services

Use accounting information to evaluate the value chain to improve strategic resource management

The Accountant's Role

- Accountants provide information that is used to
  - make strategic decisions
  - measure and evaluate management
  - provide appropriate incentives
  - provide information about the value chain

Key aspects of managing working capital

Understanding working capital

by definition: current assets *minus* current liabilities

Current assets

- **Inventory (stock)**
- **Accounts Receivable (trade debtors)**
- **Other receivables/debtors**
- **Cash**

Current liabilities

- **Accounts Payable (trade creditors)**
- **Other payables/creditors**
- **Overdraft**

Understanding working capital

by definition: current assets *minus* current liabilities

RAW MATERIALS

WORK IN PROGRESS

(WIP) – included in stock

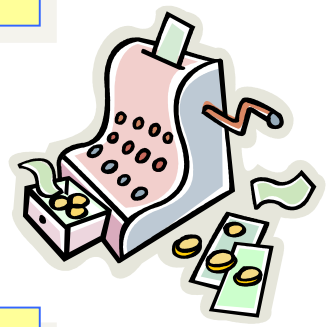
FINISHED GOODS

Included in stock

DEBTORS

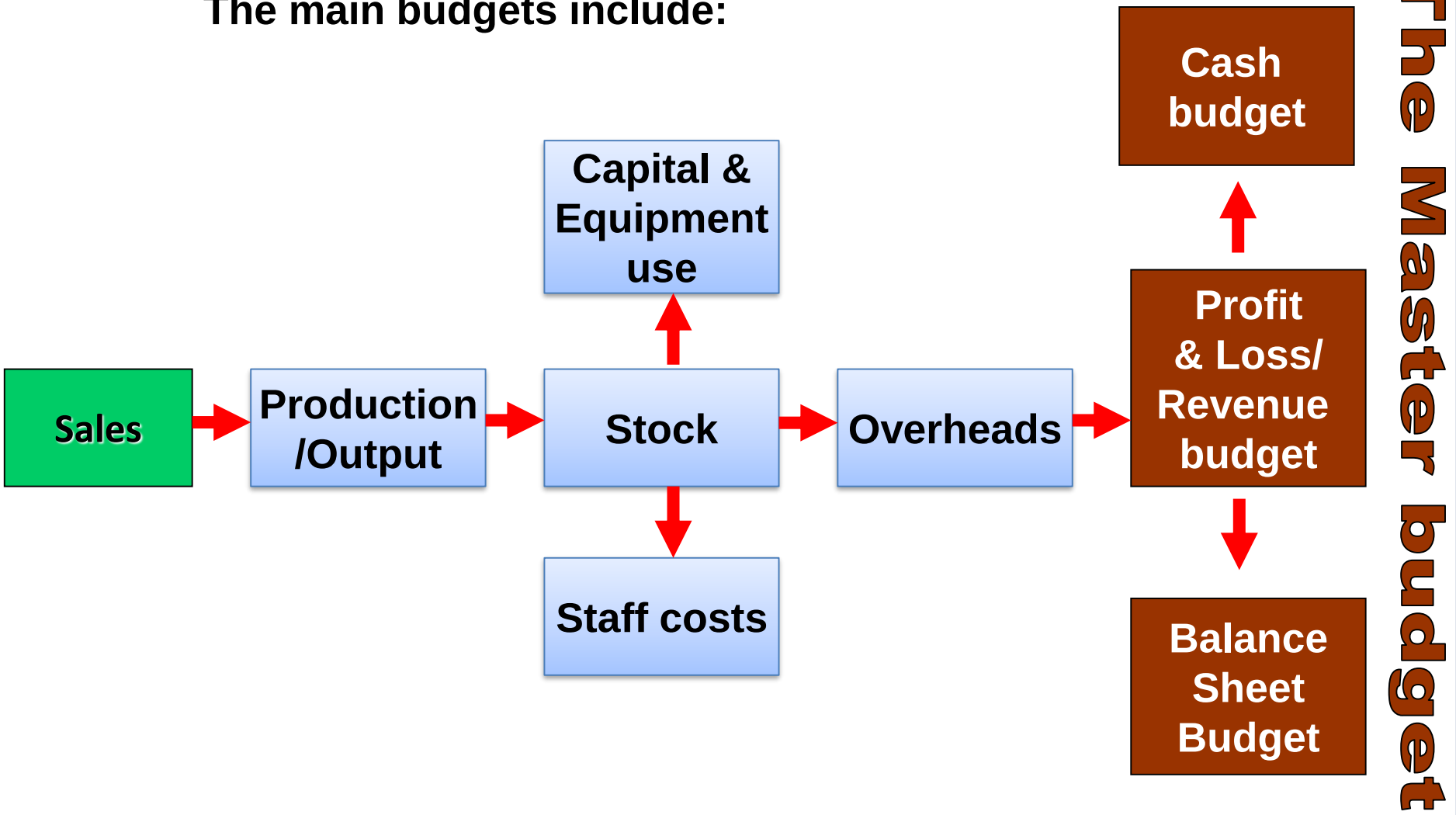
Debtors then pay, producing CASH which can then be used to pay the creditors.

CREDITORS



Inter relationships of budgets

The main budgets include:



Capital & Revenue Expenditure

Capital expenditure (spending to generate future revenue)

Money spent on purchasing assets

Items that add value or improve the organisation

Reported on the Balance sheet (not P&L)

Depreciation charged to P&L each year to reflect use



Revenue expenditure (spending to generate current year revenue)

Money spent on day-to-day consumables/services

Used within the year

Charged against profit in the P&L



Accruals (matching) concept

Matching expenditure to the income earned in the accounting period, regardless of the actual date of cash payment is made or cash received.

Accrual = an amount due in an accounting period which is unpaid at the end of the period

- Added to expenses in Profit & Loss Account
- Reported as a current liability in year end Balance Sheet

Income and costs are considered to be incurred at the point that the sale is made or cost incurred, rather than when payment is received or made.

This will deliver a result where

Revenues minus Expenses = Net Profit.

Content - The Cash Budget

- What are Cash Budgets and why they are needed
- Preparing a Cash Budget
- Budgeting for Surplus/Profit and Cost

Abacus Trading Ltd - Cash flow forecast for half year £						
	Jul	Aug	Sep	Oct	Nov	Dec
Cash inflows/receipts						
Debtor payments	18,000	12,000	14,000	16,000	17,000	13,000
Bank loan	20,000					
Rental income	1,000	1,000	1,000			
Total	39,000	13,000	15,000	16,000	17,000	13,000
Cash outflows/payments						
Suppliers	5,100	5,400	6,200	5,150	7,250	4,900
Wages	4,800	4,900	4,800	4,200	4,850	5,450
Loan repayment	800	800	800	800	800	800
Value Added Tax	5,500			6,100		
Suppliers	650	500	300	150	1,800	2,200
Insurance					7,000	
Corporation tax					21,000	
Capital expenditure		27,000				
Miscellaneous exps	50	100	50	150	250	200
Total	16,900	38,700	12,150	16,550	42,950	13,550
Net inflow / (outflow)	22,100	(25,700)	2,850	(550)	(25,950)	(550)
Opening balance	5,000	27,100	1,400	4,250	3,700	(22,250)
Closing balance	27,100	1,400	4,250	3,700	(22,250)	(22,800)

The Main Financial statements

1. Balance sheet

- **Statement of value of assets, liabilities and capital on a specific date (a snap shot of business worth)**
- **Shows how much value had been added to the business**

2. Profit and loss (P&L)

Statement of income, costs and resulting profit or loss for the year

3. Cash flow statement (CFS)

- **A statement of how cash has been generated/sourced and spent.**
- **Also serves as reconciliation between profit (from P&L) and the movement in assets and liabilities (from Balance Sheet)**

Cash Flow Statement (CFS)

A CFS explains the changes in cash and cash equivalents during the accounting period

- **Cash equivalents – items that can be converted into cash without notice (usually within 3 months)**

Approach:

Start with net profit or loss and reverse out non-cash items

= sources of cash generated from operations

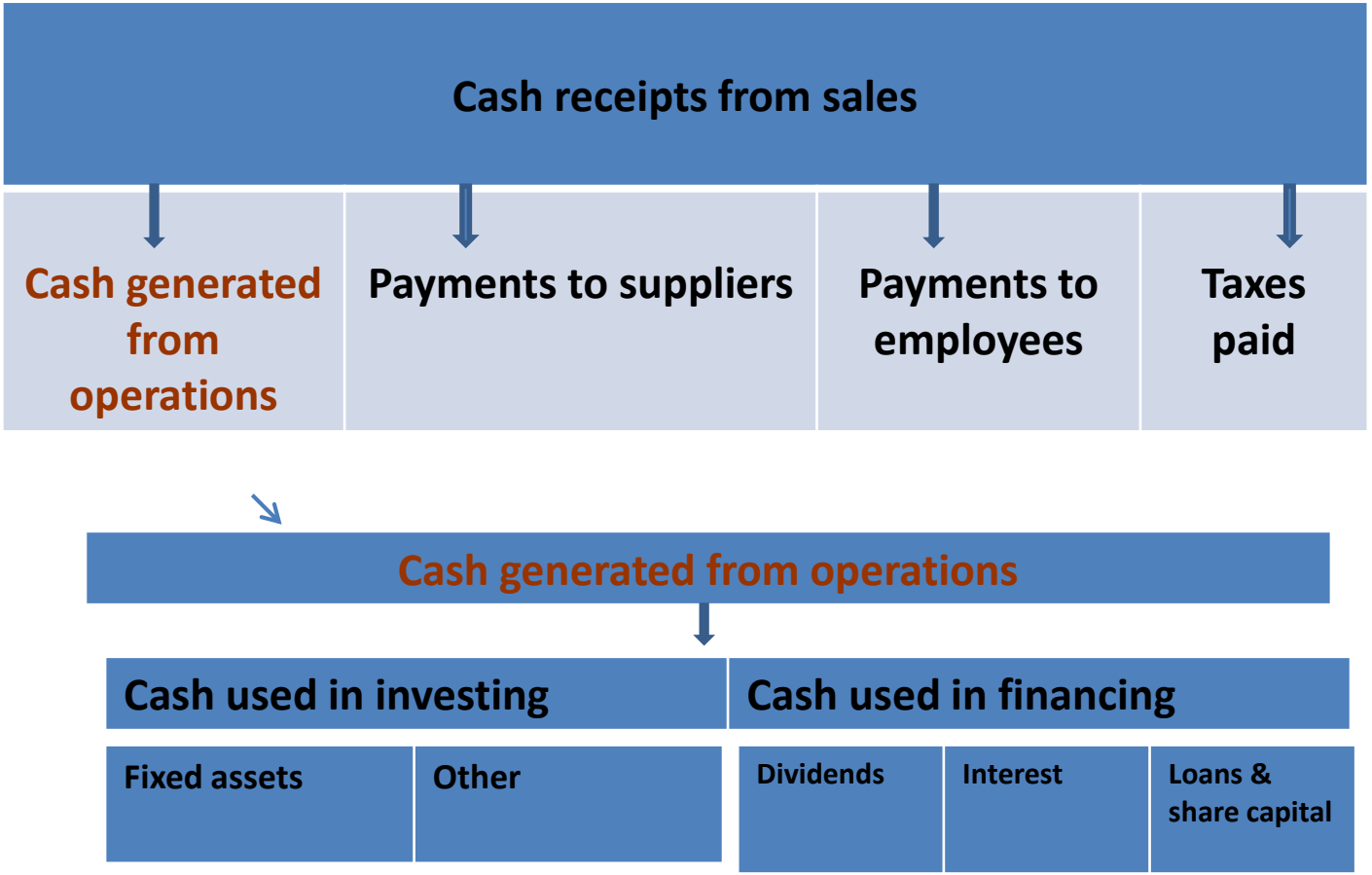
(i.e customer receipts less payments to suppliers, employees etc.)

Next, state how cash generated has been used

- **Investing – buying new assets and investments**
- **Financing – changes in share capital, loans and dividend payments**

= change in cash balances

Sources and uses of cash



Cash flow & profit

Net cash flow:

Total cash receipts *minus* total cash payments (excludes depreciation) = net cash flow

Profit:

Total income earned *minus* total expenditure incurred (includes depreciation) = profit

- **Why are cash and profit different?**
  - **Depreciation (a non cash item of expenditure)**

Cash Flow Statement

Starting with cash generated from profits		***£m***
Operating profit *(page 120)*		3206
add back non cash expenditure		
Depreciation etc,(1189-236+3-22+52+204)	1190	
Adjust for movement in working capital		
Increase in working capital (-95+79+691-20-2126+2053)		582
Start of Cash Flow Statement		
= Cash generated from operations (page 71)		**4978**
Interest and tax paid (562 + 456)	(1018)	
Net cash from operating activities (P&L)		3960
Net cash used in investing activities		(5974)
Net cash from financing activities		3615
Net increase in cash and cash equivalents		1601
Add balance at beginning of year		1788
Effect of foreign exchange rate changes		120
Cash and cash equivalents at end of year		**3509**

(should agree to Balance sheet figure)

(Tesco Financial Report , pages 68, 71 & 120)

Understanding Financial Statements

Cashflow statement

Understanding Financial Statements

- In the good old days before the recession
  - Around 18,000 UK businesses failed every year
  - Research shows that many were profitable
  - So why do profitable businesses fail?

Understanding Financial Statements

- Why do profitable businesses fail?
  - Many businesses focus on sales and profit
  - Profit is not the same thing as cashflow
  - Many businesses have poor cashflow information
  - No easy access to additional funds
  - Lack of cash causes profitable businesses to fail

Understanding Financial Statements

- The golden rule

  Cashflow is the lifeblood of the business

Understanding Financial Statements

- Vital difference between profit and cashflow
- What is profit?
  - Profit (or loss) arises from trading activity
  - Calculated in accordance with accounting rules

Understanding Financial Statements

- Vital difference between profit and cashflow
- What is profit?
  - Profit (or loss) arises from trading activity
  - Calculated in accordance with accounting rules
  - Profit = net sales income earned
    minus
    trading costs incurred
  - Profit is a matter of opinion

Understanding Financial Statements

- Vital difference between profit and cashflow
- What is cashflow?
  - Cash actually flowing in and out of the business
  - Cashflow is a matter of FACT
  - The biggest mistake any business can make is to assume that profit is an indicator of strength & health
  - Lose control of cashflow and you lose control of the business

Understanding Financial Statements

- Vital difference between profit and cashflow
  - Profit for the period is £12,000
  - Cashflow for the period is £78,000

  - But why are they different?

Understanding Financial Statements

THE MEGA TOY COMPANY

JANUARY - MARCH 2007 TRANSACTIONS : EFFECT ON PROFIT AND CASHFLOW

	Effect on cash		Effect on profit	
	+	-	+	-
1. Shares issued for £400,000 cash to the business partners	£400,000			
2. The company paid £30,000 for six months rent				
3. Racking and equipment bought for £40,000				
4. Salaries of £20,000 paid				
4. Other overheads of £18,000 paid				
5. Cash paid for stock worth £200,000				
6. Stock worth £75,000 bought on credit with 30 days to pay				
7. Sale of toys from stock costing £147,000				
7. Freight costs paid by cheque				
7. Toys sold and invoiced for £245,000 on 60 day terms				
8. Company incurred £17,000 for the toy fair but has not been invoiced				
9. Racking and equipment depreciation charge of £2,000 for first three months				
TOTALS				
NET CASHFLOW / NET PROFIT				

Understanding Financial Statements

- Profit includes
  - Non cash items like depreciation
  - Sales invoiced but not paid for by customer
  - Costs incurred but not paid for

Understanding Financial Statements

- Profit includes
  - Non cash items like depreciation
  - Sales invoiced but not paid for by customer
  - Costs incurred but not paid for
- Profit does not include
  - Stock bought but not sold
  - Prepaid costs
  - Funds received from share issues or loans
  - Fixed assets purchased

Understanding Financial Statements

- Cashflow statement
  - Is a bridge between profit and loss account and balance sheet
- What does the cashflow statement show?
  - Where funds have come from
  - How funds have been applied in the business
  - Cashflow in the period

Understanding Financial Statements

• The Mega Toy Company Limited 2007	Profit & loss account to 31st March
• Sales	£245,000
• Cost of sales	£147,000
• Gross profit	£ 98,000
• Distribution costs	£ 14,000
• Salaries	£ 20,000
• Rent	£ 15,000
• Marketing costs	£ 17,000
• Other overhead costs	£ 18,000
• Depreciation	£ 2,000
• Administrative expenses	£ 86,000
• Profit before tax	£ 12,000

Understanding Financial Statements

- The Mega Toy Company Limited Cashflow statement to 31st March 2007

• Profit	£ 12,000
• Add back non-cash items: depreciation	£ 2,000
• Funds generated from operations	£ 14,000
• Proceeds from share issue	£400,000
• Source of funds	£414,000

- Increase in stock

Understanding Financial Statements

The Mega Toy Company Limited	Balance sheet at 31st March 2007	
Racking & equipment at cost	£ 40,000	
Less depreciation	£ 2,000	
Fixed assets at net book value		£ 38,000
Cash	£ 78,000	
Stock	£128,000	
Debtors	£245,000	
Prepayments	£ 15,000	
Current assets	£466,000	
Creditors	£ 75,000	
Accruals	£ 17,000	
Current liabilities	£ 92,000	
Net current assets		£374,000
NET ASSETS		£412,000
Represented by		
Share capital	£400,000	
Profit for the period	£ 12,000	
		£412,000

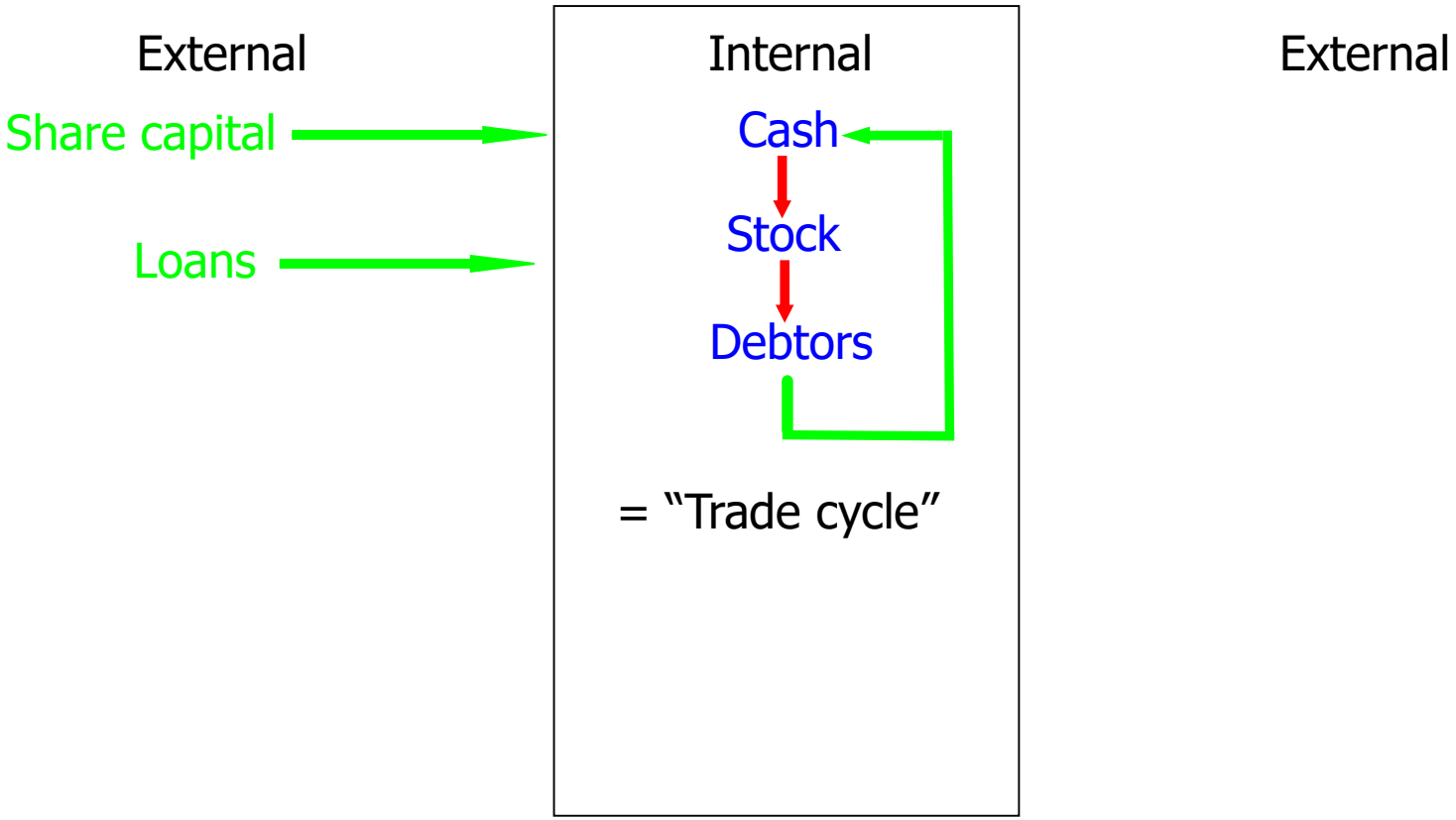
Understanding Financial Statements

- The Mega Toy Company Limited Cashflow statement to 31st March 2007

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• Funds generated from operations	£ 14,000
• Proceeds from share issue	£400,000
• Source of funds	£414,000
• Increase in stock	£(128,000)
• Increase in debtors	£(245,000)

Understanding Financial Statements

Business funds flow



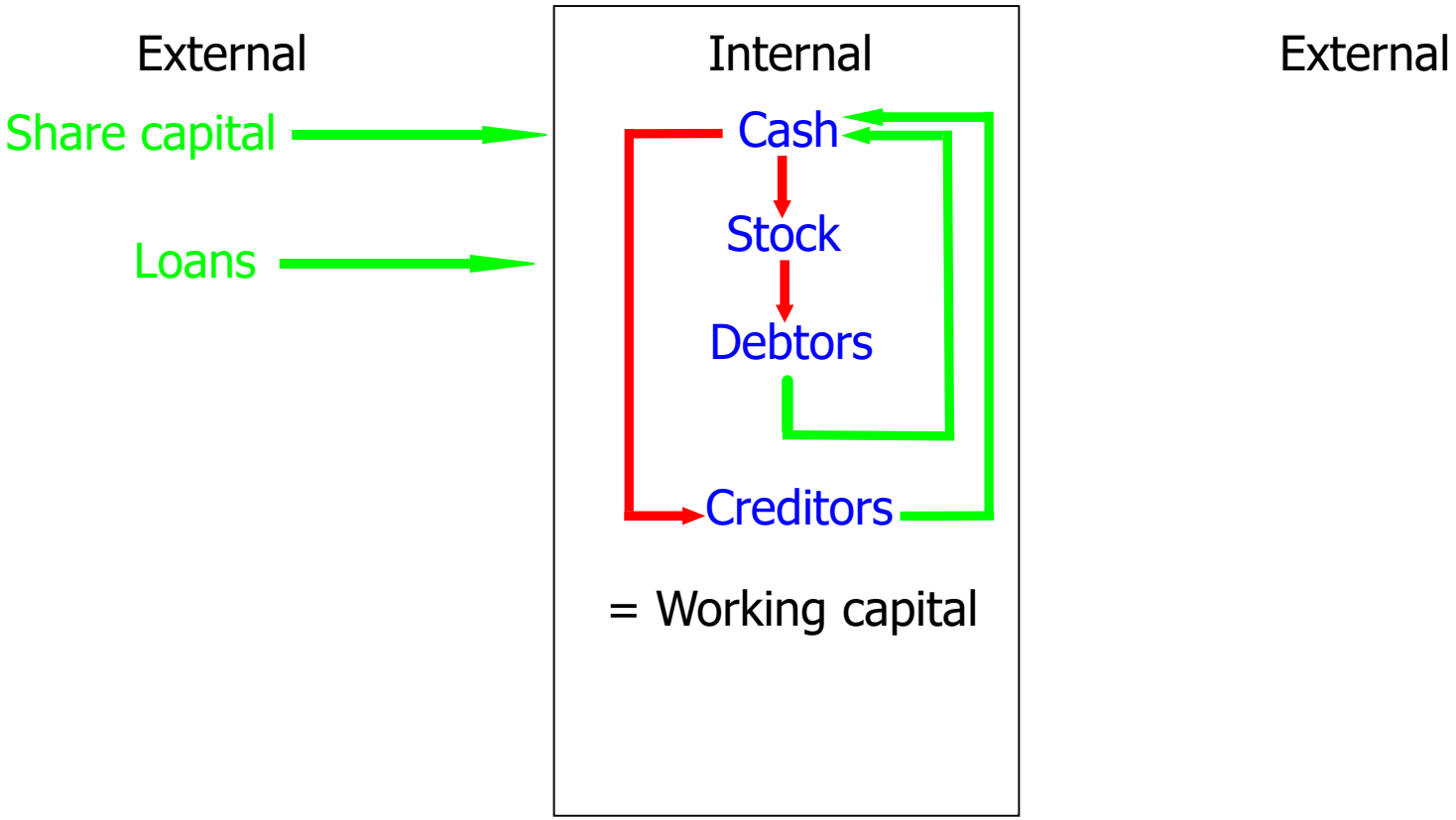
Understanding Financial Statements

- The Mega Toy Company Limited Cashflow statement to 31st March 2007

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• Funds generated from operations		£ 14,000
• Proceeds from share issue	£400,000	
• Source of funds	£414,000	
• Increase in stock	£(128,000)	
• Increase in debtors	£(245,000)	
• Increase in prepayments	£(15,000)	
• Increase in creditors	£ 75,000	
• Increase in accruals	£ 17,000	
• Increase in net working capital		£(296,000)

Understanding Financial Statements

Business funds flow

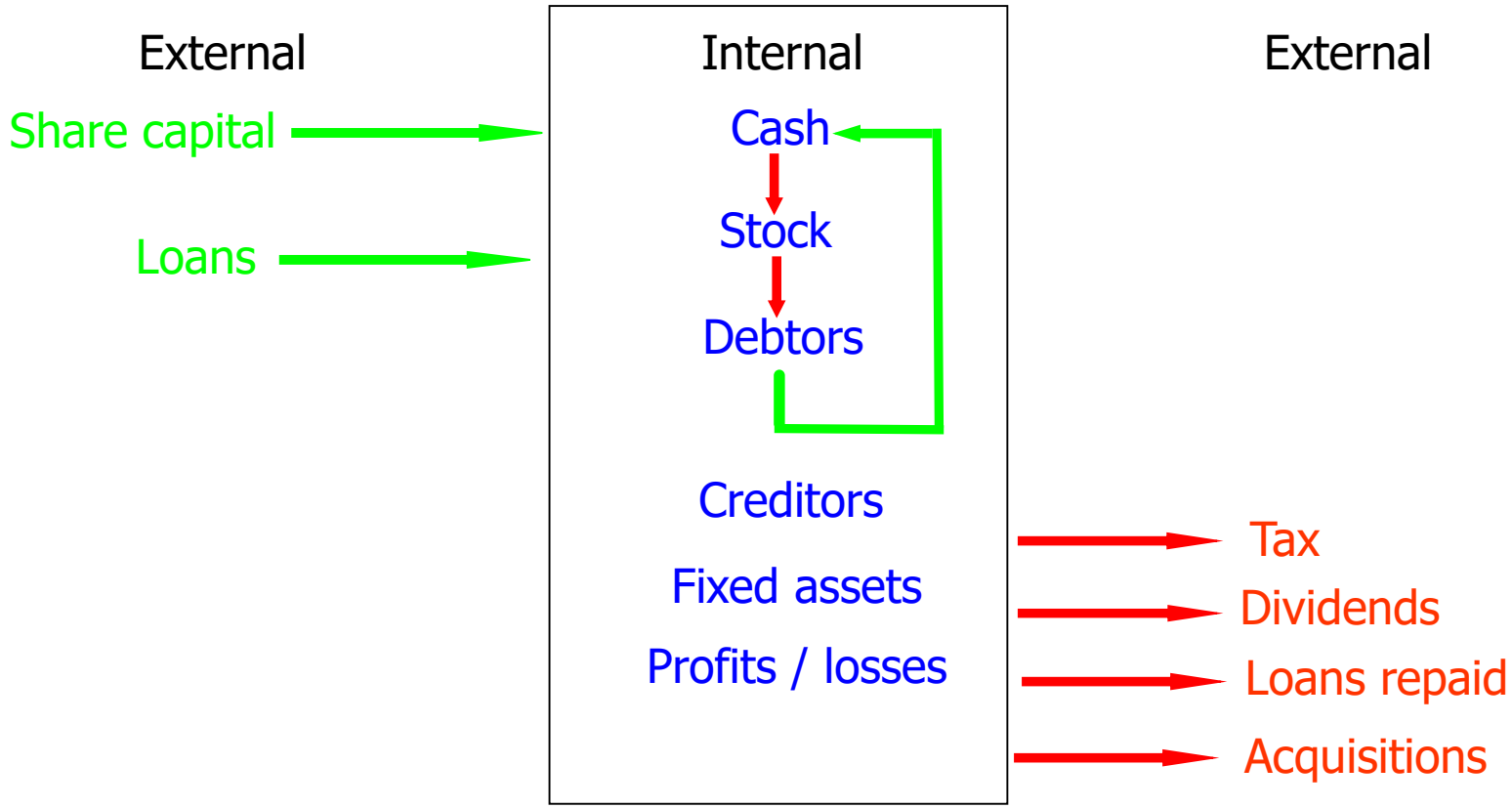


Understanding Financial Statements

• The Mega Toy Company Limited	Cashflow statement to 31st March 2007	
• Profit	£ 12,000	
• Add back non-cash items: depreciation	£ 2,000	
• Funds generated from operations	£ 14,000	
• Proceeds from share issue	£400,000	
• Source of funds		£414,000
• Increase in stock	£(128,000)	
• Increase in debtors	£(245,000)	
• Increase in prepayments	£(15,000)	
• Increase in creditors	£ 75,000	
• Increase in accruals	£ 17,000	
• Increase in net working capital		£(296,000)
• Fixed assets purchased	£(40,000)	
• Application of funds		£(336,000)
• CASHFLOW	£ 78,000	

Understanding Financial Statements

Business funds flow



Understanding Financial Statements

- Cashflow is the lifeblood of the business
  - Weak cashflow causes many business failures
  - Cashflow drives business growth
  - Without strong cashflow business slows and dies

Understanding Financial Statements

- Two ways to improve cashflow
  1. Inject additional funds
     - Debt
     - Equity

  2. Unlock the funds tied up in the business

Understanding Financial Statements

- Inject additional funds
  - Debt
    - Loans and overdrafts from banks and others
    - No dilution of ownership or control of the company
    - Overdrafts provide flexible funding
    - Not easy to get in current climate
    - Can be expensive
    - Must be repaid regardless of conditions
    - Loan covenants may restrict business activities
    - Overdrafts repayable on demand

Understanding Financial Statements

- Inject additional funds
  - Debt
  - Equity
    - Share capital from existing or new investors
    - Usually less expensive than debt
    - Dividends only paid when profit and cas
    - Not always easy to find investors
    - Can mean significant dilution of owners
    - Significant loss of control of business



Understanding Financial Statements

- Unlock the funds tied up in the business
  - Fixed assets
    - Operating leases
    - Asset backed loans
  - Working capital

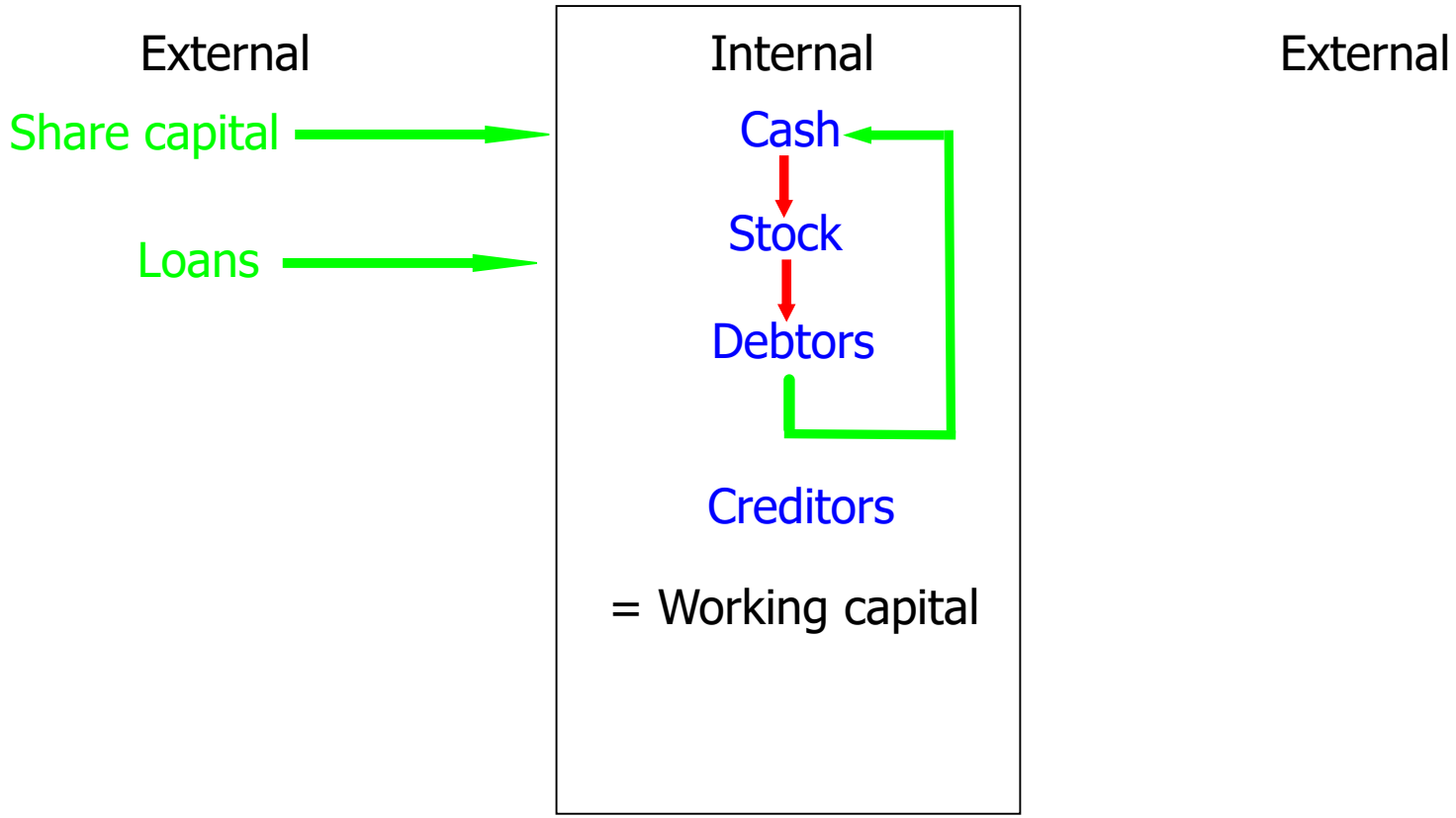
Managing Working Capital

Managing Working Capital

- What is working capital?
  - The “circulating capital” of the business

Managing Working Capital

Business funds flow



Managing Working Capital

- What is working capital?
  - The “circulating capital” of the business
  - Shown in balance sheet as “net current assets”
  - Net current assets = current assets
    minus
    current liabilities

Managing Working Capital



Managing Working Capital

KOSI-KNIT SWEATERS	BALANCE SHEET AS AT 31st DECEMBER			
	2007		2006	
Fixed assets		£86,000		£121,000
Cash	£25,000		£153,000	
Stock	£680,000		£544,000	
Debtors	£1,001,000		£833,000	
Current assets	£1,706,000		£1,530,000	
Creditors	£341,000		£398,000	
VAT & tax creditor	£75,000		£62,000	
Current liabilities	£416,000		£460,000	
Net current assets		£1,290,000		£1,070,000
NET ASSETS		£1,376,000		£1,191,000
Represented by:				
Share capital		£750,000		£750,000
Retained profits		£441,000		£410,000
Current year profit		£185,000		£31,000
		£1,376,000		£1,191,000

Managing Working Capital

- Kosi-Knit Sweaters Limited Cashflow statement to 31st March 2007

• Profit	£ 185,000
• Add back non-cash items: depreciation	£ 35,000
• Funds generated from operations	£ 220,000
• Source of funds	£ 220,000
• Increase in stock £544,000 to £ 680,000	£(136,000)

Managing Working Capital

- Why hold stock?
  - Holding stock is expensive
  - But “stock-outs” also incur costs
  - Holding stock is a trade off

Managing Working Capital

- Kosi-Knit Sweaters Limited Cashflow statement to 31st March 2007

• Profit	£ 185,000
• Add back non-cash items: depreciation	£ 35,000
• Funds generated from operations	£ 220,000
• Source of funds	£ 220,000

- Increase in stock £544,000 to £ 680,000 £(136,000)
- Increase in debtors £833,000 to £1,001,000 £(168,000)

Managing Working Capital

- Why give free loans to customers?
  - Providing credit is expensive
  - But the alternative also incurs cost
  - Giving credit to customers is a trade off

Managing Working Capital

• Kosi-Knit Sweaters Limited	Cashflow statement to 31st March 2007	
• Profit		£ 185,000
• Add back non-cash items: depreciation		£ 35,000
• Funds generated from operations		£ 220,000
• Source of funds		£ 220,000
• Increase in stock	£544,000 to £ 680,000	£(136,000)
• Increase in debtors	£833,000 to £1,001,000	£(168,000)
• Decrease in creditors	£398,000 to £ 341,000	£(57,000)
• Increase in VAT due	£ 62,000 to £ 75,000	£ 13,000
• Increase in net working capital		£(348,000)
• Application of funds		£(348,000)
• CASHFLOW		£(128,000)

Managing Working Capital

- Kosi-Knit Sweaters Limited Working capital requirement

	2007			2006		
Sales	£3,650,000	100.0%		£3,400,000	100.0%	
Stock	£ 680,000	18.6%		£ 544,000	16.0%	
Debtors	£1,001,000	27.4%		£ 833,000	24.5%	
Current assets	£1,681,000	46.1%		£1,377,000	40.5%	
Creditors	£ 341,000	9.3%		£ 398,000	11.7%	
VAT creditor	£ 75,000	2.1%		£ 62,000	1.8%	
Current liabilities	£ 416,000	11.4%		£ 460,000	13.5%	
Working capital (excluding cash)	£1,265,000	34.7%		£ 917,000	27.0%	

- Working capital required to finance sales of £1,000,000 =
- £1,000,000 x 34.7% £1,000,000 x 27.0%
- = £ 347,000 = £ 270,000

Managing Working Capital

- Why is working capital so important?
  - Working capital must be funded
  - Sales growth requires additional working capital
  - So additional funding will be required to finance growth
  - Beware of overtrading
    - Overtrading results in an acute cashflow crisis
    - Caused by a rapid expansion in sales
    - Resulting in an increased working capital requirement
    - Beyond the level that can be funded by the business

Managing Working Capital

- Always consider working capital impact
  - Decisions to improve sales and profit affect working capital
  - Kosi-Knit made smart decisions to improve sales and profit
  - But did not consider impact on working capital
    - Supply from China increased stockholding requirement
    - And reduced a source of funds from creditors
    - New customers' terms increased level of debtors
    - Significant increase in funding required

Managing Working Capital

- Two drivers of strong business
  - Cashflow is the lifeblood of the business
  - Strong cashflow drives business growth
  - Profit is a vital internal source of additional cashflow

Content - Managing Inventories

- Forecasting Future Demand
- Inventory Ratios
- Recording Values
- Reordering Systems
- Levels of Control
- Management Models

Inventory ratios: stock days or turnover

Closing inventory held x 365

Annual cost of sales

Stock days = £ 700,000 x 365
£ 800,000

= 319 days

The equivalent of 319 days stock is held (over 10 months worth of stock)

Or to look at it another way:

Stock is turned over about once a year

365 days = 1.1 times
319 days per year

Profit and loss extract	£
Sales	1,050,000
Less cost of sales	800,000
Gross profit	250,000

Balance Sheet Extract		£
Fixed Assets		1,500,000
Current Assets		
Inventory/Stock	700,000	
Debtors	180,000	
Bank	45,000	
	925,000	
Current liabilities		
Trade creditors	100,000	
Other creditors	276,000	
Working Capital		549,000
Net assets		2,049,000

Inventory –associated costs

- **Carrying costs**
  - Interest on capital invested in stocks
  - Storage (rent, light, heats, refrigeration, air conditioning)
  - Stores staff , security, material handling
  - Equipment – maintenance and running costs
  - Audit, stocktaking and stock recording
  - Insurance
  - Deterioration & obsolescence
  - Pilferage (theft), evaporation and damage.

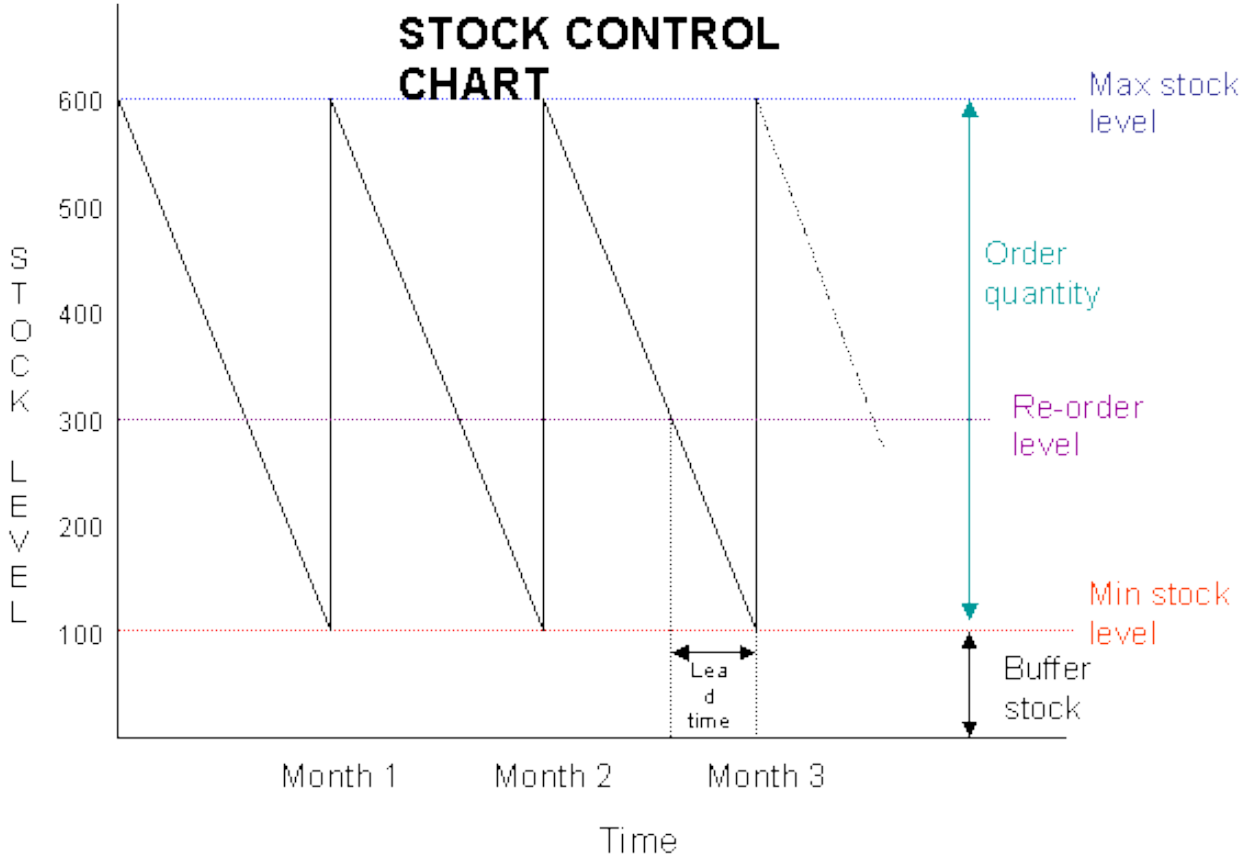
- **Obtaining stock**
  - Clerical, admin costs of purchasing, goods received and accounting
  - Transport

- **Cost of being without stock (stock-out)**
  - Lost contribution from sales and lost future sales
  - Production stoppages
  - Extra costs of obtaining urgent stock requirements

Inventory terminology

- Lead or procurement time
- Economic Order Quantity (EOQ)
- Buffer, Minimum or Safety stock level
- Maximum stock level
- Reorder level
- Reorder quantity

Inventory terminology illustrated



Inventory control

- Cost control procedure – end of year inventory check
  - Physical count compared to records
  - Valuation of stock (under of over valuations accounted for in Profit and loss account)

Suggest some reasons why the number of items recorded on the stores record for a component part may differ from number and valuation of part as recorded in the inventory account on the computer system.

Economic Order Quantity (EOQ)

- Minimises the balance of cost between ordering and carrying costs.
  - Assumptions:
    - Known and constant stockholding costs
    - Known and constant ordering costs
    - Known and constant price per unit
    - Demand rates are known
    - Instant replenishment i.e. whole batch delivered

Managing inventory / stock

Stock control system

- Recording movements of stock
- Ordering system and controls
- Physical stock checks

Management models

- Maintaining stocks to meet operational requirements
- Just In Time (JIT)

Content - Managing Receivables

- Credit Assessment
- Length Of Credit Period
- Evaluating Credit Decisions
- Debt Factoring
- The Discount Decision
- Collection Policies

Credit assessment - Measuring liquidity

Liquidity: the ability of a company to transform its current assets into cash quickly

The main liquidity measures used in business:

Current Ratio: $\frac{\text{Current assets}}{\text{Current liabilities}}$

Liquid Ratio: (Acid Test or Quick ratio) $\frac{\text{Current assets (excluding stock)}}{\text{Current liabilities}}$

Other measures: Debtor days

Stock days

Creditor days

Current Ratio

Current assets : current liabilities

Example:

Current assets £925,000

Current liabilities £549,000

Ratio = 925 / 549 = 1.6 : 1

Say, 1.6 assets to every 1 liability

Profit and loss extract	£
Sales	1,050,000
Less cost of sales	800,000
Gross profit	250,000

Balance Sheet Extract		£
Fixed Assets		1,500,000
Current Assets		
Stock	700,000	
Debtors	180,000	
Bank	45,000	
	925,000	
Current liabilities		
Trade creditors	100,000	
Other creditors	276,000	
Working Capital		549,000
Net assets		2,049,000

Liquid ratio/Quick ratio/Acid test

Current assets – stock : current liabilities

Example:

Current assets	**£925,000**
Less stock	**£700,000**
=	**£225,000**

Current liabilities £549,000

Ratio = 225 / 549 = 0.4 : 1

0.4 liquid assets to every 1 liability

Profit and loss extract	**£**
Sales	**1,050,000**
***Less* cost of sales**	**800,000**
Gross profit	**250,000**

Balance Sheet Extract		**£**
Fixed Assets		**1,500,000**
Current Assets		
Stock	**700,000**	
Debtors	**180,000**	
Bank	**45,000**	
	925,000	
Current liabilities		
Trade creditors	**100,000**	
Other creditors	**276,000**	
Working Capital		**549,000**
Net assets		**2,049,000**

Debtor days (Days Sales Outstanding (DSO))

Debtors x 365 (or number of days in period)

Credit sales (for period)

Profit and loss extract	£
Sales	1,050,000
Less cost of sales	800,000
Gross profit	250,000

Debtor days = £ 180,000 x 365

= £1,050,000

= 63 days

(approx. 2 months)

This shows the average time it takes to convert accounts receivable into cash.

Uses: Measure of efficiency & compare to credit terms.

Balance Sheet Extract		£
Fixed Assets		1,500,000
Current Assets		
Stock	700,000	
Debtors	180,000	
Bank	45,000	
	925,000	
Current liabilities		
Trade creditors	100,000	
Other creditors	276,000	
Working Capital		549,000
Net assets		2,049,000

Creditor days

$$\frac{\text{trade creditors}}{\text{cost of sales}} \times 365$$

Creditor days = £ 100,000 x 365
= £ 800,000

= 46 days

This shows the average time it takes the organisation to pay its suppliers

Profit and loss extract	£
Sales	1,050,000
Less cost of sales	800,000
Gross profit	250,000

Balance Sheet Extract		£
Fixed Assets		1,500,000
Current Assets		
Stock	700,000	
Debtors	180,000	
Bank	45,000	
	925,000	
Current liabilities		
Trade creditors	100,000	
Other creditors	276,000	
Working Capital		549,000
Net assets		2,049,000

Interest Cover

Measures the safety margin (or cover) of profit over the interest payable by a business.
Expressed as number of times

E.g. if profit was £10,000 and interest payable was £5,000, then interest cover would be 2 times (which is low).

$$\frac{\text{Net profit before interest (operating profit)}}{\text{Interest}}$$

Evaluating credit decisions

- Using ratios – pitfalls
- Historical
- The whole story?

Case study

Case study

Do these results suggest a lack of liquidity for this organisation?

Current ratio 0.6 : 1

Liquid ratio 0.4 : 1

Balance Sheet Extract			£m
Fixed Assets			23,864
Current Assets			
Stock	2,430		
Debtors	1,311		
Other assets	771		
Cash	1,788		
		6,300	
Current Liabilities			
Creditors	(7,277)		
Borrowings	(2,531)		
Tax liability	(455)		
		(10,263)	
Net current liabilities			(3,963)
Long term liabilities			(7,999)
Net Assets			11,902
Total Equity			11,902

Managing Receivables – key points

- Agreeing credit terms with customers
- Controlling debtors
  - aged debtors list
  - debtors diary
- Chasing overdue payments
  - Assertive approach to late payment
  - Prompt invoicing, statements and query resolution
  - Incentives and offering discounts
- Using debt collection agencies

Invoice Discounting and Debt factoring

- Finance company (the ‘factor’) agrees to buy or advance money against the ‘security’ of your sales ledger / accounts receivables/ trade debtors

Factoring – sales ledger balance/debtors are effectively taken over by factor who advances the money to you. Factor usually collects the debt.

Discounting – arrangement where invoices are purchased by finance company (at a discount) and money is advanced to you.

Debt factoring

- A means of getting finance on the back of invoiced sales
  - Services available:
    - Non recourse factoring (advance approx.85% of invoices to approved customers). Factor takes over the bad debt risk.
    - Recourse factoring – factor does not take the bad debt risk. If invoice unpaid after a certain time then client must reimburse factor.

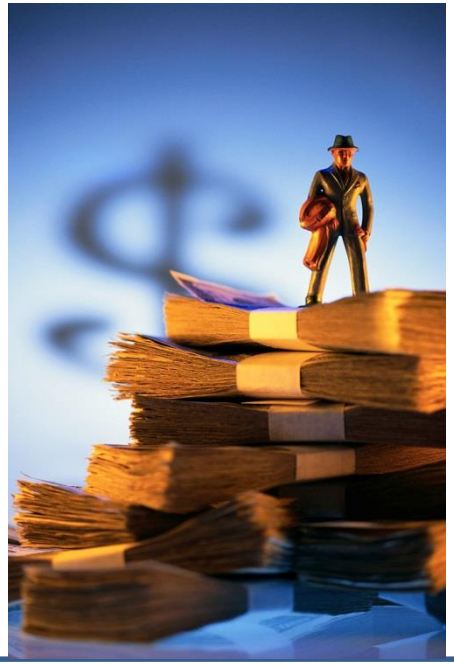
Invoice discounting

	Sale ledger balance (SLB)	Change in month	80% Advanced by factor or repaid by client	Total advanced (represents 80% if SLB
	£	£	£	£
Month 1	100,000		80,000	80,000
Month 2	130,000	30,000	24,000	104,000
Month 3	90,000	(40,000)	(32,000)	72,000

Content – Managing Payables

- Payables Payment Policies
- Controlling Payables
  - Consequences of non payment
    - Disrupted supply chain
    - Higher prices
    - Damage to reputation

Managing Cash Flow& Working Capital



Cash Management

- Common cause of business failure: Cash crisis!
- A business can be earning a profit and be forced to close because it runs out of cash!
- NFIB study:
  - 67 percent of small business owners have at least occasional problems managing cash flow.
  - 19 percent report cash flow as a continuing problem.

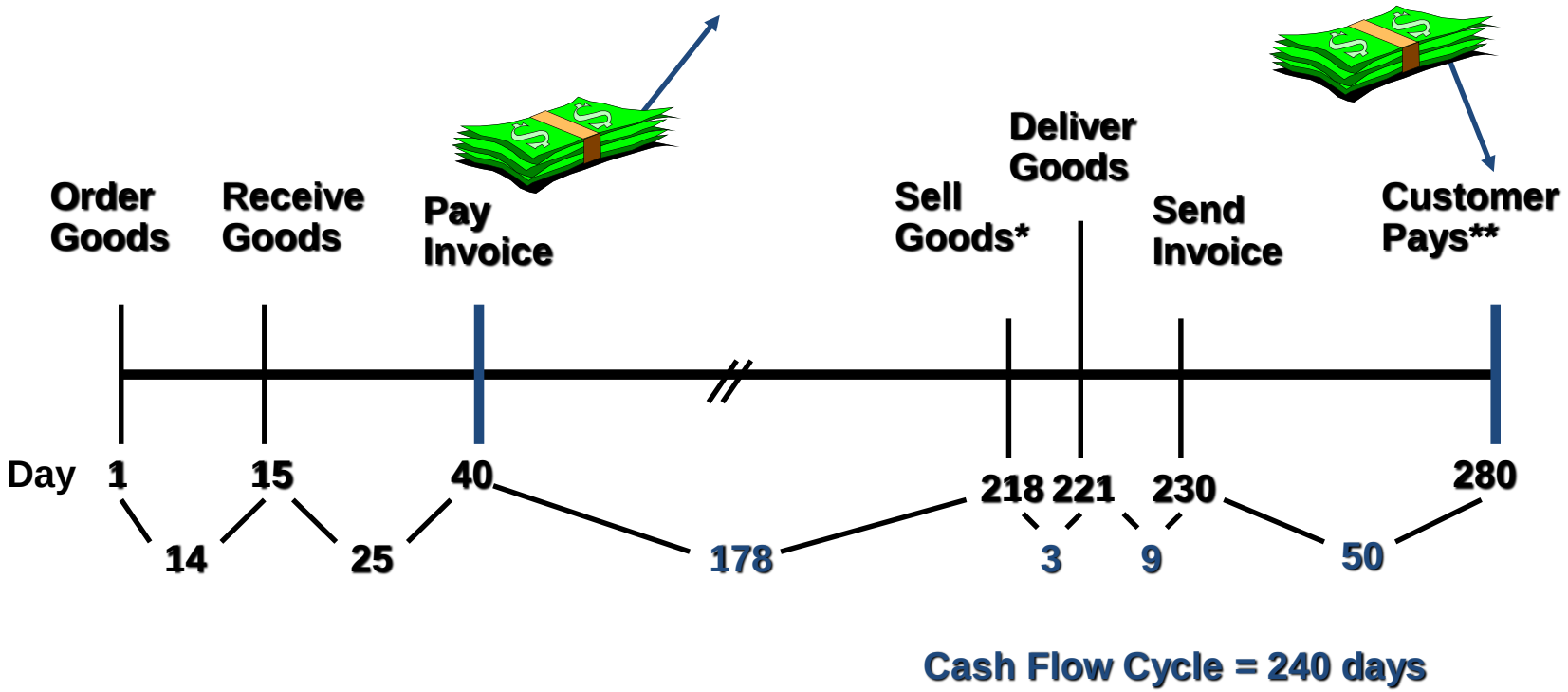


Cash Management

- Cash management – forecasting, collecting, disbursing, investing, and planning for the cash a company needs to operate smoothly.
- Young, growing companies are “cash sponges.”
- Know your company’s cash flow cycle.



The Cash Flow Cycle



Cash Flow Cycle = 240 days

* **Based on Average Inventory Turnover:**

$$\frac{365 \text{ days}}{2.05 \text{ times/year}} = 178 \text{ days}$$

** **Based on Average Collection Period:**

$$\frac{365 \text{ days}}{7.31 \text{ times/year}} = 50 \text{ days}$$

Five Cash Management Roles of an Entrepreneur

- Cash Finder
- Cash Planner
- Cash Distributor
- Cash Collector
- Cash Conserver



Cash Flow

Increase in Cash



Leakage

Decrease in Cash

Cash

Accounts Receivable

Accounts Payable

Cash Sales

Production/Cash Purchases

Inventory

Leakage



The Cash Budget

- A “cash map,” showing the amount and the timing of a firm's cash receipts and cash disbursements over time.
- Predicts the amount of cash a company will need to operate smoothly.
- A helpful tool for visualizing the firm's cash receipts and cash disbursements and the resulting cash balance.



Preparing a Cash Budget

- Determine a Minimum Cash Balance
- Forecast Sales
- Forecast Cash Receipts
- Forecast Cash Disbursements
- Estimate End-of-Month Cash Balance



Determine a Minimum Cash Balance

- Remember Goldilocks, the Three Bears, and the porridge:
  - **Not too much...**
  - **not too little...**
  - **but a cash balance that's just right ... for you!**



Forecast Sales

- The *heart* of the cash budget.
- Sales are ultimately transformed into cash receipts and cash disbursements.
- Cash forecast is only as accurate as the sales forecast from which it is derived.
- “Lumpy” sales patterns are common.
  - 15 percent to 18 percent of wine and spirits shops’ annual sales occur between December 15 and 31.
  - 40 percent of toy sales take place in last 6 weeks of the year.

Forecast Sales

- Prepare three sales forecasts:
  - Most Likely
  - Pessimistic
  - Optimistic



Sales Forecast for a Start-Up

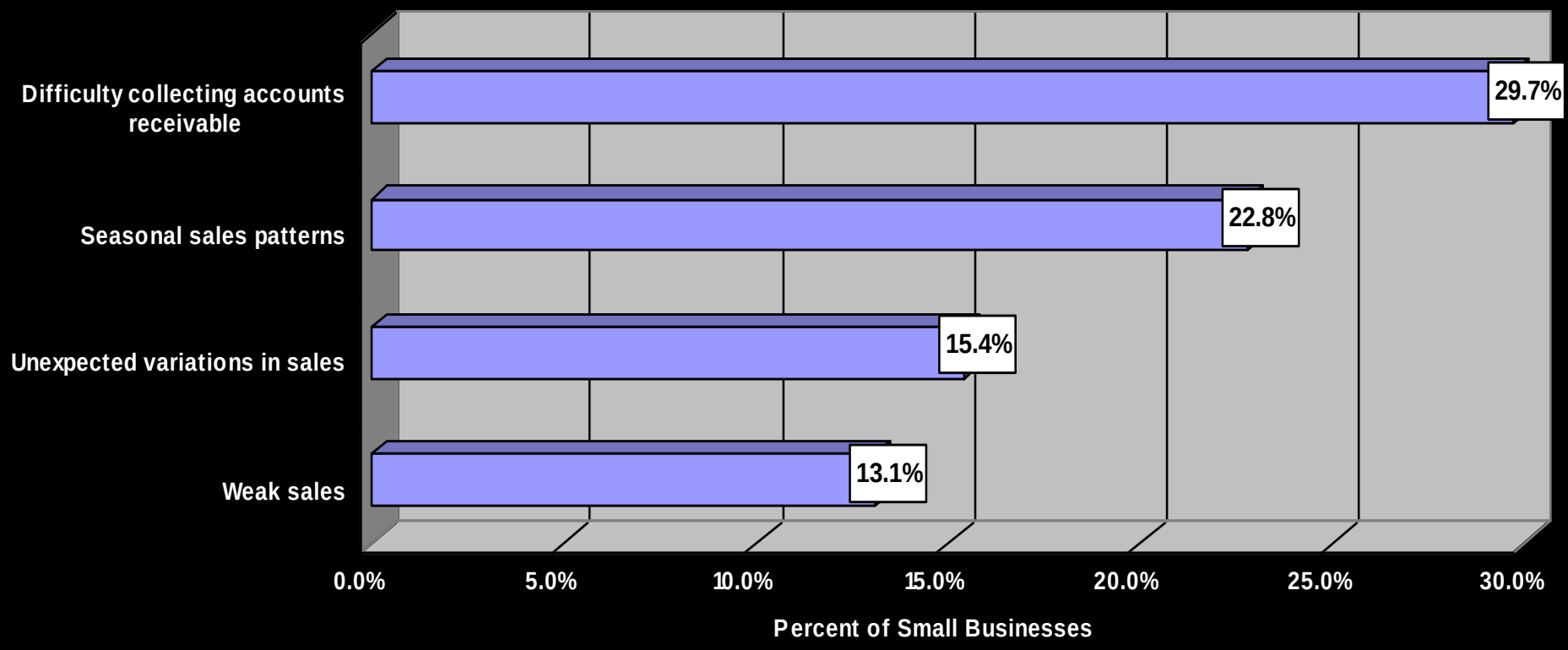
Example:

Number of cars in trading zone		84,000
x Percent of imports	x 24%	
= Number of imported cars in trading zone	20,160	

Number of imports in trading zone		20,160
x Average expenditure on repairs		x $485
= Total import repair sales potential	$9,777,600	

Total import repair sales potential	$9,777,600
x Estimated market share	x 9.9%
= Sales estimate	$967,982

Causes of Cash Flow Problems in Small Businesses

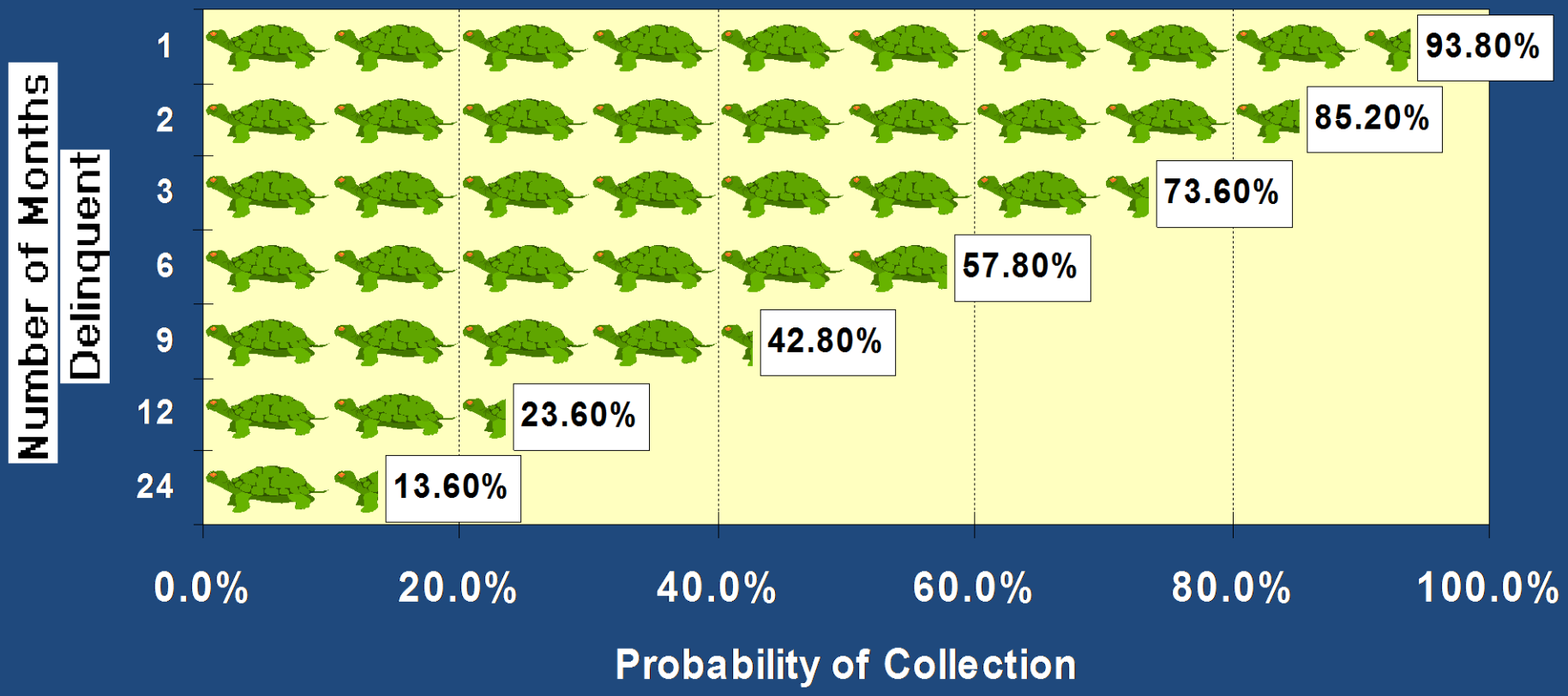


Forecast Cash Receipts

- Record all cash receipts when *actually received* (i.e., the cash method of accounting).
- Determine the collection pattern for credit sales; then add cash sales.
- Monitor closely slow and nonpayers.



Collecting Delinquent Accounts



Forecast Cash Disbursements

- Record disbursements when you expect to make them.
- Start with those disbursements that are fixed amounts due on certain dates.
- Review the business checkbook to ensure accurate estimates.
- Add a cushion to the estimate to account for "Murphy's Law."
- Don't know where to begin? Try making a *daily* list of the items that generate cash and those that consume it.

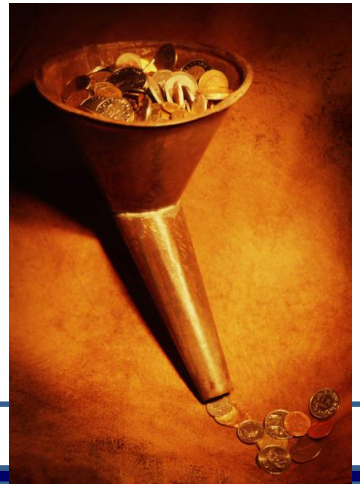
Estimate End-of-Month Balance

- Take Beginning Cash Balance...
- Add Cash Receipts...
- Subtract Cash Disbursements
- Result is Cash Surplus or Cash Shortage (Repay or Borrow?)



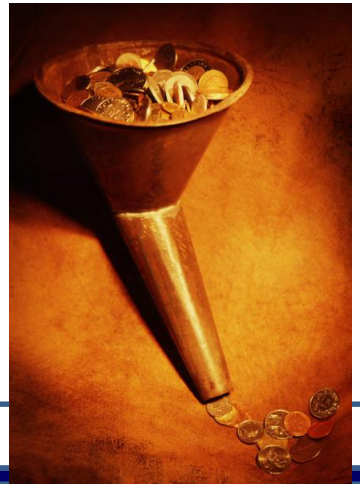
Benefits of Cash Management

- Increase amount and speed of cash flowing into the company
- Reduce the amount and speed of cash flowing out
- Make the most efficient use of available cash
- Take advantage of money-saving opportunities such as cash discounts
- Finance seasonal business needs



Benefits of Cash Management

- Develop a sound borrowing and repayment program
- Impress lenders and investors
- Reduce borrowing costs by borrowing only when necessary
- Provide funds for expansion
- Plan for investing surplus cash



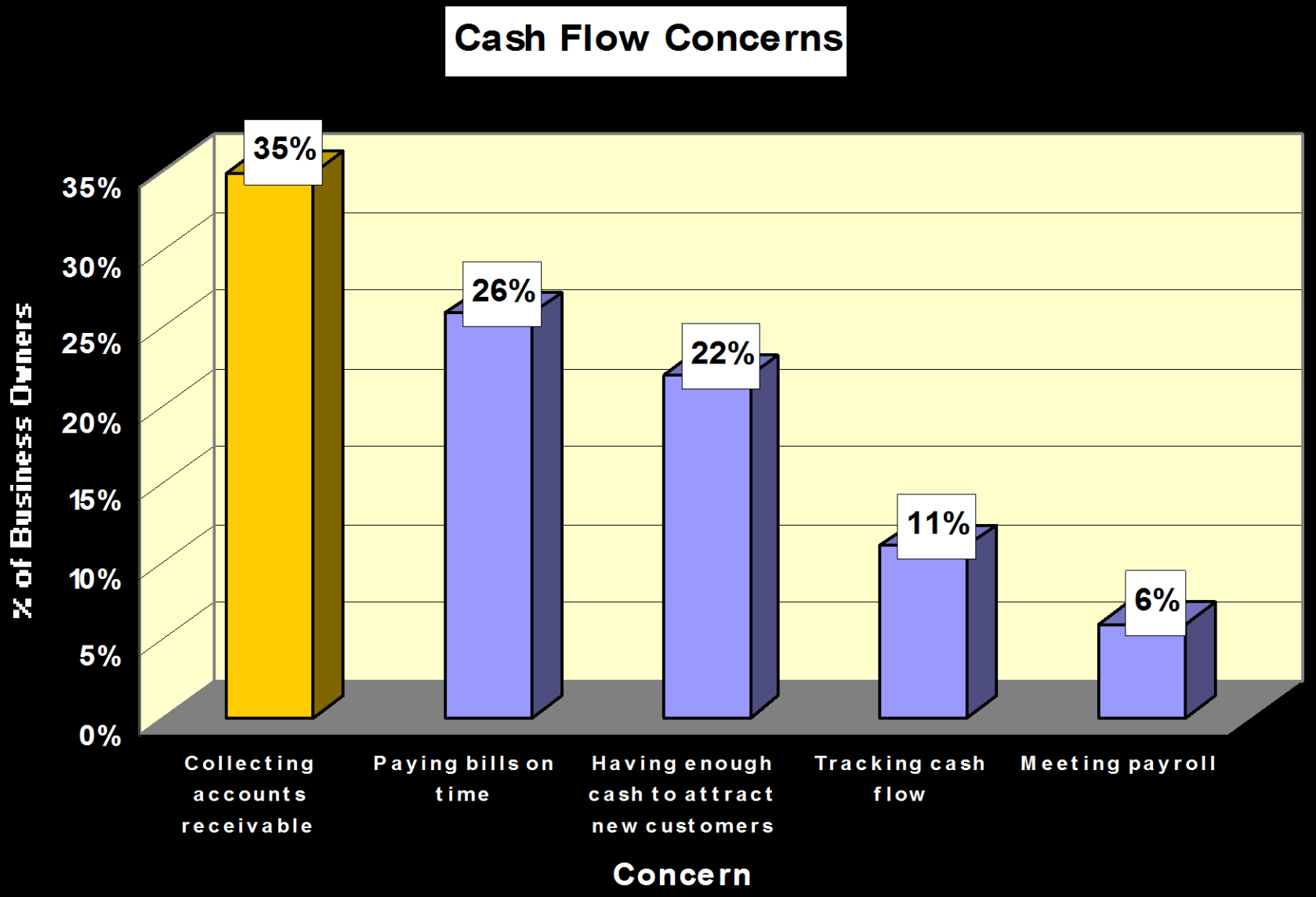
The “Big Three” of Cash Management

- Accounts Receivable
- Accounts Payable
- Inventory



Accounts Receivable

- About 90 percent of industrial and wholesale sales are on credit, and 40 percent of retail sales are on account.
- Survey of small companies across a variety of industries found that 77 percent extend credit to their customers.
- Remember: “A sale is not a sale until you collect the money.”
- The goal with accounts receivable is to collect your company’s cash as fast as you can.


Cash Flow Concerns
% of Business Owners
35%
30%
25%
20%
15%
10%
5%
0%
35%
26%
22%
11%
6%
Collecting accounts receivable
Paying bills on time
Having enough cash to attract new customers
Tracking cash flow
Meeting payroll
Concern

Beating the Cash Crisis

Accounts Receivable

- Establish a firm credit-granting policy.
- Screen credit customers carefully.
- When an account becomes overdue, take action *immediately*.
- Add finance charges to overdue accounts (check the law first!).
- Develop a system of collecting accounts.
- Send invoices promptly.



Accelerating Accounts Receivable

- Ask customers to fax or e-mail orders
- Send invoices when goods are shipped
- Highlight the due date on invoices
- Restrict customers' credit until past-due bills are paid
- Deposit checks and credit card receipts daily



Accelerating Accounts Receivable

- Identify the top 20 percent of your customers and monitor them closely
- Ask customers for up-front payments
- Watch for signs that a customer may be about to declare bankruptcy
- Consider using a lockbox service
- Track the results of your company's collection efforts



Beating the Cash Crisis

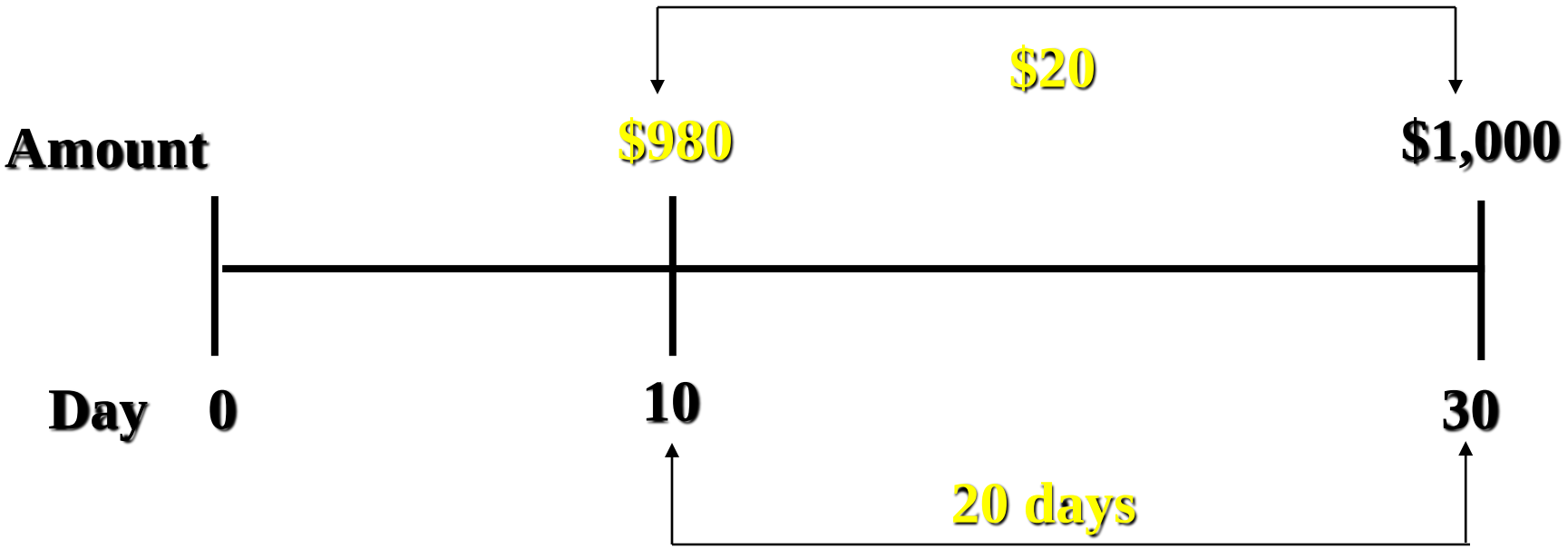
Accounts Payable

- Stretch out payment times as long as possible *without damaging your credit rating*.
- Verify *all* invoices before paying them.
- Take advantage of cash discounts.



The Cost of Forgoing a Cash Discount

$1,000 invoice 2/10, net 30



$$R = \frac{I}{P \times T} = \frac{\$20}{\$980 \times 20/360} = 36.7\%$$

Beating the Cash Crisis

Accounts Payable

- Negotiate the best possible terms with your suppliers.
- Be honest with creditors; avoid the “the check is in the mail” syndrome.
- Schedule controllable cash disbursements to come due at different times.
- Use credit cards wisely.



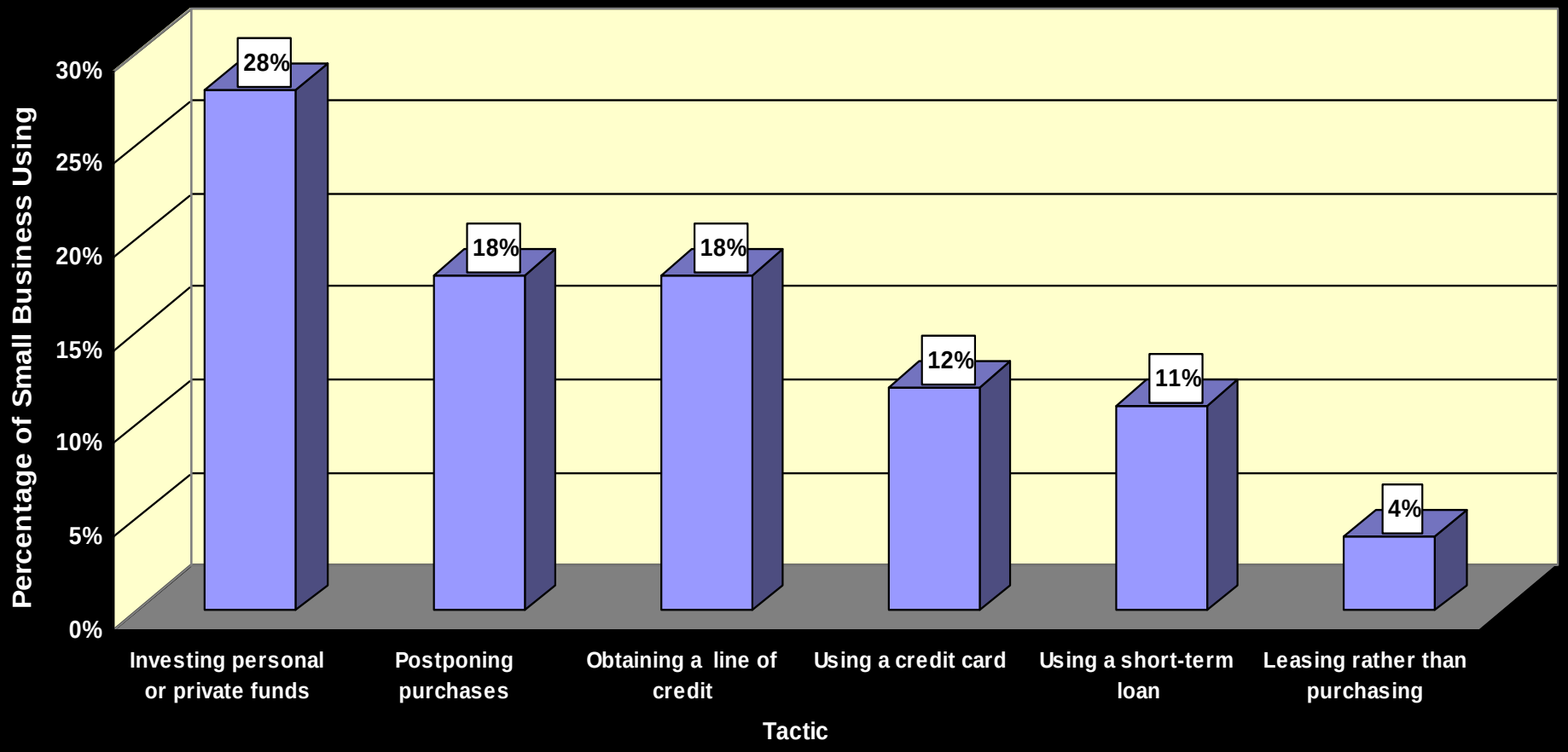
Beating the Cash Crisis

Inventory

- Monitor it closely; it can drain a company's cash.
- Avoid inventory "overbuying." It ties up valuable cash at a zero rate of return.
- Arrange for inventory deliveries at the latest possible date.
- Negotiate quantity discounts with suppliers when possible.



Coping with a Cash Crunch
Tactics Used by Small Businesses



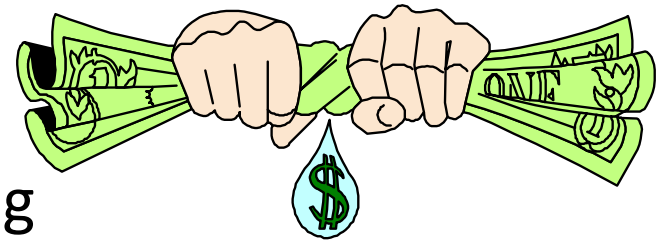
Avoiding the Cash Crunch

- Consider bartering, exchanging goods and services for other goods and services, to conserve cash.
- Trim overhead costs. For example:
  - Ask for discounts and “freebies”
  - Periodically evaluate expenses
  - Lease rather than buy
  - Avoid nonessential cash outlays
  - Negotiate fixed loan payments to coincide with your company’s cash flow



Avoiding the Cash Crunch

- Trim overhead costs. For example:
  - Buy used equipment
  - Hire part-time employees and freelancers
  - Outsource nonessential activities
  - Control employee advances and loans
  - Establish an internal security and control system
  - Devise a method for fighting check fraud
  - Change shipping terms
  - Start selling gift cards
  - Switch to zero-based budgeting



Avoiding the Cash Crunch

- Be on the lookout for employee theft
- Keep your business plan current
- Invest surplus cash



Planning to reduce costs

- To survive and be competitive organisations need to control costs.

Reduce Needless..
(needless = non value adding)

- Complexity
- Variety
- Choice – “Any colour, so long as it is black”
- Activity

Opportunities to “Rationalise”

- Product
- Customers
- Supplies
- Processes
- Places
- People – less work – less people – less cost

Product

- Complexity –range / options / components
- Variety
- 80/20 Rule – most sales (and perhaps profits from a few products?)
- Standardise
- If you cannot standardise – Use “Late differentiation”

Customers

- Are small customers / jobs profitable?
- Are some sectors' customers' requirements too onerous to be profitable?
- Can we measure customers' profitability?
- Can we serve unprofitable customers differently?
- 80/20 Rule – most sales (and perhaps profits from a few customers?)

Suppliers

- Do we have too many suppliers?
- How much does it cost us working with our suppliers?

Place - Location

- Fewer places?
- Cheaper place?

Process

- Can we make processes simpler?
- Reduce processes
- Can we outsource work to others who do it better?

Fewer Purchase Orders & Invoices

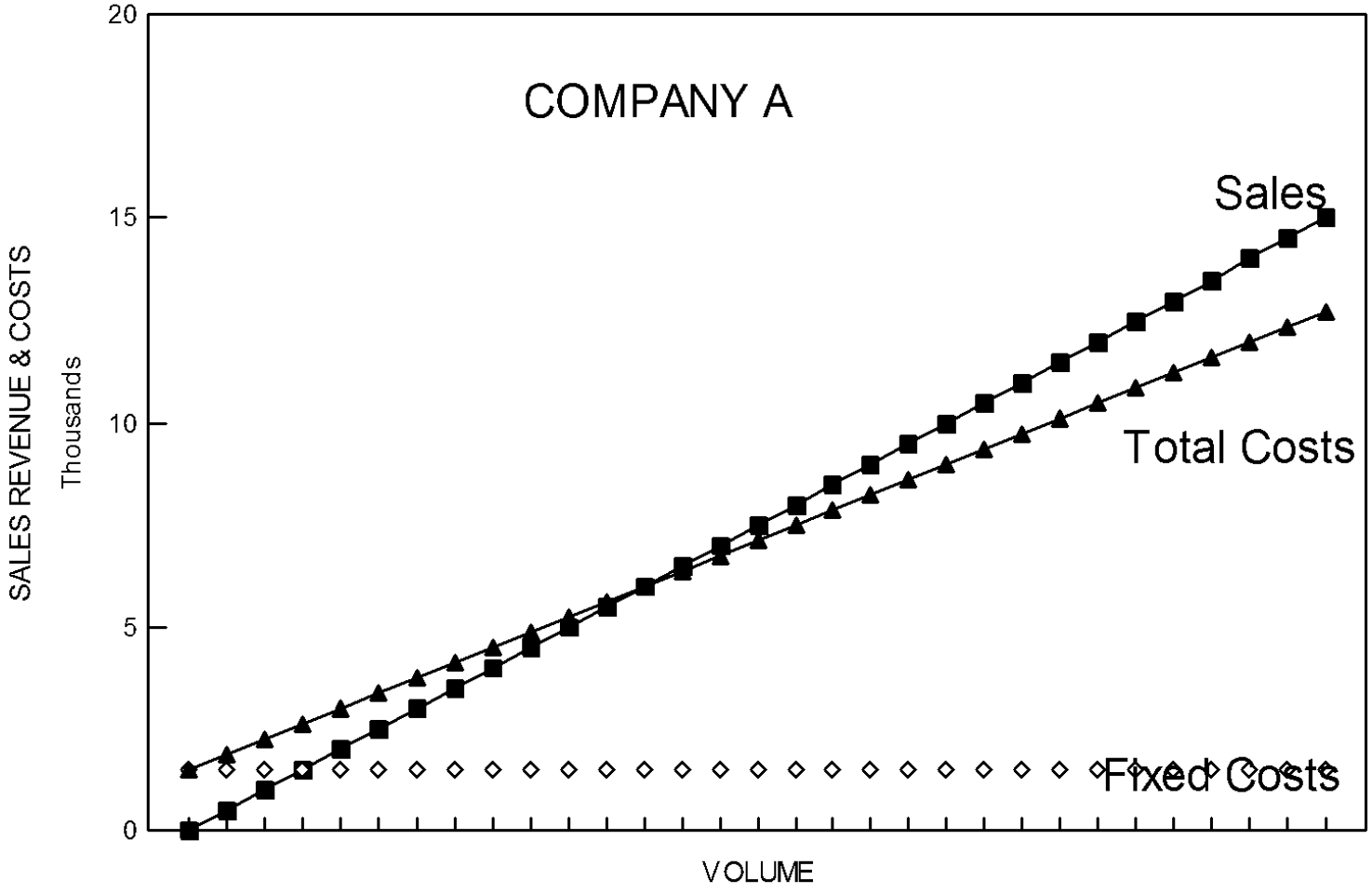
- Cost to raise an invoice?
- Cost to raise a purchase order?

Cost Structure

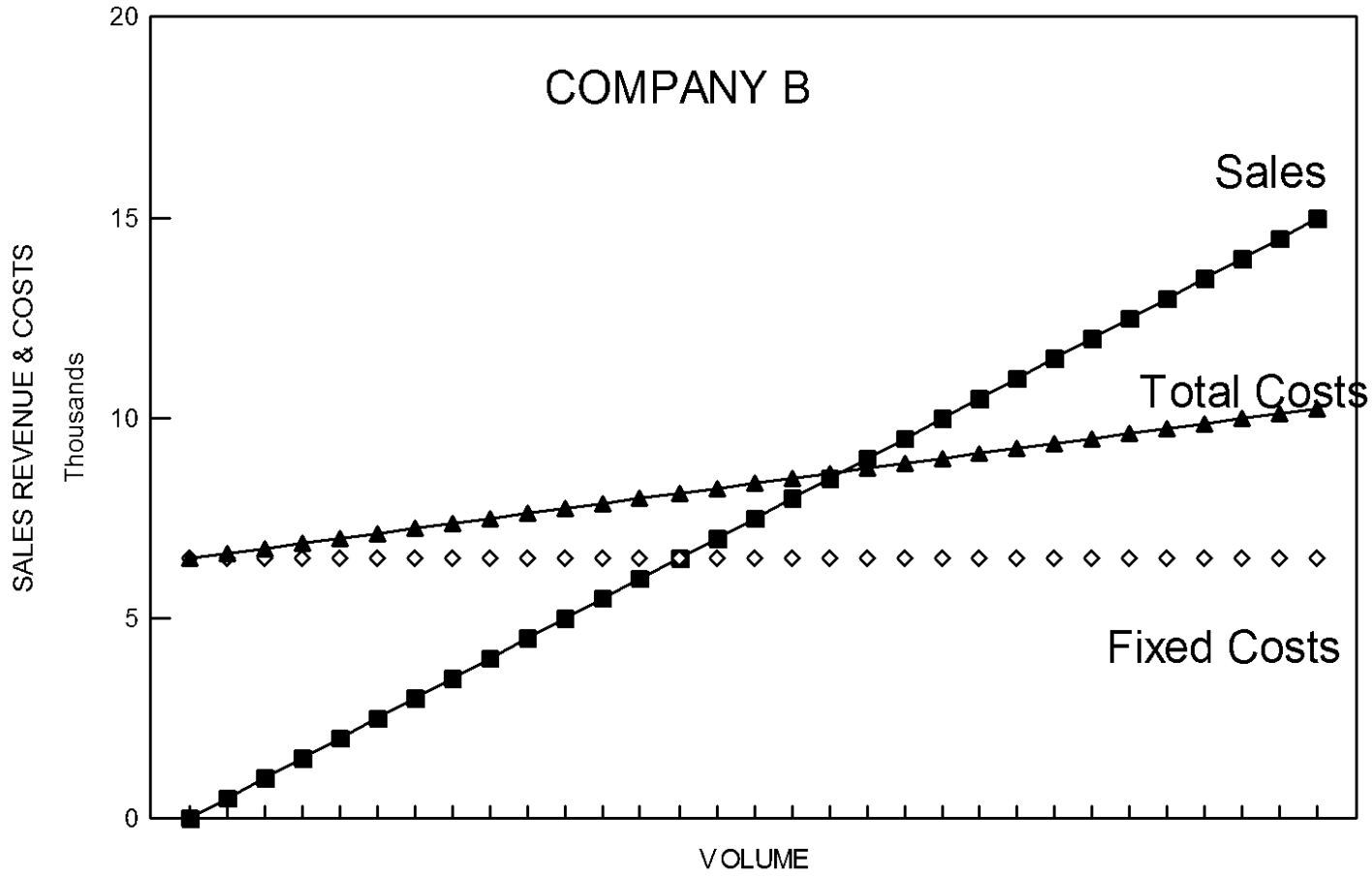
Operational Gearing

- Fixed v Variable Cost
- Cost structure and strategy
- Trends in changes in cost structure
- Alternative cost drivers to volume - ABC

Cost Structure



Cost Structure



	A	B
Company A Low contribution rate High variable cost percentage	✓	
Company B High contribution rate High fixed costs Percentage		✓
1. Hotel Chain		
2. Airline		
3. Tour Operator		
4. Supermarket		
5. Motor Manufacturer		
6. Mobile Telecoms		
7. Cinema Chain		
8. Car rental firm		
9. Power Generator (coal)		
10. Power Generator (gas)		
11. Power Generator (nuclear)		
12. Management Consultants		
13. Training Company		

Rethinking (Changing) Cost Structures

- Less Fixed
- More Variable

- More Fixed
- Less Variable

Lean Manufacturing

- Toyota Production System (TPS)
- Kaizen
- 5S
- Kanban
- Six Sigma
- Visual Factory
- Design v Delivery

Toyota Production System (TPS)

- Best Quality – Right first time
- Lowest Cost
- Shortest lead time
- JIT – Just in Time
- Standardise
- Eliminate Waste
- Motivate people to care



Toyota Production System (TPS)

Reduce

Overburden	Muri,
Inconsistency -	Mura
Eliminate waste -	Muda.



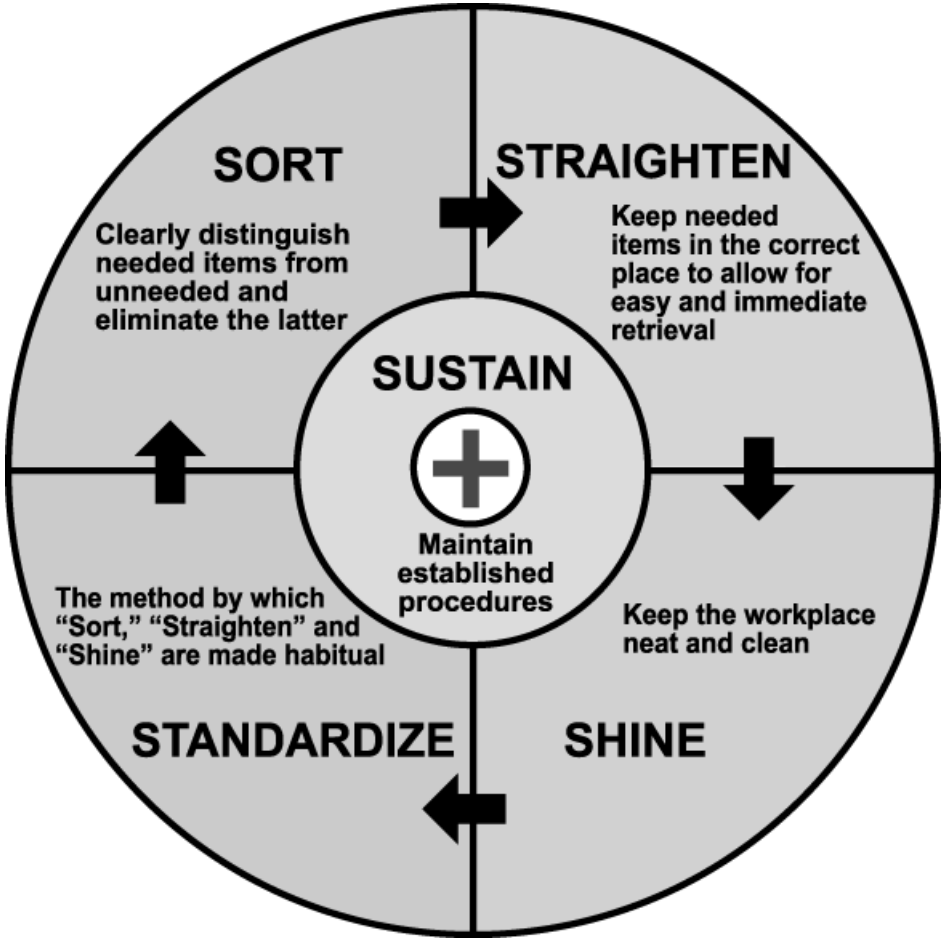
Eliminate Waste – Not Just Scrap
7 Wastes (Muda) under TPS



Kaizen

- Traditional Western Approach – If it isn't broke – don’t fix it
- Japanese Kaizen Approach – all can contribute, all the time to continuous improvement – do it better, improve it – however small

5 S - Lean


SORT
Clearly distinguish needed items from unneeded and eliminate the latter
STRAIGHTEN
Keep needed items in the correct place to allow for easy and immediate retrieval
SUSTAIN
Maintain established procedures
The method by which "Sort," "Straighten" and "Shine" are made habitual
Keep the workplace neat and clean
STANDARDIZE
SHINE

Ford - CANDO

- CANDO program (Cleaning up, Arranging, Neatness, Discipline, Ongoing Improvement),

Kanban

Kan – Visual Ban - Board

- JIT maintained by a signalling system
- Supply is “pulled” by demand

Six Sigma

- *Developed By Motorola*
- *Then GE*

Six Sigma

- "...Six Sigma is a highly disciplined process that helps us focus on developing and delivering near-perfect products and services
- To achieve Six Sigma Quality, a process must produce no more than 3.4 defects per million opportunities."

From GE

Visual Factory

- Visual factory is a term to describe how data and information is conveyed in a lean manufacturing environment. In a lean manufacturing environment time and resources dedicated to conveying information, although necessary, are a form of waste. By using visual methods to convey information such as signs and charts, information is easily accessible to those who need it. The current status of all processes is immediately apparent

Design v Delivery

Cheaper & Better by Design

- More and more costs are set at the design stage rather than at delivery (Manufacture)
- Cost Reduction should be included in design – Target Costing

Failure Costs!

- Right first time
- Poka-Yoke – zero defects objective



Alliance / Partnering

A **Strategic Alliance** is a mutually beneficial long-term formal relationship formed between two or more parties to pursue a set of agreed upon goals or to meet a critical business need while remaining independent organizations.

Alliance / Partnering

Example of Strategic Alliances

Airlines
Code Sharing
Integrated schedules

Mobile Phones
Roaming
Infrastructure sharing
Example – T-Mobile – Virgin Mobile



Getting your team to deliver more for less

Developing a cost conscious culture

Cost – Outcome Impact Model

Economy
Efficiency
Effectiveness
Capacity and Risk

"Quicker Faster Better Cheaper" Motivating and encouraging people to effectively manage cost and value

Internal service level and internal markets agreements – Pros and Cons

Mini Case Study – "Doctors; Orders" – delivering savings in a hospital

Exercise / Toolbox 4 –VFM & Getting the Team onboard and improving performance

VFM - Value For Money 3 Es

A Public Sector Model / But Good for Cost Centres?

- Economy
- Efficiency
- Effectiveness



VFM - Value For Money

- Cost – Input
- Resources
- Output
- Outcomes



VALUE FOR MONEY

ECONOMY

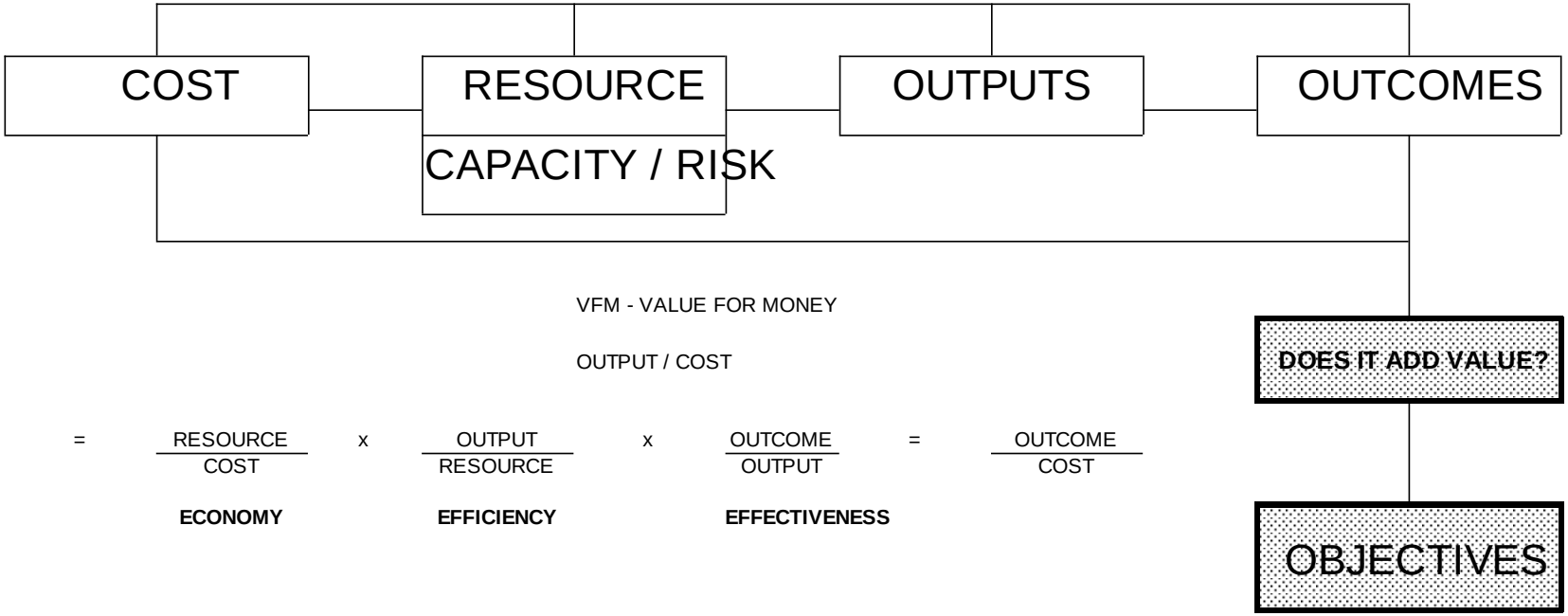
RESOURCE / COST

EFFICIENCY

OUTPUT / RESOURCE

EFFECTIVENESS

OUTCOME / OUTPUT



$$VFM = \frac{RESOURCE}{COST} \times \frac{OUTPUT}{RESOURCE} \times \frac{OUTCOME}{OUTPUT} = \frac{OUTCOME}{COST}$$

ECONOMY **EFFICIENCY** **EFFECTIVENESS**

Economy

- Minimising the costs of resources used within the public sector, but having regard to quality.
- Better Prices!

Efficiency

- The relationship between output, in terms of goods, services or other results, and the resources used to produce them.
- Example - Get staff to be more productive – deliver more

Effectiveness

- The extent to which objectives have been achieved. The relationship between the intended impacts and actual impacts of an activity
- Delivering the required result!

Exercise

- 3 Es

VFM – Value For Money

4th E

EVIDENCE

•Working capital cycle

- **Debtor days are usually more than creditor days**
- **Working capital cycle = debtor days + stock turnover days – creditor days**
- **Improve this by:**

– **reducing stocks (but chance of stock-out)**

– **reducing debtor days (but risk of losing custom)**

– **increasing creditor days (but risk of non-supply)**

Overtrading

- Decrease in working capital caused by:
  - Rapid increase in sales (+ higher debtors)
  - Need to hold more stock
  - Considerably increased overdraft
  - Higher facility required from creditors

Overtrading

OVERTRADING

Purchase of fixed assets £20,000
Purchase of stock £24,000
Creditors increase by £12,000
Bank balance reduced by £32,000 (20+24-12)

		(BEFORE)		(AFTER)
FIXED ASSETS				
EQUIPMENT		**10,000**		**30,000**
CURRENT ASSETS				
STOCK	**24,000**		**48,000**	
DEBTORS	**6,000**		**6,000**	
BANK	**2,000**		**0**	
	32,000		**54,000**	
CURRENT LIABILITIES				
OVERDRAFT	**0**		**30,000**	
CREDITORS	**8,000**		**20,000**	
	8,000		**50,000**	
NET CURRENT ASSETS		**24,000**		**4,000**
NET ASSETS		**34,000**		**34,000**
FINANCED BY:				
CAPITAL				
		34,000		**34,000**

In practice, more sales will be achieved, resulting in increased debtors, but no extra cash until the debtors pay.

Cost Reduction ideas
In your business

Cost Control (Management Ideas)
In your business

Day 2

CAPITAL BUDGETING AND INVESTMENT APPRAISAL

CAPITAL BUDGETING AND INVESTMENT APPRAISAL

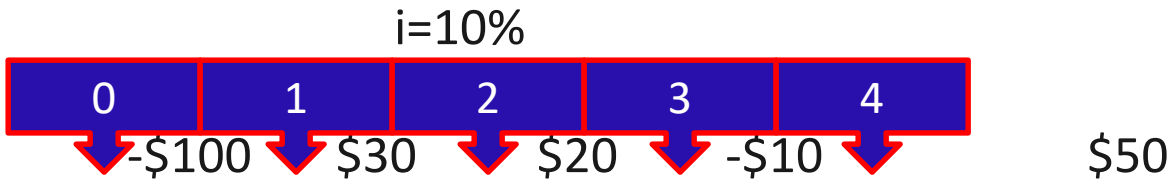
- The time value of money
- Understanding Appraisal Techniques – Net Present Value (NPV), Internal Rate of Return (IRR) and Payback period
- Probability Models (Monte Carlo), Stress Tests and Value at Risk (VaR)
- The use of Sensitivity analysis in evaluating projects
- Strategic considerations in assessing capital projects
- Creating an effective Capital Budgeting framework

The time value of money

Using Timelines to Visualize Cashflows

- A **timeline** identifies the timing and amount of a stream of cash flows along with the interest rate.
- A timeline is typically expressed in years, but it can also be expressed in months, days, or any other unit of time.

Time Line Example



- Years
- Cash flow

- The 4-year timeline illustrates the following:
  - The interest rate is 10%.
  - A cash outflow of $100 occurs at the beginning of the first year (at time 0), followed by cash inflows of $30 and $20 in years 1 and 2, a cash outflow of $10 in year 3 and cash inflow of $50 in year 4.

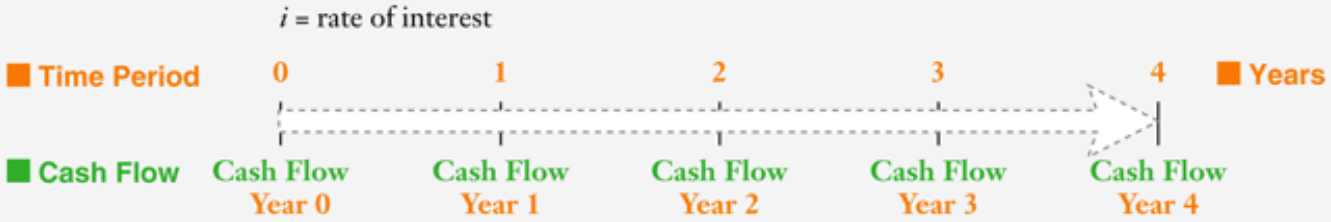
Checkpoint

Creating a Timeline

Suppose you lend a friend $10,000 today to help him finance a new Jimmy John's Sub Shop franchise and in return he promises to give you $12,155 at the end of the fourth year. How can one represent this as a timeline? Note that the interest rate is 5%.

STEP 1: Picture the problem

A timeline provides a tool for visualizing cash flows and time:



STEP 2: Decide on a solution strategy

To complete the timeline we simply record the cash flows onto the template.

STEP 3: Solve

We can input the cash flows for this investment on the timeline as shown below. Time period zero (the present) is shown at the left end of the timeline, and future time periods are shown above the timeline, moving from left to right, with the year that each cash flow occurs shown above the timeline.
Keep in mind that year 1 represents the end of the first year as well as the beginning of the second year.



STEP 4: Analyze

Using timelines to visualize cash flows is useful in financial problem solving. From analyzing the timeline, we can see that there are two cash flows, an initial $10,000 cash outflow, and a $12,155 cash inflow at the end of year 4.

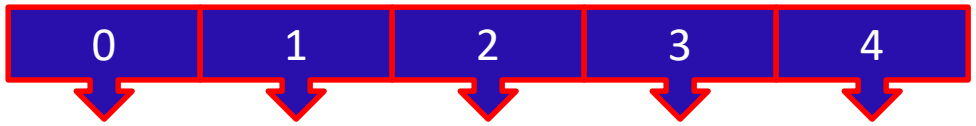
Checkpoint *Check yourself*

Draw a timeline for an investment of $40,000 today that returns nothing in one year, $20,000 at the end of year 2, nothing in year 3, and $40,000 at the end of year 4.

Timeline

i=interest rate; not given

Time Period



Cash flow	-$40,000	$0	$20,000	$0	$40,000

Simple Interest and Compound Interest

- What is the difference between simple interest and compound interest?
  - Simple interest: Interest is earned only on the principal amount.
  - Compound interest: Interest is earned on both the principal and accumulated interest of prior periods.
- Example 5.1: Suppose that you deposit $500 in your savings account that earns 5% annual interest. How much will you have in your account after two years using (a) simple interest and (b) compound interest?

Example

- Simple Interest
  - Interest earned = 5% of $500 = .05×500 = $25 per year
  - Total interest earned = $25×2 = $50
  - Balance in your savings account:
    = Principal + accumulated interest
    = $500 + $50 = **$550**
- Compound interest (assuming compounding once a year)
  - Interest earned in Year 1 = 5% of $500 = $25
  - Interest earned in Year 2 = 5% of ($500 + accumulated interest)
    = 5% of ($500 + 25) = .05×525 = $26.25
  - Balance in your savings account:
    = Principal + interest earned = $500 + $25 + $26.25 = **$551.25**

Present Value and Future Value

- Time value of money calculations involve *Present value* (what a cash flow would be worth to you today) and *Future value* (what a cash flow will be worth in the future).
- In example 5.1, Present value is $500 and Future value is $551.25 (if the *yearly compounding* rate is 5%).
- The linkage between present value and future value is:

Future Value = Present Value x (1+Interest Rate per period)$^{Number\ of\ periods}$

- For annual compounding (compounding once a year),

Future Value = Present Value x (1+Annual Interest Rate)$^{Number\ of\ years}$

If nothing is said, assume annual compounding.

Example:

- Example 5.1: The future value of $500 in 2 years with annual compounding interest rate of 5% can be computed directly from the formula:

$$FV2=PV(1+i)^2 = 500(1+0.05)^2=500(1.05)^2=551.25.$$

- Continue example 5.1 where you deposit $500 in savings account earning 5% annual interest. Show the amount of interest earned for the first five years and the value of your savings at the end of five years.
  - You can do the calculation year by year
  - or use the formula for future value: $FV_n= PV(1+i)^n$

Year by year compounding

YEAR	PV or Beginning Value	Interest Earned (5%)	FV or Ending Value
1	$500.00	$500*.05 = $25	$525
2	$525.00	$525*.05 = $26.25	$551.25
3	$551.25	$551.25*.05 =$27.56	$578.81
4	$578.81	$578.81*.05=$28 .94	$607.75
5	$607.75	$607.75*.05=$30 .39	$638.14

Use the Future Value Equation

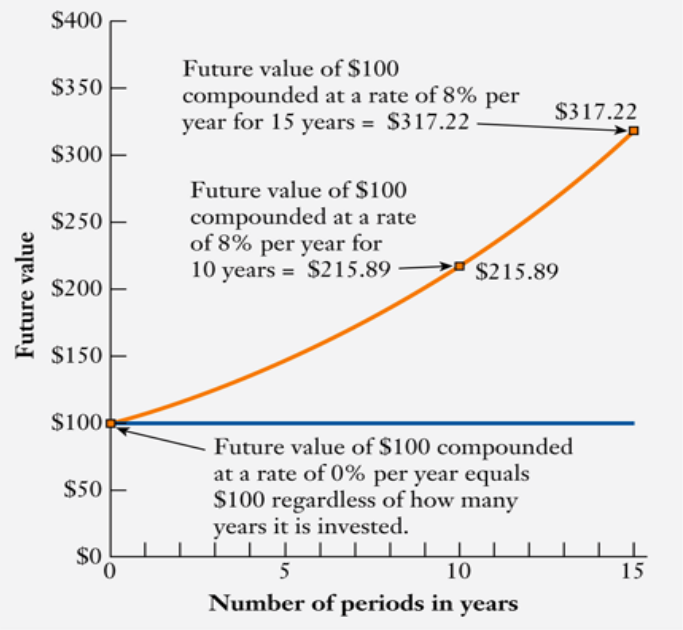
- We will obtain the same answer using the future value equation: $FV = PV(1+i)^n$

$$= 500(1.05)5 = \$638.14$$

- So the balance in savings account at the end of 5 years will equal $638.14. The total interest earned on the original principal amount of $500 will equal $138.14 (i.e. $638.14-$500.00).

Power of Time

Future Value and Compound Interest Illustrated



(Panel B) The Power of Time

This figure illustrates the importance of time when it comes to compounding. Because interest is earned on past interest, the future value of $100 deposited in an account that earns 8% compounded annually grows over threefold in 15 years. If we were to expand this figure to 45 years (which is about how long you have until you retire, assuming you're around 20 years old right now), it would grow to over 31 times its initial value.

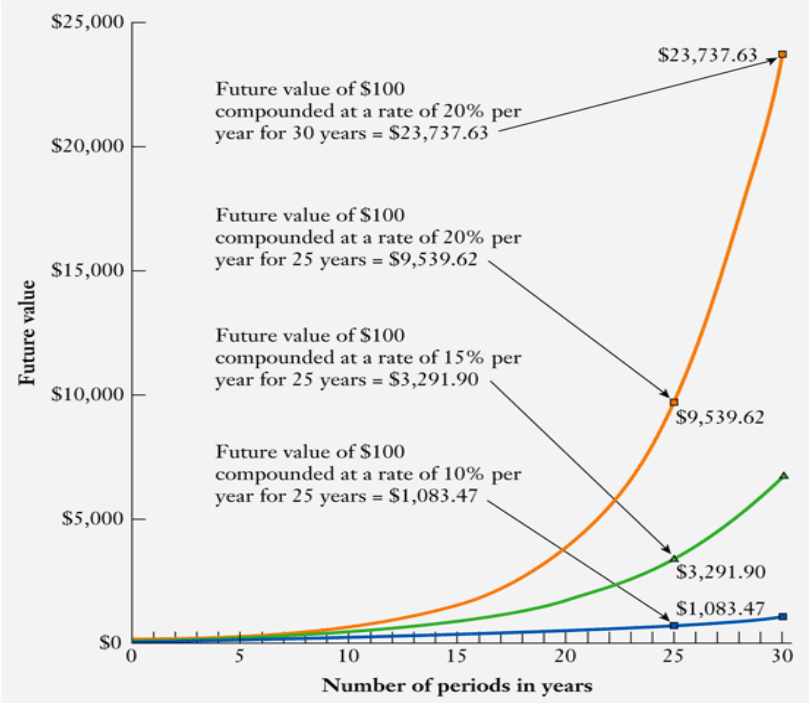
Future value of original investment increases with time, unless interest rate is zero.

Power of Interest Rate

Future Value and Compound Interest Illustrated

(Panel C) The Power of the Rate of Interest

This figure illustrates the importance of the interest rate in the power of compounding. As the interest rate climbs, so does the future value. In fact, when we change the interest rate from 10% to 20%, the future value in 25 years increases by over 8 times, jumping from $1,083.47 to $9,539.62.
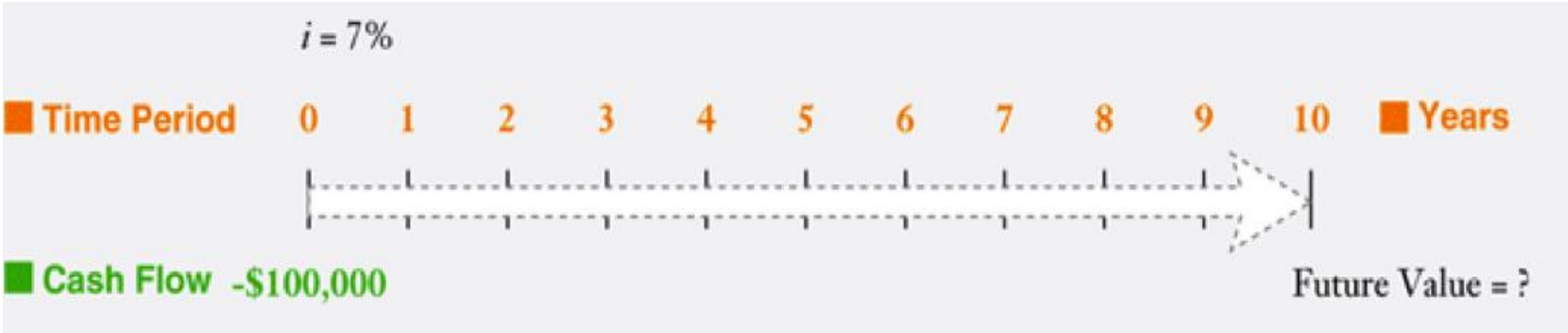


Checkpoint

Calculating the Future Value of a Cash Flow

You are put in charge of managing your firm's working capital. Your firm has $100,000 in extra cash on hand and decides to put it in a savings account paying 7% interest compounded annually. How much will you have in your account in 10 years?

Checkpoint

- Draw the time line



- It is a simple future value problem. Use the future value equation:
  $FV_{10}=PV(1+i)^{10}=100000(1.07)^{10}=$**196,715**
- Check for yourself: What's future value in 20 years? What if the annual return (interest rate) on the cash is 12%?
  - 386,968; 964,629.

FV Applications in Other Areas

- Example A DVD rental firm is currently renting 8,000 DVDs per year. How many DVDs will the firm be renting in 10 years if the demand for DVD rentals is expected to increase by 7% per year?
- Example Your annual tuition at a State University is currently $20,000. If the tuition increases by 6% annually, what will be the annual cost of attending the State University in 25 years?

FV Applications in Other Areas

- Answers:
  - Example FV = $8000(1.07)^{10}$ = **$15,737.21**
  - Example FV =$20,000 $(1.06)^{25=}$ $85,837.41 per year

Compound Interest with Shorter (Other) Compounding Periods

- Banks frequently offer savings account that compound interest every day, month, or quarter.
- More frequent compounding will generate higher interest income for the savers if the annual interest rate is the same.
- Example 5.4 You invest $500 for seven years to earn an annual interest rate of 8%, and the investment is compounded semi-annually. What will be the future value of this investment?
  - Use the more general formula:

    $FV=PV(1+\text{rate per period})^{\text{Number of periods}}$
  - Rate per half year period is 8%/2=4%.
  - Number of half-year periods in 7 years is 7x2=14 half years.
  - $FV=500x(1+0.04)^{14}=$**865.84**

Compound Interest with Shorter Compounding Periods

- Another way to write the future value equation, in terms of annual rates and years:

$$\text{Future Value in year } n \ (FV_n) = \text{Present Value } (PV)\left(1 + \frac{\text{Annual Interest Rate } (i)}{\text{Compounding Periods per Year } (m)}\right)^{m \times (\text{Number of Years } (n))}$$

- Example 5.4 again:

$FV = PV(1+i/2)^{m*2} = 500(1+.08/2)^{7*2} = 500x(1.04)^{14} = \mathbf{865.84}$.

Given the same rate and time period, the more frequent the compounding, the higher the future value.

Table 5.2 The Value of $100 Compounded at Various Non-Annual Periods and Various Rates

Notice the impact of shorter compounding periods is heightened by both higher interest rates and compounding over longer time periods.

For 1 Year at *i* Percent	*i*=2%	5%	10%	15%	
Compounded annually	$102.00	$105.00	$110.00	**$115.00**	
Compounded semiannually	102.01	105.06	110.25	115.56	
Compounded quarterly	102.02	105.09	110.38	115.87	$1.18
Compounded monthly	102.02	105.12	110.47	116.08	
Compounded weekly (52)	102.02	105.12	110.51	116.16	
Compounded daily (365)	102.02	105.13	110.52	**116.18**	
For 10 Years at *i* Percent	***i*=2%**	**5%**	**10%**	**15%**	
Compounded annually	$121.90	$162.89	$259.37	**$404.56**	
Compounded semiannually	122.02	163.86	265.33	424.79	
Compounded quarterly	122.08	164.36	268.51	436.04	$43.47
Compounded monthly	122.12	164.70	270.70	444.02	
Compounded weekly (52)	122.14	164.83	271.57	447.20	
Compounded daily (365)	122.14	164.87	271.79	**448.03**	

Checkpoint

Calculating Future Values Using Non-Annual Compounding Periods

- You have been put in charge of managing your firm's cash position and noticed that the Plaza National Bank of Portland, Oregon, has recently decided to begin paying interest compounded semi-annually instead of annually. If you deposit $1,000 with Plaza National Bank at an interest rate of 12%, what will your account balance be in five years?
- If you deposit $50,000 in an account that pays an annual interest rate of 10% compounded monthly, what will your account balance be in 10 years?

Verify the answers: [1]**$1790.85; [2]$135,352.07**

Discounting and Present Value

- What is value today of cash flow to be received in the future?
  - The answer to this question requires computing the **present value,** i.e., the value today of a future cash flow, and the process of **discounting,** determining the present value of an expected future cash flow.
  - Since we know how to compound to get future value:

    $FV_n=PV(1+i)^n$
  - We can get PV from FV:

    $PV=FV_n/(1+i)^n$
  - Compound (multiply) to get future value; discount (divide) to get present value.
  - Present value is smaller than future value with positive rate.

Example

- Example 5.5 How much will $5,000 to be received in 10 years be worth today if the interest rate is 7%?
  - PV = FV /$(1+i)^n$ =5000 /$(1.07)^{10}$= **$2,541.50**
  - To calculate present value, the interest rate is often referred to as the "discount rate."
  - The textbook version of the PV formula (for annual compounding):

$$\text{Present Value } (PV) = \text{Future Value in year } n \ (FV_n) \left[\frac{1}{\left(1 + \text{Annual Interest Rate } (i)\right)^{\text{Number of Years } (n)}} \right]$$

Impact of Interest Rates on PV

- If the interest rate (or discount rate) is higher (say 9%), the PV will be lower.
  - PV = $5000*(1/(1.09)^{10}) = 5000*(0.4224)$
    =$2,112.00
- If the interest rate (or discount rate) is lower (say 2%), the PV will be higher.
  - PV = $5000*(1/(1.02)^{10}) = 5000*(0.8203)$
    = **$4,101.50**
- Note the slight variation in which the formula is written.

Checkpoint 5.4

Solving for the Present Value of a Future Cash Flow

- Your firm has just sold a piece of property for $500,000, but under the sales agreement, it won't receive the $500,000 until ten years from today. What is the present value of $500,000 to be received ten years from today if the discount rate is 6% annually?
  - Verify the answer: **$279,197.39**
- What is the present value of $100,000 to be received at the end of 25 years given a 5% discount rate?
  - Verify the answer: **$29,530.28**

Solving for the Number of Periods

- Key Question: *How long will it take to accumulate a specific amount in the future?*
- It is easier to solve for "n" using the financial calculator or Excel rather than mathematical formula:
- $FV=PV(1+i)^n$
  - $(FV/PV)=(1+i)^n$ ← Move PV to the left.
  - $\ln(FV/PV)=n \ln(1+i)$ ← Take natural logs (ln) on both sides
  - **$n=[\ln(FV/PV)]/[\ln(1+i)]$** ← Move ln(1+i) to the left, switch sides.

Example

- Example How many years will it take for an investment of $7,500 to grow to $23,000 if it is invested at 8% annually?
  - N=ln(FV/PV)/ln(1+i)

    =[ln(2300/7500)]/[ln(1.08)] =1.12/0.077

    =**14.56**

Checkpoint

Solving for the Number of Periods, *n*

- Let's assume that the Toyota Corporation has guaranteed that the price of a new Prius will always be $20,000, and you'd like to buy one but currently have only $7,752. How many years will it take for your initial investment of $7,752 to grow to $20,000 if it is invested so that it earns 9% compounded annually?
- How many years will it take for $10,000 to grow to $200,000 given a 15% compound growth rate?

  - Verify the answers: 11years; 21.43 years.

Rule of 72

- Rule of 72 is an approximate formula to determine the number of years it will take to double the value of your investment.
- Rule of 72: N = 72/interest rate in percentage
- Example 5.7 Using Rule of 72, determine how long it will take to double your investment of $10,000 if you are able to generate an annual return of 9%.
  - Exact N=ln(2)/ln(1.09)=0.693/0.086=8.04
  - Approximate N=72/9=8.

Solving for Rate of Interest

- Key Question: What rate of interest will allow your investment to grow to a desired future value?
- $FV=PV(1+i)^n$
  - $(FV/PV)=(1+i)^n$ ← Move PV to the left
  - $(FV/PV)^{(1/n)}=1+i$ ← Take (1/n) root on both sides
  - $i=(FV/P)^{(1/n)}-1$. ← Move 1 to the left, switch sides.

Example

- Example 5.8 At what rate of interest must your savings of $10,000 be compounded annually for it to grow to $22,000 in 8 years?
  - $i=(FV/PV)^{(1/n)}-1 = (22000/10000)^{(1/8)}-1$ $=0.1036=$**10.36%.**

Checkpoint

Solving for the Interest Rate, *i*

- Let's go back to that Prius example in Checkpoint 5.5. Recall that the Prius always costs $20,000. In 10 years, you'd really like to have $20,000 to buy a new Prius, but you only have $11,167 now. At what rate must your $11,167 be compounded annually for it to grow to $20,000 in 10 years?
- At what rate will $50,000 have to grow to reach $1,000,000 in 30 years?
- Verify the answers: 6%; 10.5%.

Making Interest Rates Comparable

- The **annual percentage rate** (APR) indicates the amount of interest paid or earned in one year without compounding. APR is also known as the nominal or stated interest rate. This is the rate required by law.
- We cannot compare two loans based on APR if they do not have the same compounding period.
- To make them comparable, we calculate their equivalent rate using an annual compounding period. We do this by calculating the **effective annual rate (EAR)** .

Linking APR to EAR

- APR is the quoted annual rate with a pre-specified compounding frequency. [Let m be the number of compounding periods per year for this APR.]
- EAR is the effective annual rate at an annual compounding frequency. [One compounding per year]
- The two should generate the same amount of money in one year:
- $(1+APR/m)^m=(1+EAR)$ → **$EAR=(1+APR/m)^m-1$.**

Example

- Example 5.9 Calculate the EAR for a loan that has a 5.45% quoted annual interest rate compounded monthly.
  - Monthly compounding implies 12 compounding per year. m=12.
  - EAR = $(1+APR/m)^m - 1 = (1+.0545/12)^{12} - 1$

    = 1.0558 – 1= **.05588** or **5.59%**

Checkpoint

Calculating an EAR or Effective Annual Rate

- Assume that you just received your first credit card statement and the APR, or annual percentage rate listed on the statement, is 21.7%. When you look closer you notice that the interest is compounded daily. What is the EAR, or effective annual rate, on your credit card?
- What is the EAR on a quoted or stated rate of 13% that is compounded monthly?
  - Verify the answers: 24.23%; 13.80%.

Continuous Compounding

- When the time intervals between when interest is paid are infinitely small, we call it continuous compounding. In this case, future value and present value is linked as:
  - $FV=PV\ e^{r\,t}$
  - r is the continuous compounding rate, t is number of years.
  - E is the “natural number” 2.71828
- Continuous compounding rate is linked to EAR as
  - $EAR= e^{r} - 1$, again obtained by matching the one-year future value from the two compounding frequencies.

Example

- Example What is the EAR on your credit card with continuous compounding if the APR is 18%?

- $EAR = e^{.18} - 1$

  $= 1.1972 - 1$

  $= \mathbf{.1972 \text{ or } 19.72\%}$

Cost/Benefit Analysis: A Simple Example: A City Camp: Operate or Rent?

	Rent to Outside Group	Fix up & Operate
Benefits Rental Fees	$100,000	$200,000
Costs Repairs Supervision and Maintenance	 0 $50,000	 $75,000 $100,000
Net Benefit	$50,000	$25,000

Time Value of Money

- Previous example ignores the role of time in deciding on alternatives
- More complex issues seldom play out in one year

Time Value of Money

- Often costs and benefits distribute themselves unevenly over time: long term gain versus short term pain
- When money is received can often be as important as how much is received
- Particularly with capital investments – focus on technology

Time Value of Money Principle

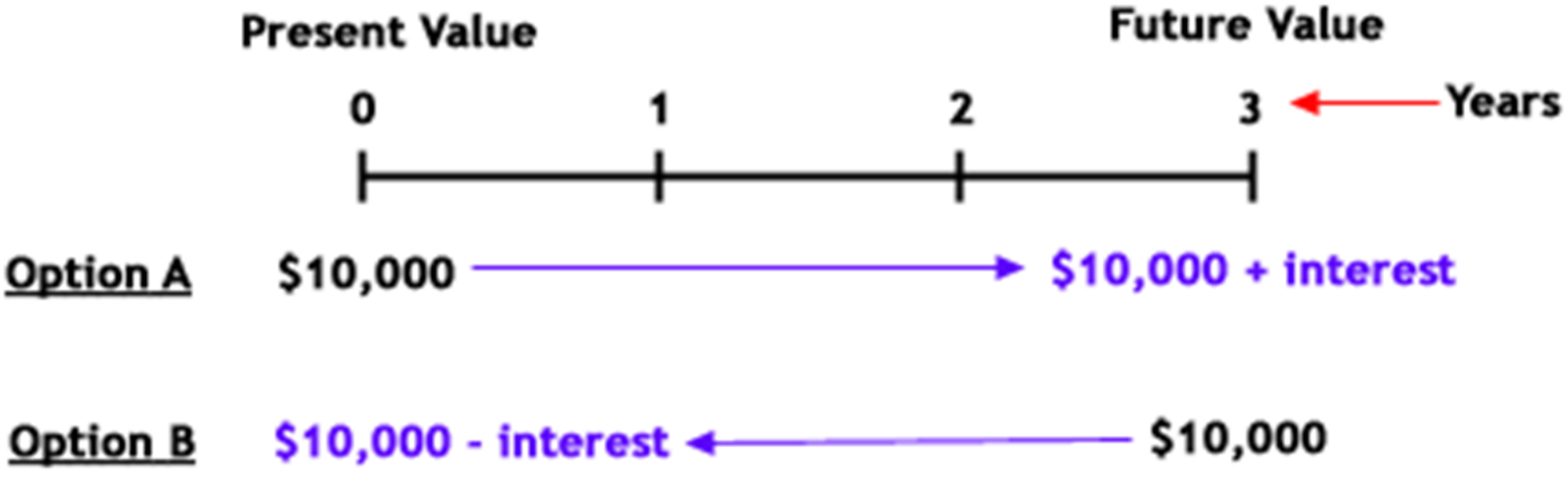
Money in hand now is worth more than the right to receive money in the future because money in hand now can be invested to earn interest.

Time Value of Money

Two important corollaries:

1. Firms or governments offering to capitalize (pay for) long term capital expenditure will factor in the cost of the money they pay up front and government will pay for that.
2. Deferred benefits are costed at current rates – means that you have to restate the value of such benefits into a common unit of measurement. That is Net Present Value

Time Value of Money



As a formula, Present Value looks like this

$$PV = FV \left[1 / (1 + i)^n \right]$$

PV = Present Value
FV = Future Value
i = Interest Rate Per Period
n = Number of Compounding Periods

Time Value of Money: measuring present value

- Common unit of measure is ‘year zero dollars’ = the present value of funds received or spent in the future

Time Value of Money: measuring present value

- Uses a factor, usually a discount rate, to restate the funds to their present value
- Example: if 90.0 cents were invested at 10% interest today (show me where) it would be worth $1.00 a year from now

Time Value of Money: measuring present value

- For decision making purposes, stating a future flow of $1 means committing 90.0 cents today
- TVM is critical for accrual-based organizations that have major capital costs or make multi-year commitments for which a cash flow is needed – less so for cash-based

Time Value of Money: measuring present value

- Major impact on intergenerational equity issues
- Where it really matters for the public sector is in its use in forward costing and cost benefit analysis of projects that derive actual costs and benefits of a project
- Also, how cash will flow becomes crucial in terms of final value

Net Present Value

Net Present Value (NPV) is a means to calculate whether the public sector organization will be better or worse off if it make a capital investment. It does so by adding the present value of outflows and the present value of inflows. It shows the value of a stream of future cash flows discounted back to the present by some percentage that represents the minimum desired rate of return, often called the cost of capital.

NPV = PV Inflows – PV Outflows

General decision rule in applying NPV. . .

If the Net Present Value is . . .	Then the Project is . . .
Positive . . .	Acceptable, since it promises a return greater than the required rate of return.
Zero . . .	Acceptable, since it promises a return equal to the required rate of return.
Negative . . .	Not acceptable, since it promises a return less than the required rate of return.

Queen's Stadium is considering purchasing vending machines with a 5-year life.

Cost and revenue information		
Cost of vending machines		$ 75,000
Revenue		$ 84,375
Cost of goods sold		50,625
Gross profit		$ 33,750
Cash operating costs	$ 3,350	
Depreciation	14,000	17,350
Pretax income		$ 16,400
Income tax		6,400
After-tax income		$ 10,000

($75,000 - $5,000) ÷ 5 years

Queens Stadium Net Present Value Analysis

	Year(s)	Cash Flow	PV factor	PV
Vending mach.	Now	$ (75,000)	1.000	$ (75,000)

Queens uses a 15% discount rate.

Term for the annual growth rate of an investment, used when a future value is assumed and you are trying to find the required present value. Also called the internal rate of return.

Queen's Stadium Net Present Value Analysis

	Year(s)	Cash Flow	PV factor	PV
Vending mach.	Now	$ (75,000)	1.000	$ (75,000)
Annual inflow	1 - 5	24,000	3.352	80,448

Present value of an annuity of $1 factor for 5 years at 15%.

$24,000 × 3.352 = $80,448

Queen's Stadium Net Present Value Analysis

	Year(s)	Cash Flow	PV factor	PV
Vending mach.	Now	$ (75,000)	1.000	$ (75,000)
Annual inflow	1 - 5	24,000	3.352	80,448
Salvage	5	5,000	0.497	2,485

Present value of $1 factor for 5 years at 15%.

Queen's Stadium Net Present Value Analysis

	Year(s)	Cash Flow	PV factor	PV
Vending mach.	Now	$ (75,000)	1.000	$ (75,000)
Annual inflow	1 - 5	24,000	3.352	80,448
Salvage	5	5,000	0.497	2,485
NPV	Now			7,933

Since the NPV is positive, we know the rate of return is greater than the 15 percent discount rate.

Risk Assessment in Capital Spending

- NPV and other tools are a means to try to quantify some risks associated with long term capital investments
- They provide a level analytical playing field
- Risk analysis is much more comprehensive than this

Understanding Appraisal Techniques – Net Present Value (NPV), Internal Rate of Return (IRR) and Payback period

Investment Appraisal

Why do we need investment appraisal tools?

- Capital is scarce in both public and private sectors
- That's never been more true than today
- We need to know if the investment is worth making
- We need to know if the risk is justified by the financial return
- We need to know if the project meets our investment criteria
- How it compares to other projects competing for same funds

Capital Budgeting Techniques

- Project Evaluation and Selection
- Potential Difficulties
- Capital Rationing
- Project Monitoring
- Post-Completion Audit

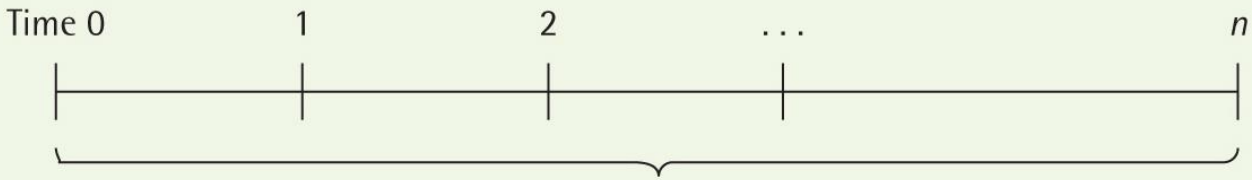
Project Evaluation: Alternative Methods

- Payback Period (PBP)
- Internal Rate of Return (IRR)
- Net Present Value (NPV)
- Profitability Index (PI)

Relevant Cash Flows in Capital Budgeting

- Relevant cash flows occur in the future and are different across the alternatives.
- Examples of relevant cash outflows include:
  - Initial investment outlay
  - Future operating costs
  - Project closing and cleanup costs
- Examples of relevant cash inflows include:
  - Future revenues
  - Decreased operating costs
  - Salvage value of assets at project's end

Relevant Cash Flows in Capital Budgeting



Initial Investment

- Acquire new assets:
  - Property, plant, and equipment
  - Initial contractual payments
  - Increase in working capital
- Costs to make assets ready for use
- Remodel costs
- Costs or proceeds from disposing of old assets

Incremental Operating Cash Flows

- New revenues
- New fixed and variable costs (excluding noncash costs such as depreciation)
- Increase or decrease in existing revenues and costs:
  - Improved product quality
  - Increased capacity
  - Greater efficiency
  - Other

Terminal Cash Flows

- Sale of assets at end of project life (e.g., salvage value)
- Closing and clean-up costs

Relevant Cash Flows in DCF Analysis

One of the biggest challenges in capital budgeting, particularly DCF analysis, is determining which cash flows are relevant in making an investment selection.

- Relevant cash flows are the differences in expected future cash flows as a result of making the investment.
- A capital investment project typically has three categories of cash flows:
  1. Net initial investment.
  2. After-tax cash flow from operations.
  3. After-tax cash flow from terminal disposal of an asset and recovery of working capital.

Relevant after-tax flows

We'll look at each category, but let's be sure we understand the effect that taxes can have on the cash flows.

PANEL A: Two Methods Based on the Income Statement

C	Operating cash inflows from investment in bus	$220,000
D	Additional depreciation deduction	120,000
OI	Increase in operating income	100,000
T	Income taxes (income tax rate $t \times OI$) = 40% × $100,000	40,000
NI	Increase in net income	$ 60,000
	Increase in cash flow from operations, net of income taxes	
	Method 1: $C - T$ = $220,000 − $40,000 = $180,000; or	
	Method 2: $NI + D$ = $60,000 + $120,000 = $180,000	

PANEL B: Item-by-Item Method

	Effect of cash operating flows	
C	Operating cash inflows from investment in bus	$220,000
$t \times C$	Deduct income tax cash outflow at 40%	88,000
$C \times (1 - t)$	After-tax cash flow from operations (excluding the depreciation effect)	$132,000
	Effect of depreciation	
D	Additional depreciation deduction, $120,000	
$t \times D$	Income tax cash savings from additional depreciation deduction at 40% × $120,000	48,000
$C \times (1 - t) + t \times D$	Cash flow from operations, net of income taxes	$180,000

Net Initial Investment

- Three components of net-initial investment cash flows:

1. Initial machine investment.
2. Initial working capital investment.
3. After-tax cash flow from current disposal of old machine.

Cash Flow from Operations

- Two components of cash flow from operations:

1. Annual after-tax cash flow from operations (excluding the depreciation effect).
2. Income tax cash savings from annual depreciation deductions.
   - For economic-policy reasons, tax laws specify which depreciation methods and which depreciable lives are permitted. When there is a legal choice, take the depreciation sooner rather than later because this will increase a project's NPV.

Cash flow from Terminal Disposal of Investment

- Two components of Terminal Disposal of Investment:

1. After-tax cash flow from terminal disposal of asset (investment).
2. After-tax cash flow from recovery of working capital (liquidating receivables and inventory that was needed to support the project).

Discounted Cash Flows

- Discounted cash flow (DCF) methods measure all expected future cash inflows and outflows of a project discounted back to the present point in time.
- The key feature of DCF methods is the time value of money which means that a dollar received today is worth more than a dollar received at any future time.
- The reason is that $1 received today could be invested at, say, 10% per year so that it grows to $1.10 at the end of one year.

Discounted Cash Flows

- The time value of money is the opportunity cost from not having the money today.
- DCF methods use the required rate of return (RRR), which is the minimum acceptable annual rate of return on an investment.
- RRR is internally set, usually by upper management, and typically represents the return that an organization could expect to receive elsewhere for an investment of comparable risk.
- RRR is also called the discount rate, hurdle rate, cost of capital, or opportunity cost of capital.

Payback Method, overview

- The Payback method measures the time it will take to recoup, in the form of expected future cash flows, the net initial investment in a project.
- Like the NPV and IRR methods, the payback method does not distinguish among the sources of cash flows.
- Shorter payback period are preferable.
- Organizations choose an acceptable project payback period. Generally, the greater the risk, the shorter the payback period should be.
- The payback method is easy to understand.
- The two weaknesses of the payback method are:
  - Fails to recognize the time value of money.
  - Doesn't consider the cash flow beyond the payback point.

Payback Method, calculation

- With uniform cash flows:

$$\text{Payback Period} = \frac{\text{Net Initial Investment}}{\text{Uniform Increase in Annual Future Cash Flows}}$$

- With non-uniform cash flows:
  - add cash flows period-by-period until the initial investment is recovered; count the number of periods included for payback period.
- It is relatively simple to adjust the payback method to incorporate the time value of money by discounting the expected future cash flows before performing the calculations.

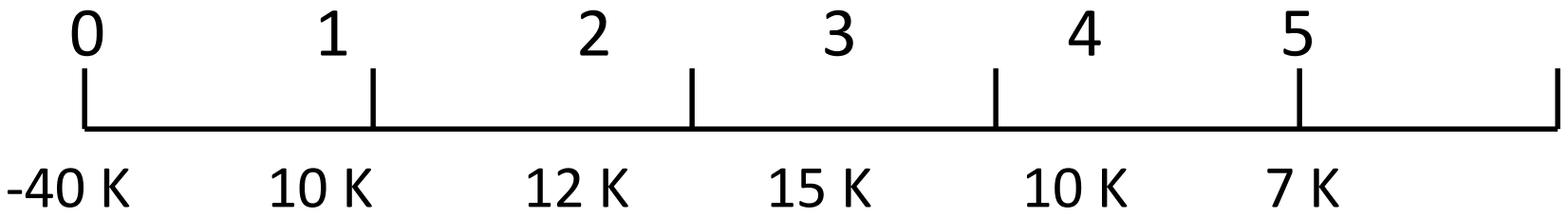
Proposed Project Data

Julie Miller is evaluating a new project for her firm, *Basket Wonders (BW)*. She has determined that the after-tax cash flows for the project will be $10,000; $12,000; $15,000; $10,000; and $7,000, respectively, for each of the Years 1 through 5. The initial cash outlay will be $40,000.

Independent Project

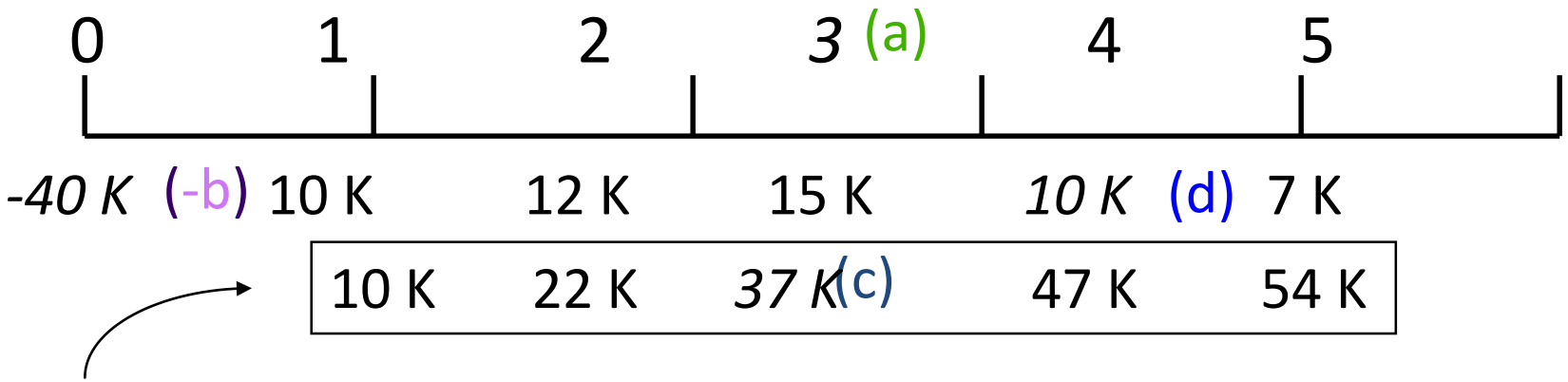
- For this project, assume that it is independent of any other potential projects that *Basket Wonders* may undertake.
- Independent -- A project whose acceptance (or rejection) does not prevent the acceptance of other projects under consideration.

Payback Period (PBP)



PBP is the period of time required for the cumulative expected cash flows from an investment project to equal the initial cash outflow.

Payback Solution (#1)



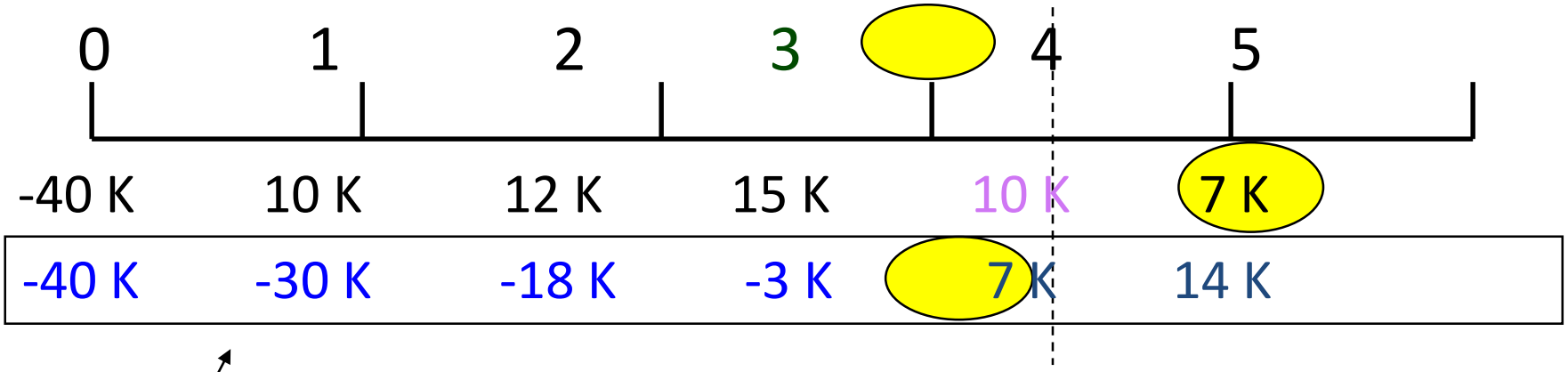
PBP = a + (b - c) / d

= 3 + (40 - 37) / 10

= 3 + (3) / 10

= 3.3 Years

Payback Solution (#2)



Cumulative Cash Flows

PBP = 3 + (3K) / 10K

= 3.3 Years

Note: Take absolute value of last negative cumulative cash flow value.

PBP Acceptance Criterion

The management of *Basket Wonders* has set a maximum PBP of 3.5 years for projects of this type.

Should this project be accepted?

Yes! The firm will receive back the initial cash outlay in less than 3.5 years. [3.3 Years < 3.5 Year Max.]

PBP Strengths and Weaknesses

Strengths:

- Easy to use and understand
- Can be used as a measure of liquidity
- Easier to forecast ST than LT flows

Weaknesses:

- Does not account for TVM
- Does not consider cash flows beyond the PBP
- Cutoff period is subjective

Payback Method Example

Graham Enterprises is considering the purchase of a new machine. The cost is $100,000 and the machine is expected to generate cost savings of $17,700 each year for 10 years. The machine is not expected to have any salvage value at the end of its life. Compute the payback period for the proposed machine.

$$\frac{\$100,000}{\$17,700} = 5.650 \text{ years}$$

Notice that the payback period is the same as the PV factor computed in the IRR example.

Payback Method Example

Cophil, Inc. is considering the purchase of a new machine. There are two alternatives, and the cash flow information is given below. Compute the payback period for each and comment on your findings.

Time period	Cash Flow	
	Machine A	Machine B
0	($100,000)	($100,000)
1	$10,000	$50,000
2	$20,000	$50,000
3	$30,000	
4	$80,000	
5	$80,000	
6	$80,000	

The payback period for Machine B is 2 years. The payback period for Machine A is 3.5 years ($60,000 covered after 3 years, and $40,000 is ½ of year 4's cash inflow).

The payback method shows Machine B to be preferable to Machine A, but ignores the large cash inflows of Machine A that occur after the payback period.

Internal Rate of Return (IRR)

IRR is the discount rate that equates the present value of the future net cash flows from an investment project with the project's initial cash outflow.

$$ICO = \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \ldots + \frac{CF_n}{(1+IRR)^n}$$

Internal Rate of Return (IRR) Method

- The IRR Method calculates the discount rate at which an investment's present value of all expected cash inflows equals the present value of its expected cash outflows.
- We are looking here for the rate of return that makes NPV = 0.
- A project is accepted only if the IRR equals or exceeds the RRR.

IRR Method, cont'd

- Managers or analysts solving capital budgeting problems typically use a calculator or computer program to provide the internal rate of return, but a more manual trial and error approach can also provide the answer.
- Trial and error approach:
  - Use a discount rate and calculate the project's NPV. Goal: find the discount rate for which NPV = 0
    1. If the calculated NPV is greater than zero, use a higher discount rate.
    2. If the calculated NPV is less than zero, use a lower discount rate.
    3. Continue until NPV = 0.

IRR Solution

$$\$40{,}000 = \frac{\$10{,}000}{(1+IRR)^1} + \frac{\$12{,}000}{(1+IRR)^2} + \frac{\$15{,}000}{(1+IRR)^3} + \frac{\$10{,}000}{(1+IRR)^4} + \frac{\$7{,}000}{(1+IRR)^5}$$

Find the interest rate (*IRR*) that causes the discounted cash flows to equal $40,000.

IRR Solution (Try 10%)

$40,000 = $10,000($PVIF_{10\%,1}$) + $12,000($PVIF_{10\%,2}$) + $15,000($PVIF_{10\%,3}$) + $10,000($PVIF_{10\%,4}$) + $ 7,000($PVIF_{10\%,5}$)

$40,000 = $10,000(.909) + $12,000(.826) + $15,000(.751) + $10,000(.683) + $ 7,000(.621)

$40,000 = $9,090 + $9,912 + $11,265 + $6,830 + $4,347

= $41,444 [*Rate is too low!!*]

IRR Solution (Try 15%)

$40,000 = $10,000($PVIF_{15\%,1}$) + $12,000($PVIF_{15\%,2}$) + $15,000($PVIF_{15\%,3}$) + $10,000($PVIF_{15\%,4}$) + $ 7,000($PVIF_{15\%,5}$)

$40,000 = $10,000(.870) + $12,000(.756) + $15,000(.658) + $10,000(.572) + $ 7,000(.497)

$40,000 = $8,700 + $9,072 + $9,870 + $5,720 + $3,479

= $36,841 [*Rate is too high!!*]

IRR Solution (Interpolate)

$$.05\left[\left[X\left[\begin{array}{ll}.10 & \$41,444\\ IRR & \$40,000\\ .15 & \$36,841\end{array}\right]\$1,444\right]\$4,603\right]$$

$$\frac{X}{.05} = \frac{\$1,444}{\$4,603}$$

IRR Solution (Interpolate)

$$.05 \left[X \left[\begin{array}{ll} .10 & \$41,444 \\ IRR & \$40,000 \\ .15 & \$36,841 \end{array} \right] \$1,444 \right] \$4,603$$

$$\frac{X}{.05} = \frac{\$1,444}{\$4,603}$$

IRR Solution (Interpolate)

$$.05\left[\left[X\left[\begin{array}{ll}.10 & \$41,444\\ IRR & \$40,000\\ .15 & \$36,841\end{array}\right]\$1,444\right]\$4,603\right]$$

$$X = \frac{(\$1,444)(0.05)}{\$4,603} \qquad X = .0157$$

IRR = .10 + .0157 = .1157 or 11.57%

IRR Acceptance Criterion

The management of *Basket Wonders* has determined that the hurdle rate is 13% for projects of this type.

Should this project be accepted?

No! The firm will receive 11.57% for each dollar invested in this project at a cost of 13%. [IRR < Hurdle Rate]

IRR Strengths and Weaknesses

Strengths:

- Accounts for TVM(time value of money)
- Considers all cash flows
- Less subjectivity

Weaknesses:

- Assumes all cash flows reinvested at the IRR
- Difficulties with project rankings and Multiple IRRs

Net Present Value (NPV) Method

- The NPV method calculates the expected monetary gain or loss from a project by discounting all expected future cash inflows and outflows back to the present point in time, using the RRR.
- Based on financial factors alone, only projects with a zero or positive NPV are acceptable.
- We'll use three steps for the NPV method.

Three-Step NPV Method

1. Draw a sketch of the relevant cash inflows and outflows. (see right side of next slide)
2. Discount the Cash Flows using the Correct Compound Interest Table from Appendix A and Sum Them.
3. Make the Project Decision on the Basis of the Calculated NPV (zero or positive should be accepted because the expected rate of return equals (zero) or exceeds the required rate of return.)

Net Present Value (NPV) Analysis

- The NPV of a project is the sum of the project's discounted cash flows:

$$NPV = \sum_{t=0}^{n} \frac{\text{Expected cash flow}_t}{(1+r)^t}$$, where

- t = year of the project's life in which cash flow occurs
- n = life of the project
- r = discount, or hurdle rate
- If a project's NPV > 0, it is acceptable

Net Present Value (NPV)

NPV is the present value of an investment project's net cash flows minus the project's initial cash outflow.

$$NPV = \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} - ICO$$

NPV Solution

Basket Wonders has determined that the appropriate discount rate (k) for this project is 13%.

$$NPV = \frac{\$10,000}{(1.13)^1} + \frac{\$12,000}{(1.13)^2} + \frac{\$15,000}{(1.13)^3} + \frac{\$10,000}{(1.13)^4} + \frac{\$7,000}{(1.13)^5} - \$40,000$$

NPV Solution

NPV = $10,000($PVIF_{13\%,1}$) + $12,000($PVIF_{13\%,2}$) + $15,000($PVIF_{13\%,3}$) + $10,000($PVIF_{13\%,4}$) + $7,000($PVIF_{13\%,5}$) - $40,000

NPV = $10,000(.885) + $12,000(.783) + $15,000(.693) + $10,000(.613) + $7,000(.543) - $40,000

NPV = $8,850 + $9,396 + $10,395 + $6,130 + $3,801 - $40,000

= - $1,428

NPV Acceptance Criterion

The management of *Basket Wonders* has determined that the required rate is 13% for projects of this type.

Should this project be accepted?

No! The NPV is negative. This means that the project is reducing shareholder wealth. [*Reject as NPV < 0*]

NPV Strengths and Weaknesses

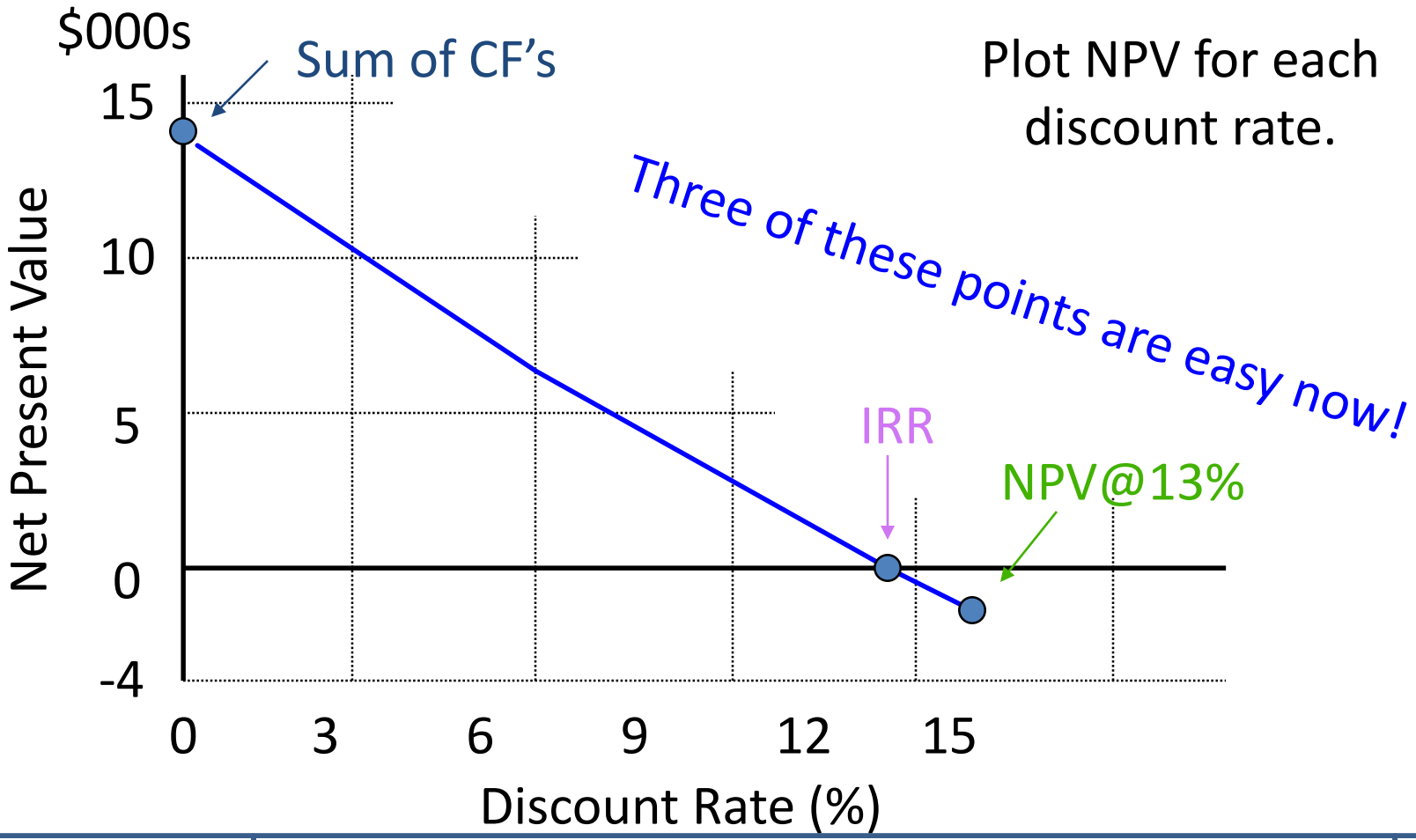
Strengths:

- Cash flows assumed to be reinvested at the hurdle rate.
- Accounts for TVM.
- Considers all cash flows.

Weaknesses:

- May not include managerial options embedded in the project.

Net Present Value Profile



NPV Analysis and Project Ranking

- NPV analysis is often used to screen projects as to whether they are acceptable.
- After screening, acceptable projects may be ranked according to their profitability index.

$$\text{Profitability index} = \frac{\text{Present value of benefits}}{\text{Present value of costs}}$$

- The profitability index allows for rankings of projects of various sizes.

Profitability Index (PI)

PI is the ratio of the present value of a project's future net cash flows to the project's initial cash outflow.

Method #1:

$$PI = \left[\frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \ldots + \frac{CF_n}{(1+k)^n} \right] \div ICO$$

<< OR >>

Method #2:

$$PI = 1 + [\ NPV / ICO\ ]$$

PI Acceptance Criterion

PI = $38,572 / $40,000

= .9643 *(Method #1, 13-34)*

Should this project be accepted?

No! The PI is less than 1.00. This means that the project is not profitable. [*Reject* as *PI* < *1.00*]

PI Strengths and Weaknesses

Strengths:

- Same as NPV
- Allows comparison of different scale projects

Weaknesses:

- Same as NPV
- Provides only relative profitability
- Potential Ranking Problems

Evaluation Summary

Basket Wonders Independent Project

Method	Project	Comparison	Decision
PBP	3.3	3.5	**Accept**
IRR	11.47%	13%	**Reject**
NPV	-$1,424	$0	**Reject**
PI	.96	1.00	**Reject**

NPV Example

Joseph Leasing is considering an investment in a new apartment building. The Lindie Lane building will cost $450,000 and the net annual cash inflows are expected to be $45,000 for 7 years. At the end of the 7th year, Joseph expects to be able to sell Lindie Lane building for $400,000. Joseph demands a minimum required rate of return of 8% on all invest-ments. Assume all cash inflows occur at the end of each year. Compute the NPV of the Lindie Lane building. Is it an acceptable investment?

PV of cash inflows:	
Annuity of cash inflows:	
$45,000 x PV annuity factor of 5.206	$234,270
Sale of building:	
$400,000 x PV of $1 factor of 0.583	233,200
	467,470
PV of cash outflows:	
Initial investment	450,000
NPV	$17,470

Yes,
the NPV > 0, so the investment is acceptable

NPV Example

Joseph Leasing is also looking at the purchase of a lot with a double-wide trailer on it. The cost is $65,000 and the expected net cash inflows are $6,800 per year for 10 years. At the end of the 10th year, Joseph expects to be able to sell the lot and trailer for $45,000. Compute the NPV of the trailer investment. Is it an acceptable investment?

PV of cash inflows:	
Annuity of cash inflows:	
$6,800 x PV annuity factor of 6.710	$45,628
Sale of lot and trailer:	
$45,000 x PV of $1 factor of 0.463	20,835
	66,463
PV of cash outflows:	
Initial investment	65,000
NPV	$1,463

Yes, the NPV > 0, so the invest-ment is acceptable

NPV Example

Compare the two investments for Joseph using the profitability index, and describe to him what the index means. Which investment (or both) should he make?

			Profitability index
Lindie Lane building:			
PV of cash inflows	467,470	=	1.0388
PV of cash outflows	450,000		
Trailer:			
PV of cash inflows	66,463	=	1.0225
PV of cash outflows	65,000		

The Lindie Lane yields a slightly greater PV for each invested dollar than does the trailer.

If Joseph has sufficient capital, he should invest in both unless he has alternatives that have even greater profitability indices.

Other Project Relationships

- *Dependent* -- A project whose acceptance depends on the acceptance of one or more other projects.
- *Mutually Exclusive* -- A project whose acceptance precludes the acceptance of one or more alternative projects.

Potential Problems Under Mutual Exclusivity

Ranking of project proposals *may* create contradictory results.

A. Scale of Investment
B. Cash-flow Pattern
C. Project Life

A. Scale Differences

Compare a small (S) and a large (L) project.

	NET CASH FLOWS	
END OF YEAR	Project S	Project L
0	-$100	-$100,000
1	0	0
2	$400	$156,250

Scale Differences

Calculate the PBP, IRR, NPV@10%, and PI@10%.

Which project is preferred? Why?

Project	IRR	NPV	PI
S	100%	$ 231	3.31
L	25%	$29,132	1.29

B. Cash Flow Pattern

Let us compare a *decreasing* cash-flow (D) project and an *increasing* cash-flow (I) project.

END OF YEAR	NET CASH FLOWS	
	Project D	Project I
0	-$1,200	-$1,200
1	1,000	100
2	500	600
3	100	1,080

Cash Flow Pattern

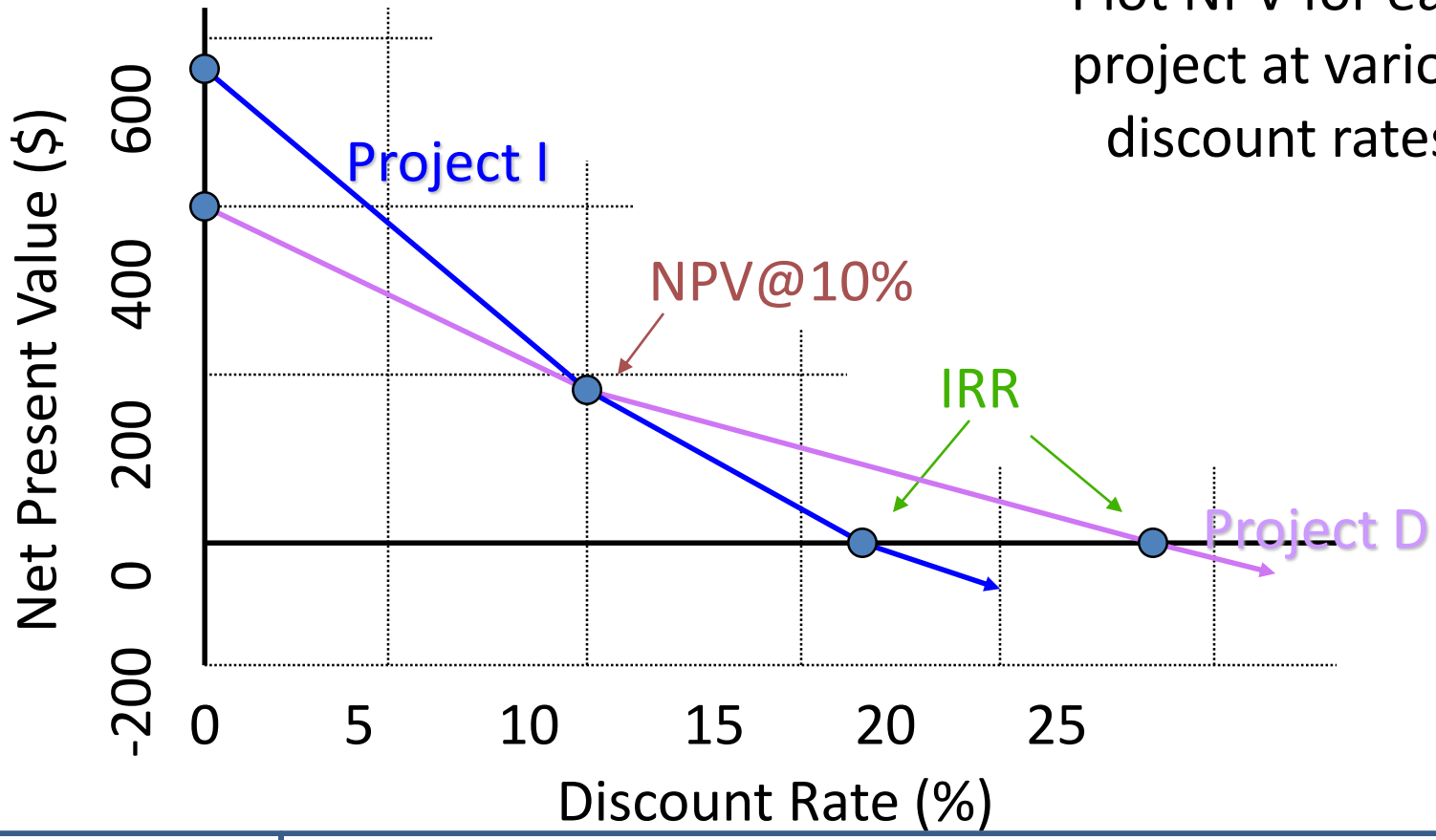
Calculate the IRR, NPV@10%, and PI@10%.

Which project is preferred?

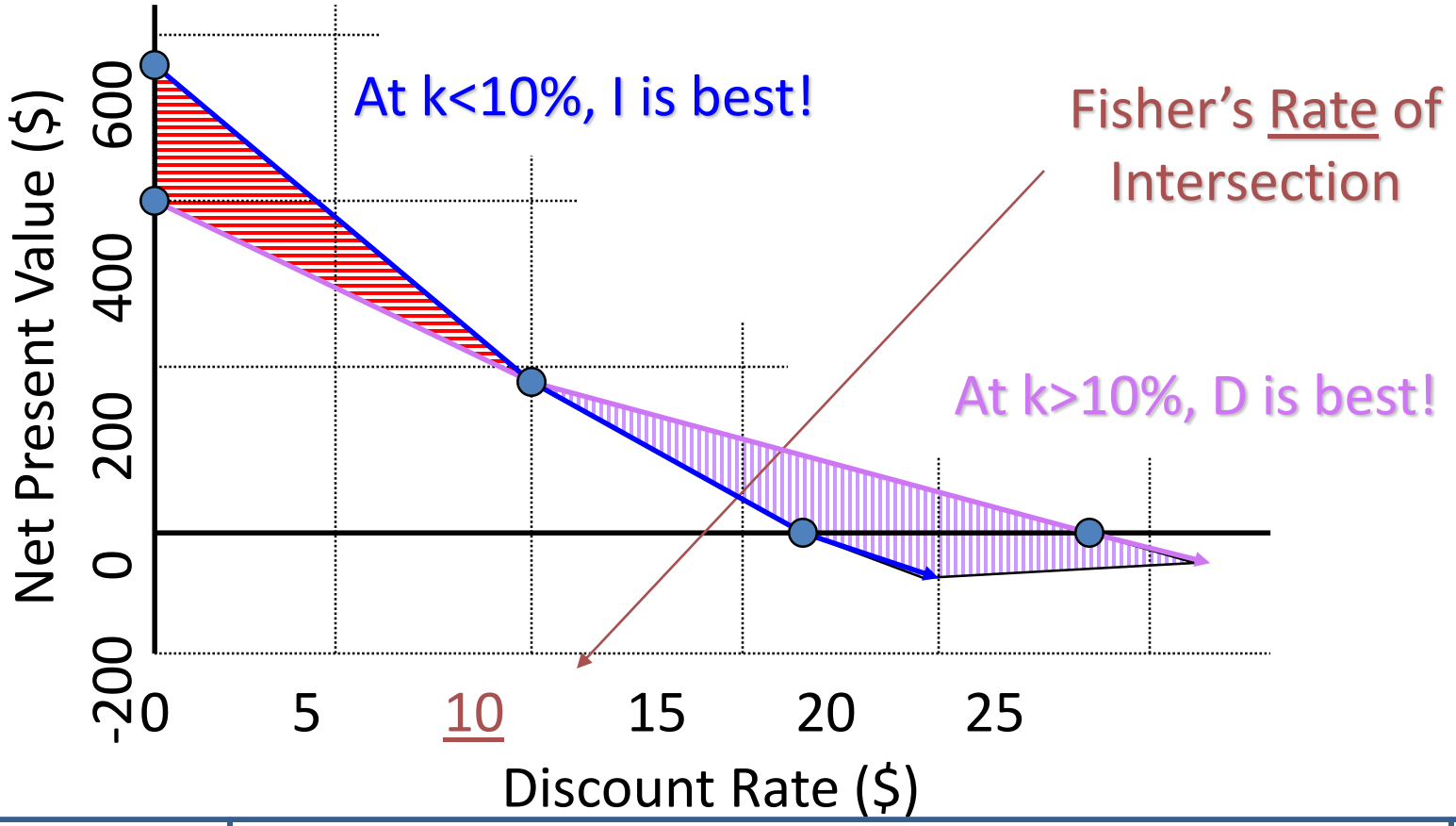
Project	IRR	NPV	PI
D	23%	$198	1.17
I	17%	$198	1.17

Examine NPV Profiles

Plot NPV for each project at various discount rates.



Fisher's Rate of Intersection



C. Project Life Differences

Let us compare a *long* life (X) project and a *short* life (Y) project.

END OF YEAR	NET CASH FLOWS	
	Project X	Project Y
0	-$1,000	-$1,000
1	0	2,000
2	0	0
3	3,375	0

Project Life Differences

Calculate the PBP, IRR, NPV@10%, and PI@10%.

Which project is preferred? Why?

Project	IRR	NPV	PI
X	50%	$1,536	2.54
Y	100%	$ 818	1.82



Another Way to Look at Things

1. Adjust cash flows to a common terminal year if project "Y" will ***NOT*** be replaced.

   Compound Project Y, Year 1 @10% for 2 years.

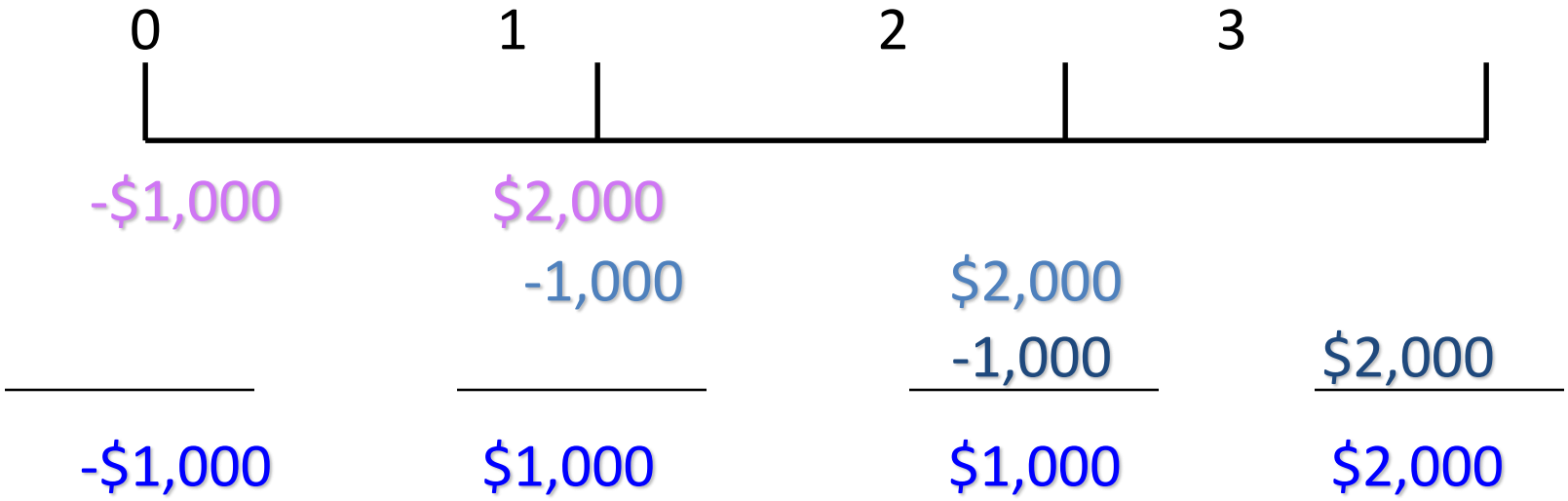
Year	0	1	2	3
CF	-$1,000	$0	$0	$2,420

Results: IRR* = 34.26% NPV = $818

**Lower IRR* from adjusted cash-flow stream. X is still Best.

Replacing Projects with Identical Projects

2. Use *Replacement Chain Approach* when project "Y" will be replaced.



Results: IRR = 100% NPV* = $2,238.17

**Higher NPV, but the same IRR.* Y is Best.

Capital Rationing

Capital Rationing occurs when a constraint (or budget ceiling) is placed on the total size of capital expenditures during a particular period.

Example: Julie Miller must determine what investment opportunities to undertake for *Basket Wonders (BW)*. She is limited to a maximum expenditure of $32,500 *only* for this capital budgeting period.

Available Projects for BW

Project	ICO	IRR	NPV	PI
A	$ 500	18%	$50	1.10
B	5,000	25	6,500	2.30
C	5,000	37	5,500	2.10
D	7,500	20	5,000	1.67
E	12,500	26	500	1.04
F	15,000	28	21,000	2.40
G	17,500	19	7,500	1.43
H	25,000	15	6,000	1.24

Choosing by IRRs for BW

Project	ICO	IRR	NPV	PI
C	$ 5,000	37%	$ 5,500	2.10
F	15,000	28	21,000	2.40
E	12,500	26	500	1.04
B	5,000	25	6,500	2.30

Projects C, F, and E have the three *largest IRRs*.

The resulting *increase* in shareholder wealth is $27,000 with a $32,500 outlay.

Choosing by NPVs for BW

Project	ICO	IRR	NPV	PI
F	$15,000	28%	$21,000	2.40
G	17,500	19	7,500	1.43
B	5,000	25	6,500	2.30

Projects F and G have the two *largest NPVs*.

The resulting *increase* in shareholder wealth is $28,500 with a $32,500 outlay.

Choosing by PIs for BW

Project	ICO	IRR	NPV	PI
F	$15,000	28%	$21,000	2.40
B	5,000	25	6,500	2.30
C	5,000	37	5,500	2.10
D	7,500	20	5,000	1.67
G	17,500	19	7,500	1.43

Projects F, B, C, and D have the four *largest PIs*.

The resulting *increase* in shareholder wealth is $38,000 with a $32,500 outlay.

Summary of Comparison

Method	Projects Accepted	Value Added
PI	F, B, C, and D	$38,000
NPV	F and G	$28,500
IRR	C, F, and E	$27,000

PI generates the *greatest increase* in *shareholder wealth* when a limited capital budget exists for a *single period*.

Single-Point Estimate and Sensitivity Analysis

Sensitivity Analysis: A type of "what-if" uncertainty analysis in which variables or assumptions are changed from a base case in order to determine their impact on a project's measured results (such as NPV or IRR).

- Allows us to change from "*single-point*" (i.e., revenue, installation cost, salvage, etc.) estimates to a "*what if*" analysis
- Utilize a "base-case" to compare the impact of individual variable changes
  - E.g., Change forecasted sales units to see impact on the project's NPV

Post-Completion Audit

Post-completion Audit

A formal comparison of the actual costs and benefits of a project with original estimates.

- Identify any project weaknesses
- Develop a possible set of corrective actions
- Provide appropriate feedback

Result: Making better future decisions!

Multiple IRR Problem*

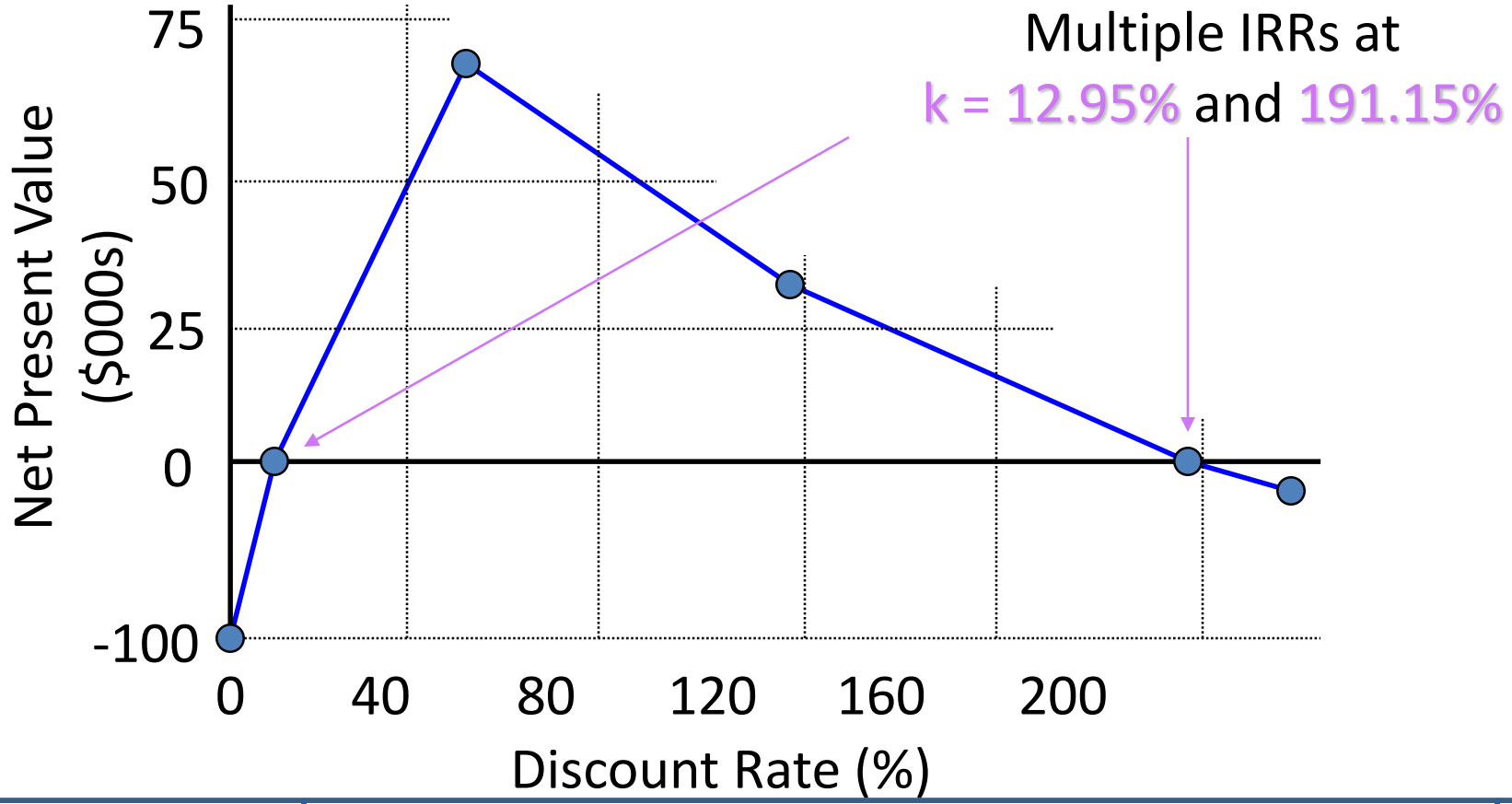
Let us assume the following cash flow pattern for a project for Years 0 to 4:

-$100 +$100 +$900 -$1,000

How many *potential* IRRs could this project have?

Two!! There are as many potential IRRs as there are sign changes.

NPV Profile -- Multiple IRRs



Comparing the NPV and IRR Methods

- NPV is generally preferred because its use leads to shareholder value maximization.
- NPV is expressed in dollars, not in percentages; IRR projects cannot be added or averaged to represent the IRR of a combination of projects.
- The NPV value can always be computed for a project.
- NPV method can be used when the RRR varies over the life of the project.

Comparing the NPV and IRR Methods, concluded

- IRR is more prone (than NPV) to indicate erroneous decisions.
  - IRR implicitly assumes that project cash flows can be reinvested at the project's rate of return.
  - NPV accurately assumes that project cash flows can only be reinvested at the company's required rate of return.

  Still, the IRR method is widely used.

Accrual Accounting Rate of Return Method (AARR)

- The AARR method divides the average annual [accrual accounting] income of a project by a measure of the investment in it.
- That “measure of the investment” in the project can vary company by company.
- Also called the accounting rate of return.
- The AARR method is similar to the IRR method in that both calculate a rate-of-return percentage; however, the IRR method is generally regarded as better than the AARR.

AARR Method Formula

$$\text{Accrual Accounting Rate of Return} = \frac{\text{Increase in Expected Average Annual After-Tax Operating Income}}{\text{Net Initial Investment}}$$

Remember that the value used for the denominator can vary so be sure you understand how the AARR is defined in each individual situation.

AARR Method, advantages and disadvantages

- Firms vary in how they calculate AARR.
- Easy to understand, and uses numbers reported in financial statements.
- Does not track cash flows.
- Ignores time value of money.
- When different methods lead to different rankings of projects, more weight should be given to the NPV method because the assumptions made by the NPV method are most consistent with making decisions that maximize a company's value.

Probability Models (Monte Carlo), Stress Tests and Value at Risk (VaR)

When should a company use scenario planning?

1. When uncertainty is high
2. Too many costly surprises have occurred in the past
3. Insufficient new opportunities are perceived or generated
4. The industry has experienced significant change, or is about to
5. Strong differences of opinion exist, each of which has its merits

Typical outcomes of scenario planning

- ‘This is what we have to do’
  (developing new business opportunities)
- ‘We better think again’
  (understanding outcomes of plans better)
- ‘We better watch those dots on the horizon’
  (perceiving weak signals of new developments)
- ‘We are in the right track’
  (moving forward with more confidence)

The use of Sensitivity analysis in evaluating projects

Uncertainty and the Budgeting Process

- What-If Analysis
- Sensitivity Analysis
- Scenario analysis:
  - Best-case scenario
  - Worst-case scenario
  - Most-likely scenario

Single-Point Estimate and Sensitivity Analysis

Sensitivity Analysis: A type of "what-if" uncertainty analysis in which variables or assumptions are changed from a base case in order to determine their impact on a project's measured results (such as NPV or IRR).

- Allows us to change from "*single-point*" (i.e., revenue, installation cost, salvage, etc.) estimates to a "*what if*" analysis
- Utilize a "base-case" to compare the impact of individual variable changes
  - E.g., Change forecasted sales units to see impact on the project's NPV

Dealing with Risk and Uncertainty

Sensitivity analysis is the name for a variety of methods that examine how an amount (e.g., B/E point) changes if factors involved in predicting that amount change (e.g., sales volume or unit variable cost). For CVP, three methods of *sensitivity analysis* are commonly employed:

(1) ***What-if analysis*** *(using the contribution margin and contribution margin ratio)*

(2) Construction of ***decision tables/decision trees***, and

(3) ***Monte Carlo Simulation*** (MCS)

Other Approaches to handling risk/uncertainty:

(1) Margin of safety and Margin of safety Ratio

(2) Degree of operating leverage (DOL)

Handling Risk and Uncertainty: What-if analysis

What-if analysis is the calculation of an amount given different levels of a factor that influences that amount

- Example: if contribution margin (cm) is $40 per unit and the cm ratio is 0.53333, each unit change in sales volume affects profit by $40 and each dollar change in sales affects profits by $0.53333

Sensitivity Analysis

- CVP provides structure to answer a variety of "what-if" scenarios.
- "What" happens to profit "if":
  - Selling price changes.
  - Volume changes.
  - Cost structure changes.
    - Variable cost per unit changes.
    - Fixed costs change.

As an example, if a company determines that an ad campaign costing $15,000 is expected to increase sales 25%, should they proceed? That question cannot be properly answered without doing this type of analysis.

Financial-planning models & sensitivity analysis:

- Financial planning models may be employed to conduct sensitivity (“what-if”) analysis to assist in the budgetary process.
- A “what-if” analysis or sensitivity analysis is a technique that examines how a result will change if the original predicted data or underlying assumption change.

Sensitivity Analysis

- Sensitivity analysis is used to assist managers in planning and budgeting.
- Sensitivity analysis is a "what if" technique that illustrates the impact of changes from the predicted data.
- Two scenarios are being considered for Stylistic Furniture's budget.

File Edit View Insert Format Tools Data Window Help

	A	B	C	D	E	F	G	H	I
1	Key Assumptions								
2		Units Sold		Selling Price		Direct Material Cost		Budgeted Operating Income	
3	What-If Scenario	Casual	Deluxe	Casual	Deluxe	Red Oak	Granite	Dollars	Change from Master Budget
4	Master budget	50,000	10,000	$600	$800	$7.00	$10.00	$4,860,000	
5	Scenario 1	50,000	10,000	582	776	$7.00	$10.00	3,794,100	22% decrease
6	Scenario 2	50,000	10,000	600	800	$7.35	$10.50	4,483,800	8% decrease

Sensitivity analysis

It is important to know how sensitive your forecast is to changes. Sensitivity analysis looks at ‘what if?’ scenarios. What happens to your cash position, for example, if sales fall by 10%?

What happens if your main supplier increases raw material prices by 12%? Sensitivity analysis is particularly used by financial institutions when considering propositions for a loan.

Sensitivity analysis

If your business is particularly susceptible to small changes, then you probably do not have a sufficiently large profit margin. You will thus be less likely to receive the loan required. You may find it difficult to cut costs.

You may not be able simply to increase prices to improve your margins - that might deter customers.

Sensitivity analysis

Are there other ways in which you can push up the margins, e.g. by increasing output?

Having undertaken your sensitivity analysis, you may need to review elements of your forecast. Sensitivity analysis can help in making decisions.

Financial Modeling

- Any model we use has the potential to have error
- How do we account for the uncertainty associated with our inputs into the model?

Three Types of Risk

- Stand Alone Risk

  Views project in isolation
- With-in firm (Corporate Risk)

  Looks at the firms portfolio of projects and how they interact
- Market Risk

  Risk from the view of a well diversified investor.

Definitions

- Risk
  - Exposure to a chance of injury or loss
- Probability
  - The likelihood an event occurs
- Risk vs. Uncertainty
  - Risk – the probability of the outcome is known
  - Uncertainty – includes judgment concerning the probability

Definitions and Terms Continued

- Objective Prob –can measure prob. precisely
- Subjective Prob. – Includes judgment or opinion
- Variation Risk – We want to look at a range of possible outcomes

Issues in Risk Measurement

1. Stand Alone Risk is the easiest to measure
2. Market Risk is the most important to the shareholder
3. To evaluate risk you need three things
   i. Standard deviation of the projects forecasted returns
   ii. Correlation of the projects forecasted returns with the firms other assets
   iii. Correlation of the projects forecasted returns with the market

Issues in Risk Management

4. Using the numbers in 3) you can find the corporate beta and market beta coefficient (equal to $((\sigma/\sigma)\rho)$
5. Most projects have a + correlation with other projects and a coefficient < 1
6. Most projects are positively correlated with the market with coefficient < 1
7. Corporate risk should also be examined
    1. More important to small business
    2. Investors may look at things other than market risk
    3. Firm Stability is important to creditors, suppliers etc

Stand Alone Risk (Review)

- The easiest approach to measuring stand alone risk is to use the standard deviation of the projects returns.
- Just like security analysis you need to be careful looking at only standard deviation – don't forget coefficient of variation

Measuring Stand Alone Risk

- Sensitivity Analysis
- Scenario Analysis
- Monte Carlo Simulation

Sensitivity Analysis

- Looks at the change in your decision variable when one input changes.
- Examples:
  - what happens to the value of a project if sales are 10% higher than expected.
  - What happens to the cost of capital if the risk free rate increases.

Example 1

- Basic time value of money problem.
- Assume you believe you need 2,000,000 when you retire and you are now 25 years old.
- How much will you need to deposit each year at the end of the year if your account earns 8% each year?

$27,357.56

Example 1 Change ONLY
Expected return

What if your estimated rate of return is of by 10% of the base (What if your account earns 8.8% each year? Or 7.2% each year)?

Rate	Payment
7.2%	$24,322.44
8%	$27,357.56
8.8%	$30,724.44

Example 2: change ONLY
Amount Needed for Retirement

Now assume that the amount you need for retiremetn may be off either way by 10%

Savings Needed	Payment
1,800,000	$24,621.80
2,000,000	$27,357.56
2,200,000	$30,093.31

Sensitivity Analysis

- Usually the results are represented in a table where the response of the decision variable to changes in more than one individual variable are reported.
- Then you can compare across variables to see which one has the largest impact on your decision

Example Results

Change in Payment needed for Retirement		
	Savings Needed	Expected Return
+10%	$24,621.80	$24322.44
Base	$27,357.56	$27,357.56
-10%	$30,093.31	$30,724.49

Sensitivity Analysis

- Benefits
  a. Easy to Calculate and Understand
  b. Measures risk associated with individual inputs
- Weaknesses
  a. Ignores probability of event
  b. Ignores interaction among the variables
  c. Ignores gains from diversification

Scenario Analysis

- Differences from Sensitivity Analysis
  - Allows you to change more than one variable at a time
  - Look at a group of scenarios (best case, base case, and worst case) for example worst case – what if all variables change against us by 20%….
  - Includes probability estimates of each scenario

Scenario Analysis

- Now let <u>both</u> the future cash flows and the cost of capital change.

Worst Case Scenario (Savings↑ Return↓)	Best Case Scenario (Savings↓ Return↑)
Need $2,200,000	Need $1,800,000
Return = 7.2%	Return = 8.8%
PMT = 33,796.89	PMT = $21,890.20

Scenario Analysis

- Given the NPV and Probability you can find the expected NPV and standard deviation

Scenario	NPV	Prob.	NPV(Prob)
Worst	$33,796.89	.33	$11,265.63
Base	$27357.56	.33	$ 9,119.17
Best	$21,890.20	.33	$ 7,296.73
	Expected NPV		$27,681.55
	Standard Deviation		$ 5,959.95

Interpreting the Results

- The project has an expected return on 4204.94 with standard deviation of 741.38
- This implies a 68 % confidence interval of (3463.56 to 4946.32) a large range of possible outcomes
- The coefficient of variation would be .1763 (you are accepting .1763 units of risk for each unit of return)

Scenario Analysis

- Benefits
  1. More than one variable changes at a time
  2. Accounts for probability
  3. Easy to perform
- Weaknesses
  1. Small number of scenarios is unrealistic
  2. Probability distributions difficult to estimate

Sensitivity analysis

You may want to consider, for example, the effect of increased raw material, labour or overhead costs; of reducing prices, with constant volumes, to counteract competitors; or reducing volumes, with constant prices, due to over optimistic forecasts.

Furthermore, if you are about to spend a large sum of money on equipment, you may want to look ahead several years, if at all possible.

Including a sensitivity analysis in your business plan will demonstrate that you have thought about some of the potential risks - and that is half way to avoiding them.

Monté Carlo Simulation

Monte Carlo Simulation

- A more advanced form of scenario analysis
- Utilizes the computer to make random choices for each variable input then calculate the expected return and standard deviation

Mont Carlo Simulation

1. Construct a model of the firms cash flows and NPV's
2. Specify a probability distribution for each uncertain variable (characterized by mean and standard dev) and correlation among variables.
3. Allow computer to select a random draw form the distribution for each variable
4. Calculate NPV (this is one scenario).
5. Repeat 3) an 4) (10,000 or 100,000 times) equal chance of each scenario –Calculate expected NPV and standard deviation.

Monte Carlo Simulation

- Benefits
  1. More realistic selection of variables
  2. Easy to understand results
- Weaknesses
  1. Only as good as probability estimate and correlation of variables

Simulation *Defined*

A computer-based model used to run experiments on a real system.

- Typically done on a computer.
- Determines reactions to different operating rules or change in structure.
- Can be used in conjunction with traditional statistical and management science techniques (such as waiting line problems, when the basic assumptions do not hold, or where problems involve multiple phases).

Differences Between Optimization and Simulation

Optimization models

- Yield decision variables as *outputs*
- Promise the best (optimal) solution to the model

Simulation models

- Require the decision variables as *inputs*
- Give only a satisfactory answer

Types of Simulation Models

- Continuous
  - Based on mathematical equations.
  - Used for simulating continuous values for all points in time.
  - Example: The amount of time a person spends in a queue.

- Discrete
  - Used for simulating specific values or specific points.
  - Example: Number of people in a waiting line (queue).

Simulation Methodology:

- Estimate probabilities of future events
- Assign random number ranges to percentages (probabilities)
- Obtain random numbers
- Use random numbers to “simulate” events.

Data Collection and Random Number Interval Example

Suppose you timed 20 athletes running the 100-yard dash and tallied the information into the four time intervals below.

You then count the tallies and make a frequency distribution.

Then convert the frequencies into percentages.

Finally, use the percentages to develop the random number intervals.

Seconds	Tallies	Frequency	%	RN Intervals
0-5.99	𝍸	4	20	01-20
6-6.99	𝍸 𝍸	10	50	21-70
7-7.99	𝍸	4	20	71-90
8 or more	||	2	10	91-100

Sources of Event Probabilities and Random Numbers

Event Probabilities

- From historical data (assuming the future will be like the past)
- From expert opinion (if the future will be unlike the past, or no data is available)

Random Numbers

- From probability distributions that ‘fit’ the historical data or can be assumed (use Excel functions)
- From manual random number tables
- From your instructor (for homework and tests, so we all get the same answer!)

Probability Distributions

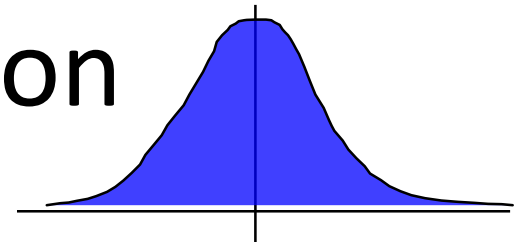
A probability distribution defines the behavior of a variable by defining its limits, central tendency and nature

- Mean
- Standard Deviation
- Upper and Lower Limits
- Continuous or Discrete

Examples are:

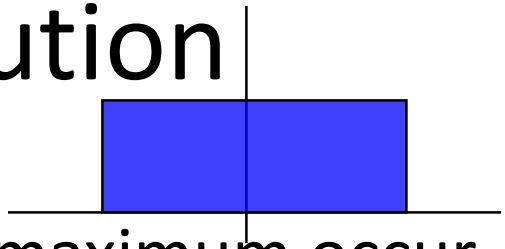
- Normal Distribution (continuous)
- Binomial (discrete)
- Poisson (discrete)
- Uniform (continuous or discrete)
- Custom (create your own!)

Normal Distribution



- Conditions:
  - Uncertain variable is symmetric about the mean
  - Uncertain variable is more likely to be in vicinity of the mean than far away
- Use when:
  - Distribution of x is normal (for any sample size)
  - Distribution of x is not normal, but the distribution of sample means (x-bar) will be normally distributed with samples of size 30 or more (Central Limit Theorem)
- Excel function: NORMSDIST() – returns a random number from the cumulative standard normal distribution with a mean of zero and a standard deviation of one [e.g., NORMSDIST(1) = .84]

Uniform Distribution



- All values between minimum and maximum occur with equal likelihood
- Conditions
  - Minimum Value is Fixed
  - Maximum Value is Fixed
  - All values occur with equal likelihood
- Excel function: RAND() – returns a uniformly distributed random number in the range (0,1)

Note on Random Numbers in Excel Spreadsheets

- Once entered in a spreadsheet, a random number function remains “live.” A new random number is created whenever the spreadsheet is re-calculated. To re-calculate the spreadsheet, use the F9 key. Note, almost any change in the spreadsheet causes the spreadsheet to be recalculated!
- If you do not want the random number to change, you can freeze it by selecting: tools, options, calculations, and checking “manual.”

Evaluating Results

- Conclusions depend on the degree to which the model reflects the real system
- The only true test of a simulation is how well the real system performs after the results of the study have been implemented.

Simulation Applications

- Machine Breakdown problems
- Queuing problems
- Inventory problems
- Many other applications

Many Computer Games Are Simulations!

SimCity, SimFarm, SimIsle, SimCoaster, and others in this family of games have elaborate Monte Carlo models underlying the game exterior. Microsoft has recently released Train Simulator, for which there are numerous additional scenarios available on the Internet. Strategy games such as Civilization and Railroad Tycoon are also based on simulation modeling. Most of these games contain editors, in which the user can create new scenarios, new terrain, and even control the likelihoods of events.

Advantages of Simulation

- Simulation often leads to a better understanding of the real system.
- Years of experience in the real system can be compressed into seconds or minutes.
- Simulation does not disrupt ongoing activities of the real system.
- Simulation is far more general than mathematical models.
- Simulation can be used as a game for training experience (safety!).

Simulation Advantages

- Simulation can be used when data is hard to come by.
- Simulation can provide a more realistic replication of a system than mathematical analysis.
- Simulation can be used to analyze transient conditions, whereas mathematical techniques usually cannot.
- Simulation considers variation and can calculate confidence intervals of model results.

Simulation Advantages

- Simulation can model a system with multiple phases
- Simulation can model a system when it is already in a steady-state (i.e., can initialize the system with the beginning queue, beginning inventory, etc.!).
- Simulation can also test a “range” of inputs to perform what-if/sensitivity analysis.
- Many standard simulation software packages are available commercially (and Excel works fine too!).

Disadvantages of Simulation

- There is no guarantee that the model will, in fact, provide good answers.
- There is no way to prove reliability.
- Simulation may be less accurate than mathematical analysis because it is randomly based.
- Building a simulation model can take a great deal of time (but if the payoff is great, then it is worth it!).
- A significant amount of computer time may be needed to run complex models (old concern - no longer an issue!).
- The technique of simulation still lacks a standardized approach.

Strategic considerations in assessing capital projects

Capital budgeting

- Working closely with accountants, top executives have to figure out how and when to best allocate the firm's financial resources among alternative opportunities to create future value for the company. Because it is hard to know what the future holds and how much projects will ultimately cost, this can be a challenging task, but it is one that managers must constantly confront.
- This session explains the different methods managers use to get the "biggest bang" for the firm's "buck" in terms of the projects they undertake.

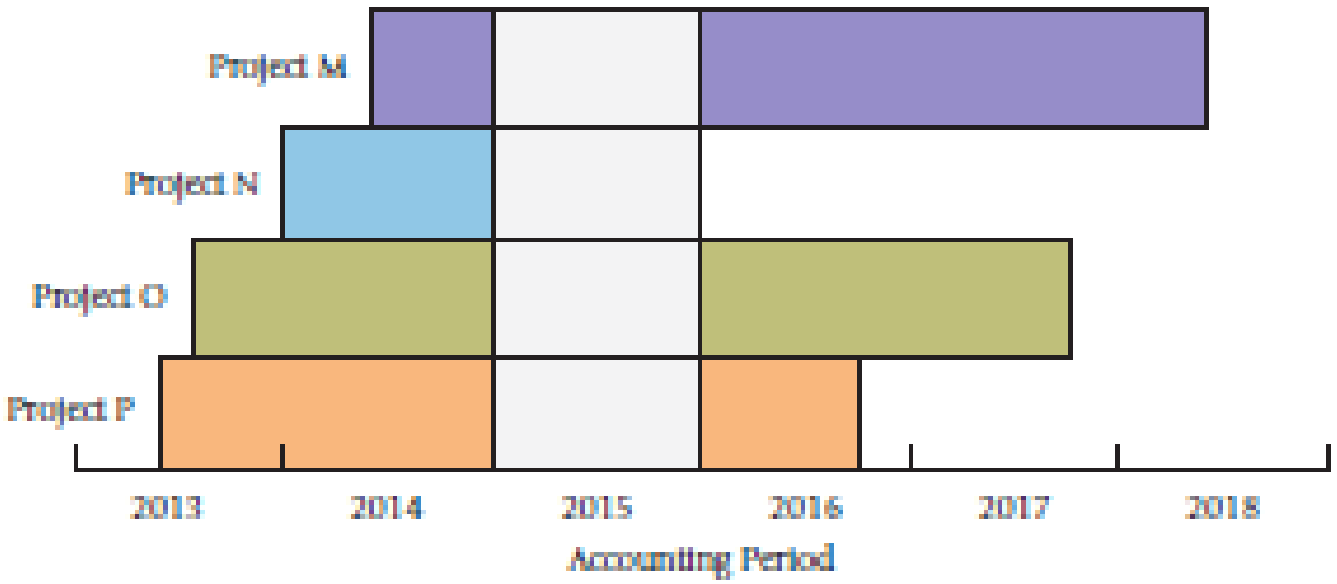
Capital budgeting

- Capital budgeting is the process of making long-run planning decisions for investments in projects.
- In much of accounting, income is calculated on a period-by-period basis.
- In choosing investments, managers make a selection from among multiple projects each of which may span several different periods.

Two different, intersecting Dimensions of Cost Analysis

- Horizontally across is the project dimension, and
- Vertically upward is the accounting-period dimension.
- To make capital budgeting decisions, managers must analyze each project by considering all the life-span cash flows from its initial investment through its termination.

Project and Time Dimensions of Capital Budgeting Illustrated



Five Stages in Capital Budgeting

1. Identify projects—identify potential capital investments that agree with the organization's strategy.
2. Obtain information—gather information from all parts of the value chain to evaluate alternative projects.
3. Make predictions—forecast all potential cash flows attributable to the alternative projects.

Five Stages in Capital Budgeting, concluded

4. Make Decisions by Choosing Among Alternatives - Determine which investment yields the greatest benefit and least cost to the organization.
5. Implement the decision, evaluate performance and learn (generally separated into two phases):
   I. Obtain funding and make the investment selected in stage 4.
   II. Track realized cash flows, compare against estimated numbers and revise plans if necessary.

Capital budgeting and working capital

- New projects often require additional investments in current assets, such as inventories and receivables. Working capital refers to the difference between current assets and current liabilities. Any additional investment required for a project will be included in that project's cash flows.

Project management and performance evaluation

We have looked at ways to identify relevant cash flows and techniques to analyze them. Our final stage of capital budgeting (stage 5) is the implementation and control of the project, and the evaluation of performance.

- Implementation and control:
  - Management of the investment activity itself.
  - Management control of the project as a whole.
- A post-investment audit may be done to provide management with feedback about the performance of a project so that management can compare actual results to the costs and benefits expected at the time the project was selected.

Evaluating Managers and Goal-Congruence Issues

- A post-investment audit may prevent managers from overstating the expected cash inflows from projects and accepting projects they should reject.
- Companies should perform post-investment audits with thought and care and only after the project outcomes are fully known.
- There is an inconsistency between using the NPV method as best for capital budgeting decisions and then using a different method to evaluate performance. Even though NPV is the best for capital budgeting decisions, managers will be tempted to make the decisions based on the method on which they will be evaluated.

Strategic Considerations in Capital Budgeting

- A company's strategy is the source of its strategic capital budgeting decisions.
- Managers can use the framework for project evaluation and also to make strategic decisions about which customers to invest in.
- Some firms regard R&D projects as important strategic investments.

Sustainability and Capital Budgeting

- Incremental Operating Cash flows are often impacted by sustainable management initiatives
- These cash flows must be included in capital budgeting decisions
  - Waste and Emission Treatment
  - Prevention and Environmental Management
  - Non-Product Output
    - Material Purchase
    - Processing Costs
  - Environmental Revenues
  - Image Benefits and Costs

Evaluating Capital Projects

1) Focus on Cash Flow, Not Profits.
   - Cash Flow = Economic Reality.
   - Profits Can Be Managed.
2) Carefully Estimate Expected Future Cash Flows.
3) Select a Discount Rate Consistent with the Risk of Those Future Cash Flows.
4) Account for the Time Value of Money.
5) Compute a "Base-Case" NPV.

Evaluating Capital Projects

6) Net Present Value = Value Created or Destroyed by the Project.
   - NPV is the Amount by which the Value of the Firm Will Change if you Undertake the Project.

7) Identify Risks and Uncertainties. Run a Sensitivity Analysis.
   - Identify "Key Value Drivers."
   - Identify Breakeven Assumptions.
   - Estimate Scenario Values.
   - *Bound the Range of Value*

Evaluating Capital Projects

8) Identify Qualitative Issues.

- **Flexibility**
- **Quality**
- **Know-How**
- **Learning**

9) Decide

Financial Performance Measures for Investment Centers

Strategic objectives for financial-performance measures for investment SBUs are:

- *Motivate* managers to exert a high level of effort to achieve the goals of the firm (increase ROI)
- Provide the right *incentive* for managers to make decisions that are consistent with the goals of top management (goal congruence)
- Fairly determine the rewards earned by the managers for their effort and skill (ROI = sound basis for comparison between units of different size)

Alternative Measures for Evaluating the Financial Performance of Investment Centers

- Return on investment (ROI)
- Residual income (RI)
- Economic value added (EVA®)

Return on Investment (ROI)

- ROI is the most common measure of investment center short-run financial performance
  - The higher the percentage, the better the indicated financial performance

$$\text{ROI} = \text{Return on sales} \times \text{Asset turnover}$$

$$\text{ROI} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}$$

- In practice, be aware that there are different ways to define “profit” and “investment” for purposes of determining ROI

Return on Investment (ROI)

The two components of ROI give a more complete picture of management performance (goals should be set for each of the two component measures):

- *Return on sales* (ROS) or *profit margin*, a firm's profit per sales dollar, measures the manager's ability to control expenses and increase revenue to improve profitability
- *Asset turnover* (AT), the amount of dollar sales achieved per dollar of investment, measures the manager's ability to increase sales from a given level of investment

ROI Example

CompuCity sells computers, software, and books in three locations, Boston, South Florida, and the Midwest. The company's profit's declined in the Midwest last year. CompuCity's operating results and the corresponding ROI calculations appear on the next slide.

ROI Example:

Panel 1: Income, Investment, and Sales

	Income		Investment (Assets)		Sales	
	2012	2013	2012	2013	2012	2013
Computers	$ 8,000	$ 5,000	$ 50,000	$ 62,500	$ 200,000	$ 250,000
Software	15,000	16,000	100,000	80,000	150,000	160,000
Books	3,200	5,000	32,000	50,000	80,000	100,000
Total	$ 26,200	$ 26,000	$ 182,000	$ 192,500	$ 430,000	$ 510,000

$8,000 Income/$200,000 Sales

$200,000 Sales/$50,000 Investment

	Return on Sales		Asset Turnover		ROI	
	2012	2013	2012	2013	2012	2013
Computers	4.00%	2.00%	4.00	4.00	16.00%	8.00%
Software	10.00%	10.00%	1.50	2.00	15.00%	20.00%
Books	4.00%	5.00%	2.50	2.00	10.00%	10.00%
Total	6.10%	5.10%	2.36	2.65	14.40%	13.50%

$8,000 Income/$50,000 Investment

ROI Example: Summary Analysis

- Overall ROI has fallen from 14.4% in 2009 to 13.5% in 2010, mainly due to a decline in overall ROS
- The drop in ROS is due to the sharp decline in ROS for the computer unit
- Software is the most profitable investment unit, as measured by ROI

Accounting Policy Issues and ROI: Things to Consider When ROI is Used to Evaluate Relative Performance of Investment Centers

- **Depreciation policy**–the determination of the useful life of the asset and the depreciation method affect both “income” and “investment”; larger depreciation charges reduce ROI
- **Capitalization policy**–the firm’s capitalization policy identifies when an item is expensed or capitalized as an asset; an expensed item reduces the numerator of ROI, a capitalized item reduces the denominator

Additional Considerations: Accounting Policies and ROI

For inventory:

- **Inventory measurement methods**–choice of inventory cost-flow assumption (FIFO, LIFO) affects "income" and reported inventory values (as such, the denominator, "investment" could be affected by this choice) (e.g., LIFO often increases CGS and decreases inventory in times of rising prices causing ROI to decrease)
- **Full costing**–full costing creates an upward bias on income, and therefore on ROI, when inventory levels are rising; the reverse is true when inventory levels are falling
- **Disposition of variances**–standard cost variances can be closed to the CGS account or prorated to CGS and ending inventory accounts; the choice has a direct effect on income and inventory balances

Defining the ROI Measure

- How is "investment" *defined* (i.e., which assets should be included in the measure of investment)?
  - "Investment" is commonly defined as the net cost of long-lived assets plus working capital
  - A key criterion for including an asset in ROI is the degree to which the unit controls it; only those controllable at the unit level should be included
  - The value of intangibles should also be considered
- Allocating shared assets?
  - Management must determine a fair sharing arrangement
  - Assets should be allocated according to peak demand if user units require high levels of service at periods of high demand

Measurement Issues: How Should "Investment" Be Measured?

- The amount of investment is typically measured at the historical cost of the assets
- *Historical cost* is amount of the book value of current assets plus the net book value (NBV) of the long-lived assets
- NBV is the asset's historical cost less accumulated depreciation
- A problem arises when long-lived assets are a significant portion of total investment because historical cost often does not reflect current market value
- Relatively small historical cost value = significantly overstated ROI (and the "illusion of profitability")

Measurement Issues for ROI Determination

Assets can be measured at either historical cost (NBV or GBV) or at some measure of current value:

- *Net book value* (NBV) is historical (acquisition) cost, less accumulated depreciation/amortization
- *Gross book value* (GBV) is the historical cost without the reduction for depreciation (removes the age bias)
- *Replacement cost* represents the current cost to replace the assets at the current level of service and functionality (purchase price)
- *Liquidation value* is the price that could be received from their sale (sale price or “exit value”)

ROI Measurement Issues

CompuCity has three marketing regions: 15 stores in the Midwest; 18 stores in the Boston area; and 13 stores in South Florida. Current value information appears below.

Region	Income	Measure of Assets			
		Net Book Value	Gross Book Value	Replacement Cost	Liquidation Value
Financial data:					
Midwest	$26,000	$192,500	$250,500	$388,000	$ 332,000
Boston region	38,500	212,000	445,000	650,000	1,254,600
South Florida	16,850	133,000	155,450	225,500	195,000
Return on investment:					
Midwest		13.5%	10.4%	6.70%	7.8%
Boston region		18.2	8.7	5.9	3.1
South Florida		12.7	10.8	7.5	8.6

Asset Measurement in ROI Calculations: Summary Analysis

- At first glance the Boston area appears to be the most profitable, but when the age of the store is factored in (GBV), the ROI figures for all three regions are comparable
- Replacement cost is useful for evaluating manager's performance (South Florida is slightly in the lead)
- The analysis of liquidation-based ROIs is useful for showing CompuCity management that the real estate value of these stores could now exceed their value as CompuCity retail locations

Strategic Issues Regarding the Use of ROI for Performance-Evaluation Purposes

- Value-creation in the new economy—can this be captured by the ROI measure?

- Short-run focus of the metric:
  - Numerator issues?
  - Denominator issues?

- Decision model and performance-evaluation model inconsistency (e.g., NPV vs. ROI)

- ROI has a disincentive for new investment by the most profitable units because ROI encourages units to only invest in projects that earn higher than the unit's current ROI (**note:** this is a goal-congruency problem)

Summary Comments: Selected Advantages and Limitations of ROI

Advantages

1. Easily understood by managers
2. Comparable to interest rates and the rates of return on alternative investments
3. Widely used and reported in the business press

Limitations

1. Goal congruency issue: incentive for high ROI units to invest in projects with ROI higher than the minimum rate of return but lower than the unit's current ROI
2. Comparability across investment centers can be problematic

Residual Income (RI)

- In contrast to ROI (which is a percentage, i.e., a *relative* performance indicator), *residual income* (RI) is a dollar amount:

  RI = investment center income less an *imputed charge* for the investment in the unit

- RI is equal to the desired minimum rate of return times the level of "investment" in the unit

- RI can be interpreted as the income earned after the unit has "paid" a charge for the funds invested in the unit

Residual Income (RI) Example

	Midwest	
Investment (@NBV)	$	192,500
Minimum rate of return		12%
Minimum income		23,100
Actual income		26,000
Residual income	$	2,900

Residual Income (RI) Example

In this case (*but not always*), the RI calculation for CompuCity produces the same relative profitability ranking as the ROI calculation

Financial data	Income	NBV
Midwest	$ 26,000	$ 192,500
Boston area	38,500	212,000
South Florida	16,850	133,000
ROI:		
Midwest		13.51%
Boston area		18.16%
South Florida		12.67%

RI (minimum rate of return is 12%):

	Minimum Return	RI
Midwest	$ 23,100	$ 2,900
Boston area	25,440	13,060
South Florida	15,960	890

Selected Advantages and Limitations of RI

Advantages

1. Supports incentive to accept all projects with ROI > minimum rate of return
2. Can use the minimum rate of return to adjust for differences in risk
3. Can use a different minimum rate of return for different types of assets

Limitations

1. Favors large units when the minimum rate of return is low
2. Not as intuitive as ROI
3. May be difficult to obtain a minimum rate of return at the subunit level

Advantages of Both ROI and RI

1. *Congruent* with top management goals for return on assets
2. *Comprehensive financial measure*—includes all the elements important to top management: revenues, costs, and level of investment
3. *Comparability*: expands top management's span of control by allowing comparison across SBUs

Limitations of Both ROI and RI

1. *May mislead strategic decision making*: not as comprehensive as the BSC, which includes customer satisfaction, internal processes, and learning as well as financial measures; the BSC is explicitly linked to strategy
2. *Accounting issues*: variations exist in the definition and measurement of "investment" and in the determination of "profits"
3. *Short-term focus*: investments with long-term benefits may be neglected

Economic Value Added (EVA®)

- *Economic value added* (EVA®) is a business unit's income after taxes and after deducting the cost of capital
- EVA® is a Registered Trade Mark of Stern Stewart & Co.
- EVA® approximates an entity's "economic profit"
- EVA® involves numerous adjustments to reported accounting income and level of investment (Stern Stewart reports up to 160 such adjustments!!)
- Similar to Residual Income (RI), EVA motivates managers to increase investment as long as the expected return (in $ terms) above the cost of capital is positive

Economic Value Added (EVA®)

EVA® = NOPAT – (*k* × Average invested capital)

NOPAT = after-tax cash operating income, after depreciation (i.e., the "total pool of cash funds available to suppliers of capital")

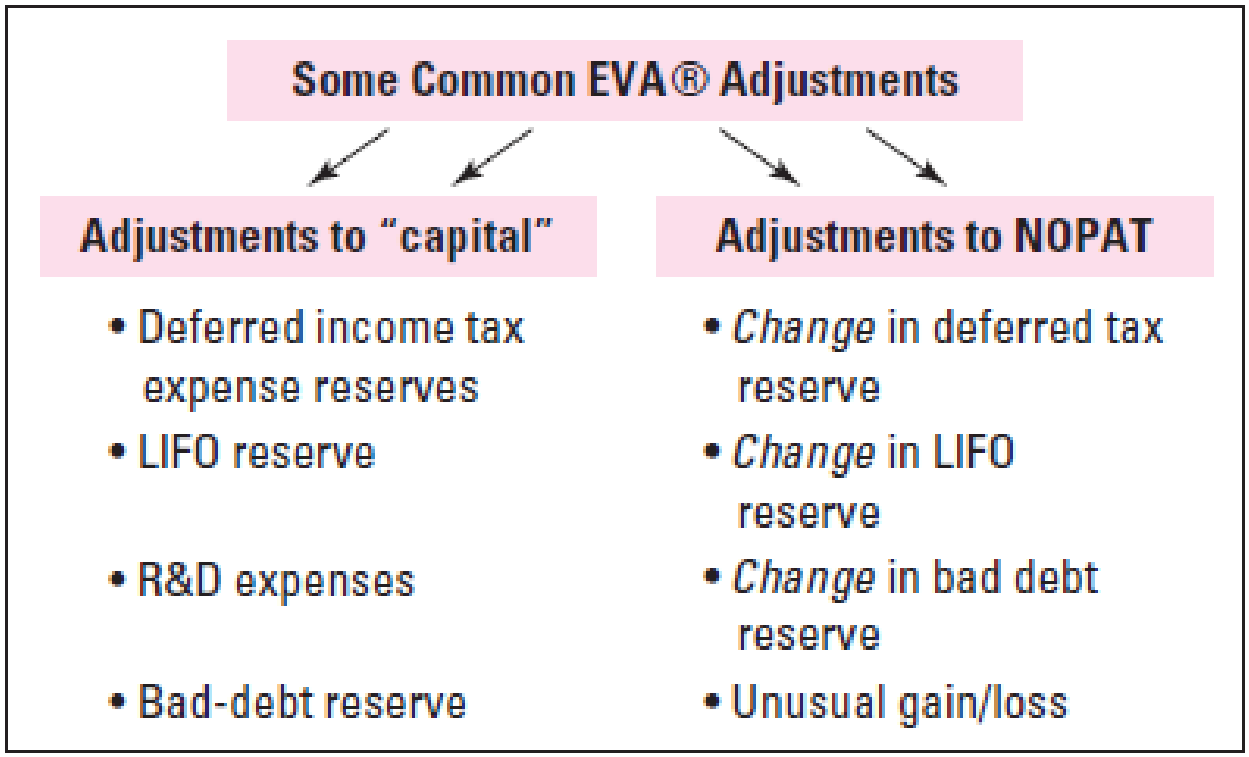
= Revenues – Cash operating costs – Depreciation – Cash taxes on operating income

k = minimum rate of return (hurdle rate), e.g., WACC

Thus, EVA® = (*r* – *k*) × capital, where *r* = NOPAT/invested capital ("cash on cash return")

Economic Value Added (EVA®)

To estimate EVA, it is necessary to adjust reported accounting numbers (both earnings and level of investment; the latter are referred to as *equity-equivalent adjustments,* or EE for short)



The Investment Decision

- Is the activity worthy of an investment?
- Which assets can be used for the activity?
- Of the available assets for each activity, which is the best investment?
- Of the “best investments” for all worthwhile activities, in which ones should the company invest?

Consider Quantitative and Qualitative Factors

Capital Budgeting Terms

- Screening decision
- Preference decision
- Mutually exclusive projects
- Independent projects
- Mutually inclusive projects

Ranking Capital Projects

- For the projects under consideration
  - Net present value is nonnegative
  - Profitability index of 1 or more
  - Internal rate of return equals or exceeds hurdle rate
- Selection ranking of multiple projects
  - Results can vary depending on evaluation techniques and whether dollars or percentages are used



Ranking Capital Projects

- Reinvestment Assumptions
  - Net present value and profitability index assume that released cash flows are reinvested at the discount rate
  - Internal rate of return assumes that released cash flows are reinvested at the expected internal rate of return

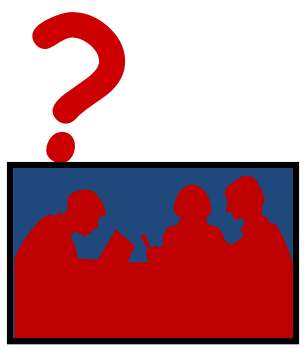


Ranking Capital Projects

- Net present value superior to internal rate of return
  - more realistic reinvestment assumption
  - results measured in dollars not rates



Do you prefer
a 100 percent return on $1, or
a 10% return on $100?



Capital Rationing

- Limited capital available for capital asset acquisition
- Net present value does not consider the differences in investment amounts; combine NPV with profitability index
- Rank projects using various methods
- Select combination of projects that will maximize net present value to firm

Compensating for Risk

- Judgmental method
  - Use logic and reasoning to decide if acceptable rate of return will be achieved
- Risk-adjusted discount rate method
  - Higher discount/hurdle rate for riskier projects
  - Shorter payback period for riskier projects
- Sensitivity analysis
  - Determine the amount of change that must occur in a variable before a different decision would be made

Postinvestment Audit

- Complete after project has stabilized
- Compare actual results to expected results
- Use same analysis techniques
- Identify areas where results differ from expectation
- Evaluate capital budgeting process, particularly cash flow projections



Additional Considerations in Strategic Investment Decisions

- Qualitative issues that may arise in capital budgeting include:
  - the effects of the decision on the company's reputation,
  - the effects on the quality of the company's products and services,
  - the effects on the company's community, and
  - the effects on employees.
- After a capital budgeting decision is made, a post-investment audit should be performed to assess the decision process.

Creating an effective Capital Budgeting framework

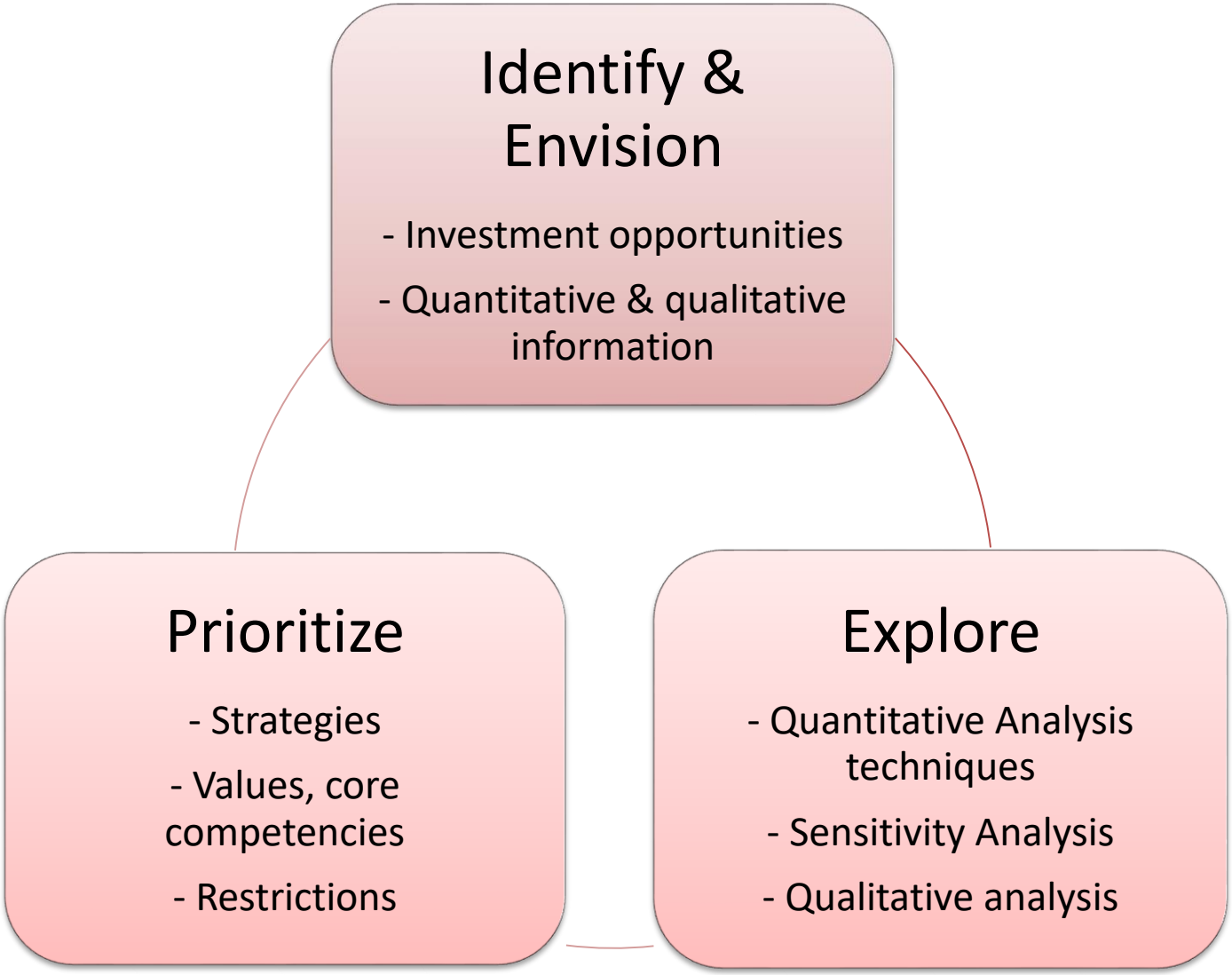
Capex

- Important as this is an area of investment to grow the business.
- Affects the P&L as depreciation would have to be added
- Also easier to secure funding for capital items rather than revenue.

Process for Making Strategic Investment Decisions

- The process used to compare and analyze long-term investment projects is called capital budgeting.
- Strategic investment decisions typically involve a large up front investment
- Time value of money must be considered since the project life is greater than 1 year
- Examples of strategic investment decisions?

Process for Making Strategic Investment Decisions



Process for Making Strategic Investment Decisions

- The capital budgeting process includes the following stages:
  - Identify decision alternatives.
  - Identify relevant cash flows.
  - Apply the appropriate quantitative techniques.
  - Perform sensitivity analysis.
  - Identify and analyze qualitative factors.
  - Consider quantitative and qualitative factors and make a decision.





Capital Budgets



Capital Budgeting

- **Capital Budgeting** is a process used to evaluate investments in long-term or capital assets.
- **Capital Assets**
  - have useful lives of more than one year;
  - analysis requires focus on the life of the asset;
  - low-cost, long-lived assets are not usually subjected to the Capital Budgeting process;
  - cost often makes it necessary for the organization to finance the asset using **long-term financing** from capital campaigns, mortgages, long-term loans, leases, and equity offerings.

What are capital assets?

- They are used in the production or supply of goods and services (productivity criterion),
- Their life extends beyond a fiscal year (longevity criterion)
- they are not intended for resale in the ordinary course of operations
- Their treatment as a capital assets is of value (materiality principle)



Types of Capital Budget Actions

- Capital Acquisitions
- Capital Improvements
- Maintenance



Risk in Capital Investment Decisions

Outcome is uncertain.

Investment involves a long-term commitment.

Capital budgeting:
Analyzing alternative long-term investments and deciding which assets to acquire, eliminate or renovate

Decision may be difficult or impossible to reverse.

Large amounts of money are usually involved.

Why Prepare a Capital Budget?

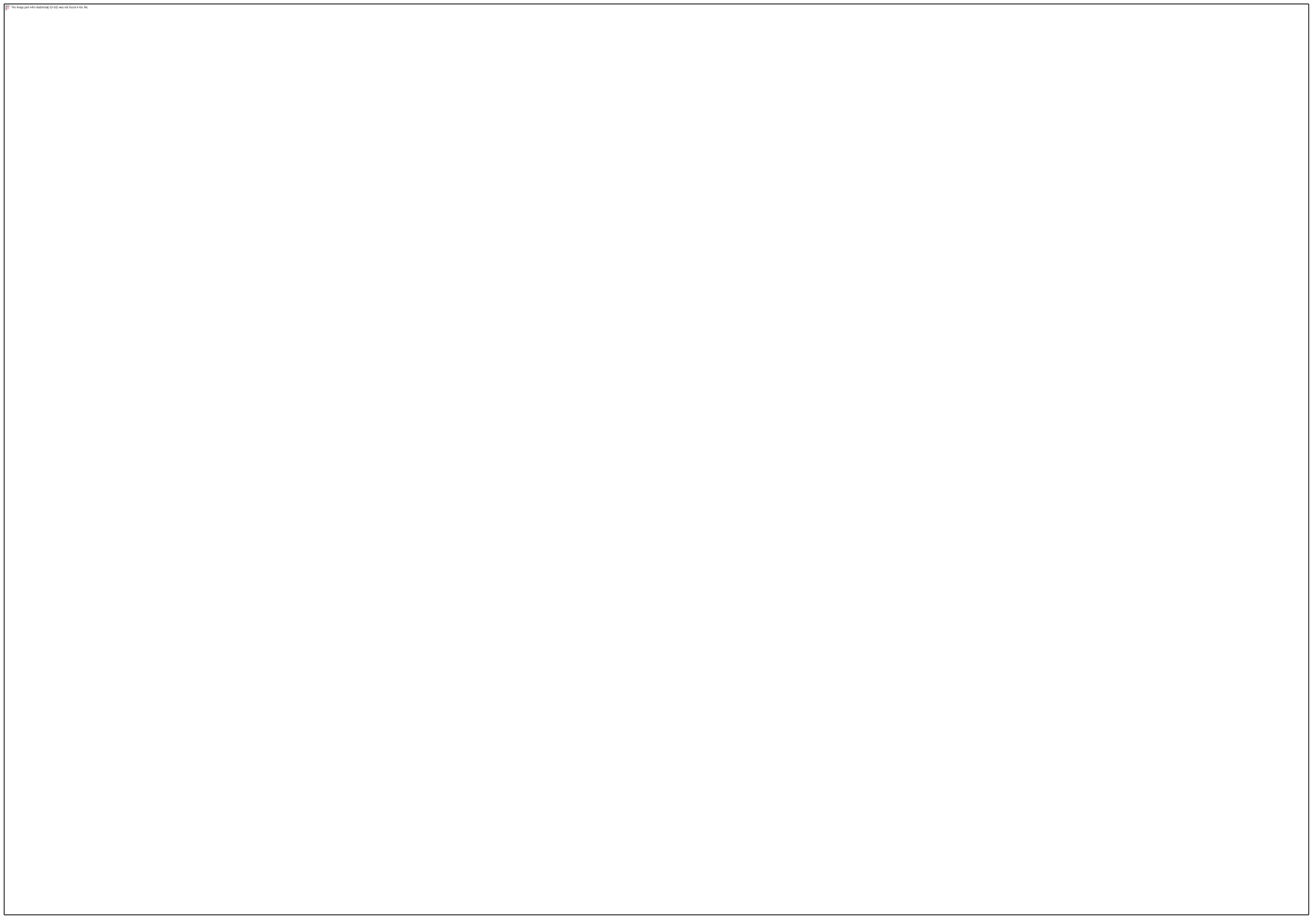
- Since the investments are large, mistakes can be costly.
- Since capital acquisitions lock the organization in for many years, bad investments can hamper the organization for many years.
- Since capital assets have long lives, they must be looked at over their lives. Operating budgets do not do that. Value of accrual basis here.
- Since the cash the organization uses to buy the capital asset is not free, managers must include the cost of that money in their analysis.

Some uniquely public sector issues in capital funding

- Social/economic goals versus monetary – regional distribution, make-work projects
- Depreciation and replacement
- The border-line between capital and operational budgets and its impact on financial reporting of deficits, etc.
- Asset valuation and management
- Investment strategies – debt, current funds, other party investment

Capital assets age and break-down!





Steps in the Development of a Capital Budget

- Inventory of Capital Assets
- Development of a Capital Investment Plan
- Development of a Time-Sensitive CIP – multi-year projection
- Development of a Financing Plan
- Approvals, consultations, winning support, and implementation

Inventory of Capital Assets

- Life cycle assessments – replacement plans
- Depreciation schedules: accrued value or replacement value
- Provides information on the capacity of the infrastructure in place

Capital Investment Plan

- Primarily a planning document – not necessarily fully funded
- Relating it to the agency's or government's overall objectives and priorities
- Danger of 'hidden' capital costs not attracting public or political attention: replacing computers, buildings, sewers
- Danger in 'all to obvious' capital renewal costs getting priorities: potholes

Developing a Multi-Year Plan

- Reinforces the cyclical nature of capital costs – recurring expenses
- Permits inclusion of maintenance and preventive costs of capital
- Permits some entities to consider various longer-term funding strategies

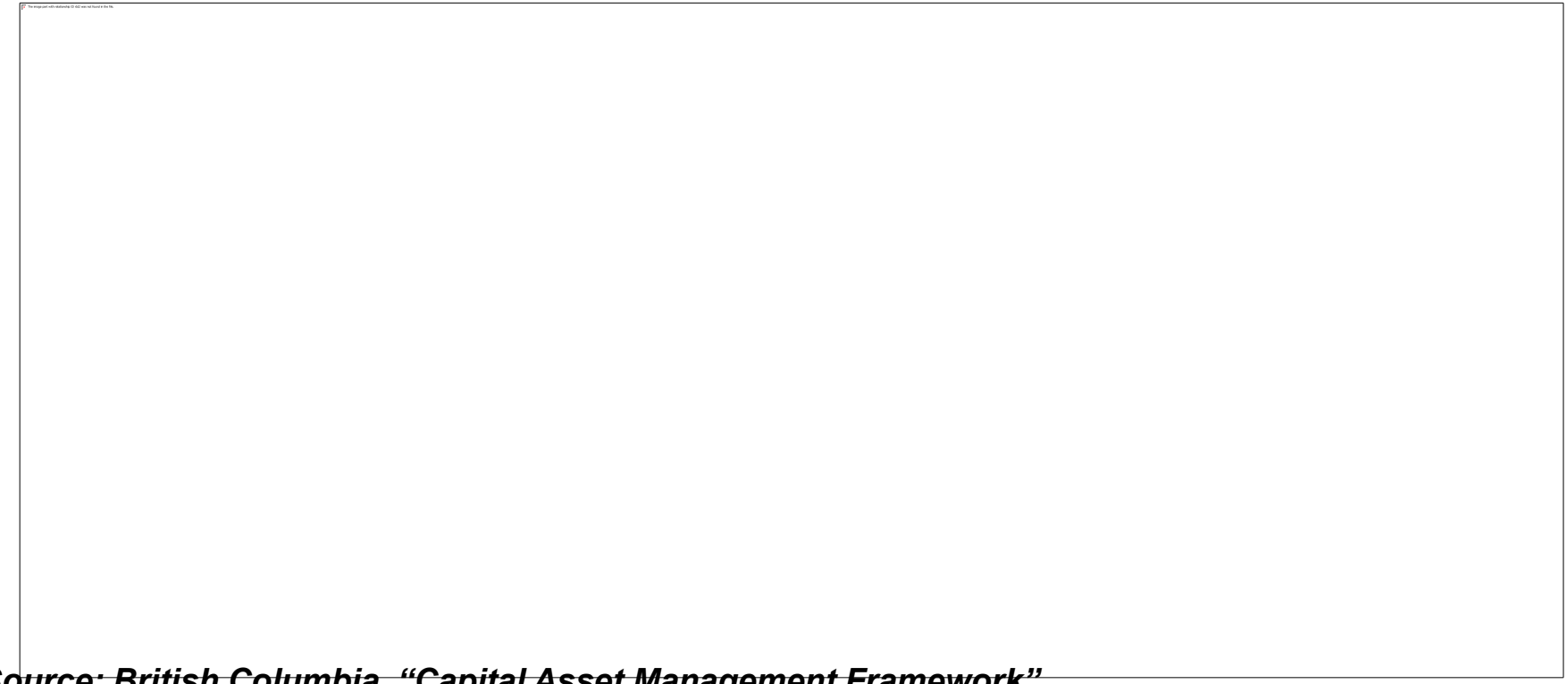
Development of a Financing Plan

- Complexity varies dramatically
- Ranges from drawing on appropriated funds completely right through to public-private partnerships, bonds issues, specialized financing strategies such as user fees (airports)
- Increasing trend to look at creative options

Capital Funding Alternatives

- Internal Funds
  - DEVELOPMENT CHARGES
  - OPERATING FUNDS
  - SPECIAL RESERVES
    - CAPITAL DEVELOPMENT
    - REPAIR AND MAINTENANCE
    - LIFECYCLE REPLACEMENT – THINK SYSTEMS
- EXTERNAL FUNDING
    - LEVIES
    - SPECIAL CHARGES – AIRPORT TAX
    - PRIVATE FUNDING - PPPs
    - DEBT

Continuum of Options, Risk and Delivery Tools



Source: British Columbia, "Capital Asset Management Framework", http://www.fin.gov.bc.ca/TBS/CAMF_Guidelines.pdf

Other Important Concepts for Budgets and Planning

- Costing and costing issues – discussed last lecture.
- Cost/Benefit Analysis
- Time Value of Money

} **To be dealt with in this lecture**

Post-Completion Audit

Post-completion Audit

A formal comparison of the actual costs and benefits of a project with original estimates.

- Identify any project weaknesses
- Develop a possible set of corrective actions
- Provide appropriate feedback

Result: Making better future decisions!

Risk Assessment in Capital Spending

- NPV and other tools are a means to try to quantify some risks associated with long term capital investments
- They provide a level analytical playing field
- Risk analysis is much more comprehensive than this

What is Risk?

- The possibility that the goals of the project will not be met.
- That includes costs, timing, objectives and policy intent.
- It also includes failures in methodology:
  - Cost estimations and potential overruns
  - Project management
  - Even technology chosen – a bridge too far, a submarine too old

Key Attributes of Risk

- Time horizon is the future which always involves uncertainty.
- Since future events can be either positive or negative, risks can be either threats or opportunities.
- Risk is measured by likelihood and impact.
- Risk appetite and tolerance vary over time, by individual, and by organization.
- Risks have a cost stream potential if the nature of the risk is known or capable of projection.

Risk Management in a Public Sector Context

- A changing landscape
- Increased transparency
- Increased exposure to the private sector
- Greater citizen expectations
- Stronger inspection of services
- More performance indicators
- More choice?

'Reputation' becomes more tangible – 'managing reputation' becomes vital aspect of strategic risk management in the public sector

Other Risks

- Policy risks
- Public interest risks
- Management or organizational risks
- Project risks

There is now a good body of public sector experience that shows that there is a need for systematic risk management of major capital ventures, regardless of how they are financed and delivered. There is also ample evidence of internal project management risk management practices being sound, but being generally ignored by decision makers due to the overriding political benefits or ideological imperatives associated with them.

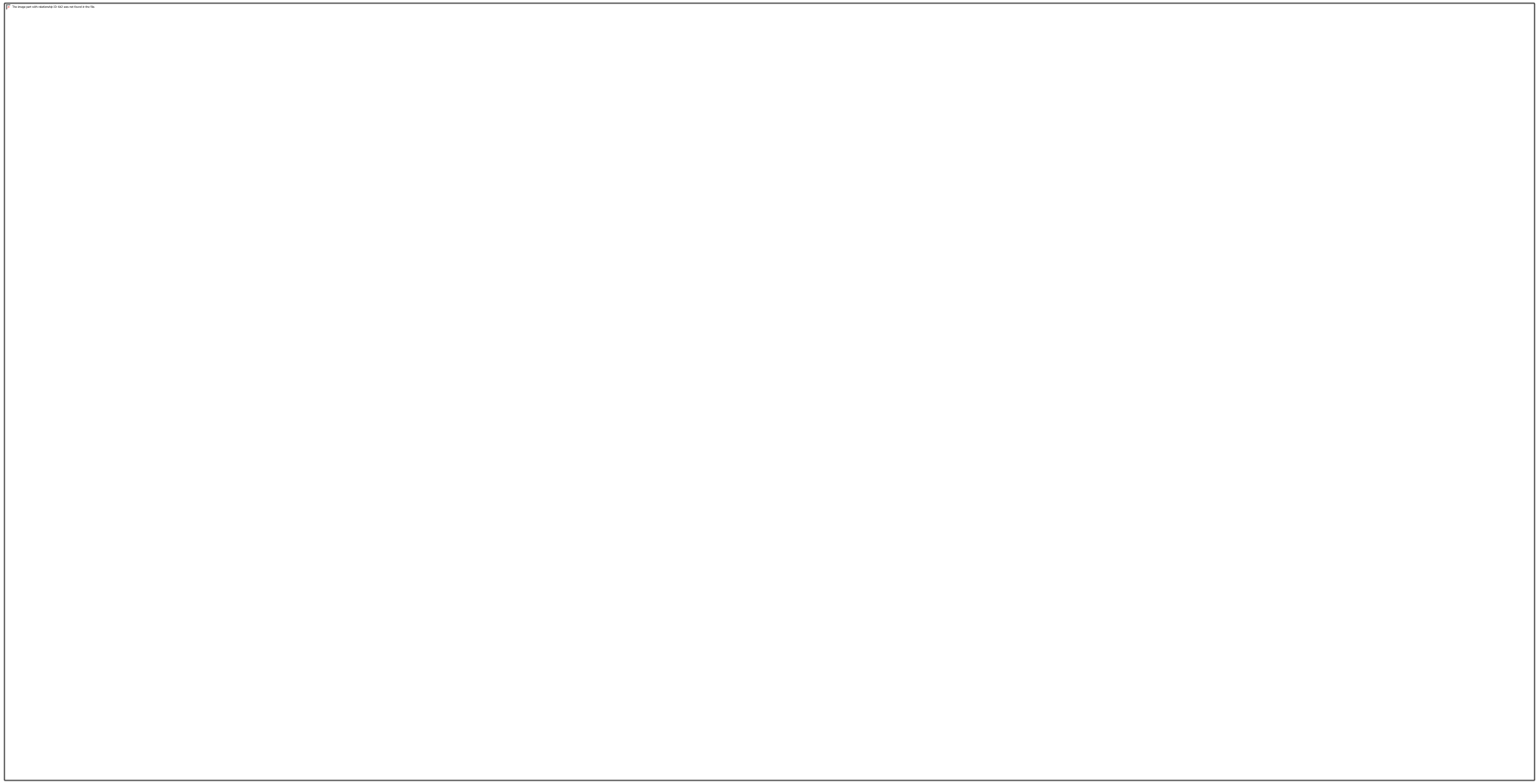
Other Risks

- External capacities of designers, expert advisors, funders, co-funders
- General financing issues
- Poor fit to operations risks
- A general assortment of risk that might attract a chicken little syndrome.

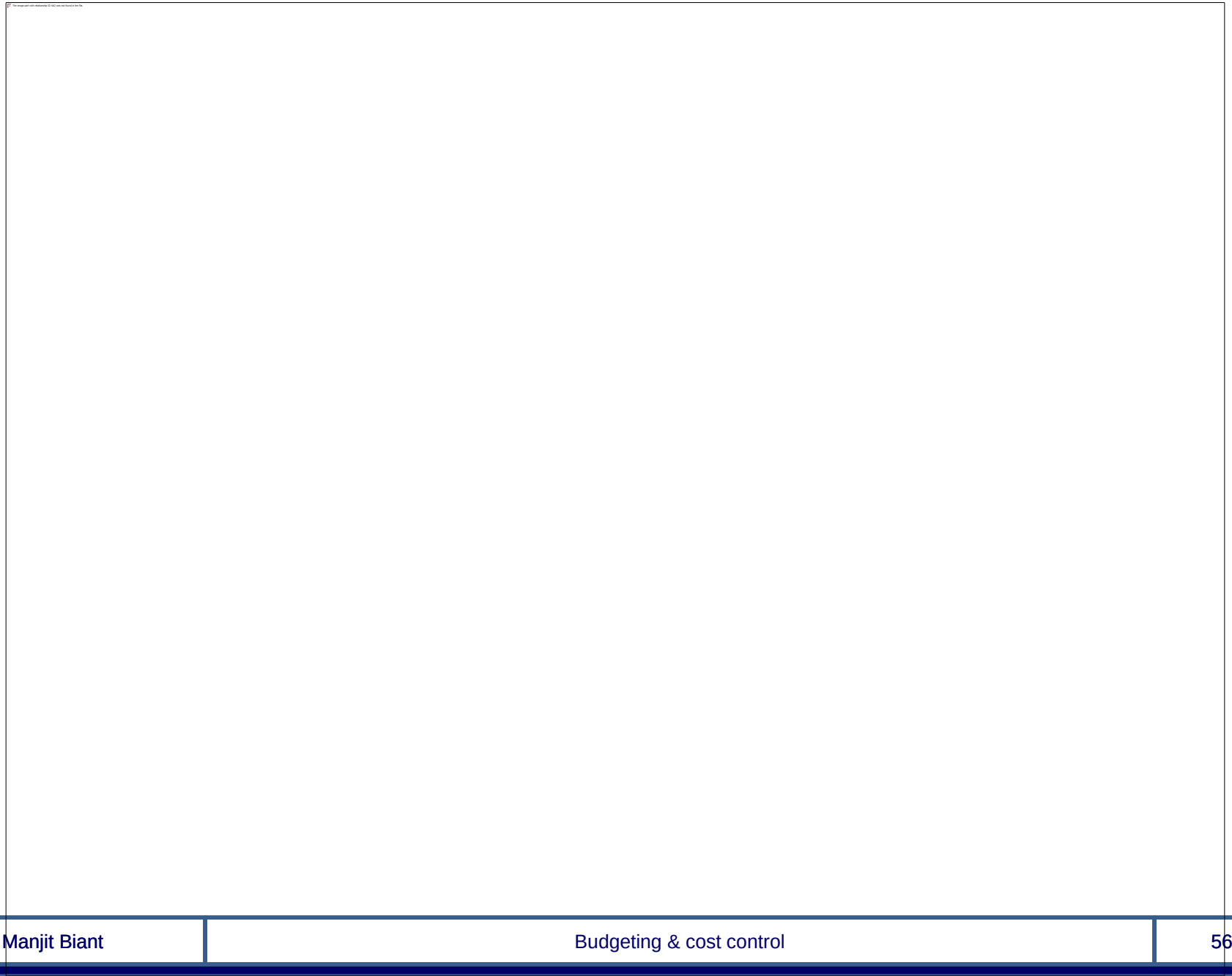
How Do You Measure It?

- Probability and Intensity
- Not all risks are equal, not all risks require action – this is about priority setting

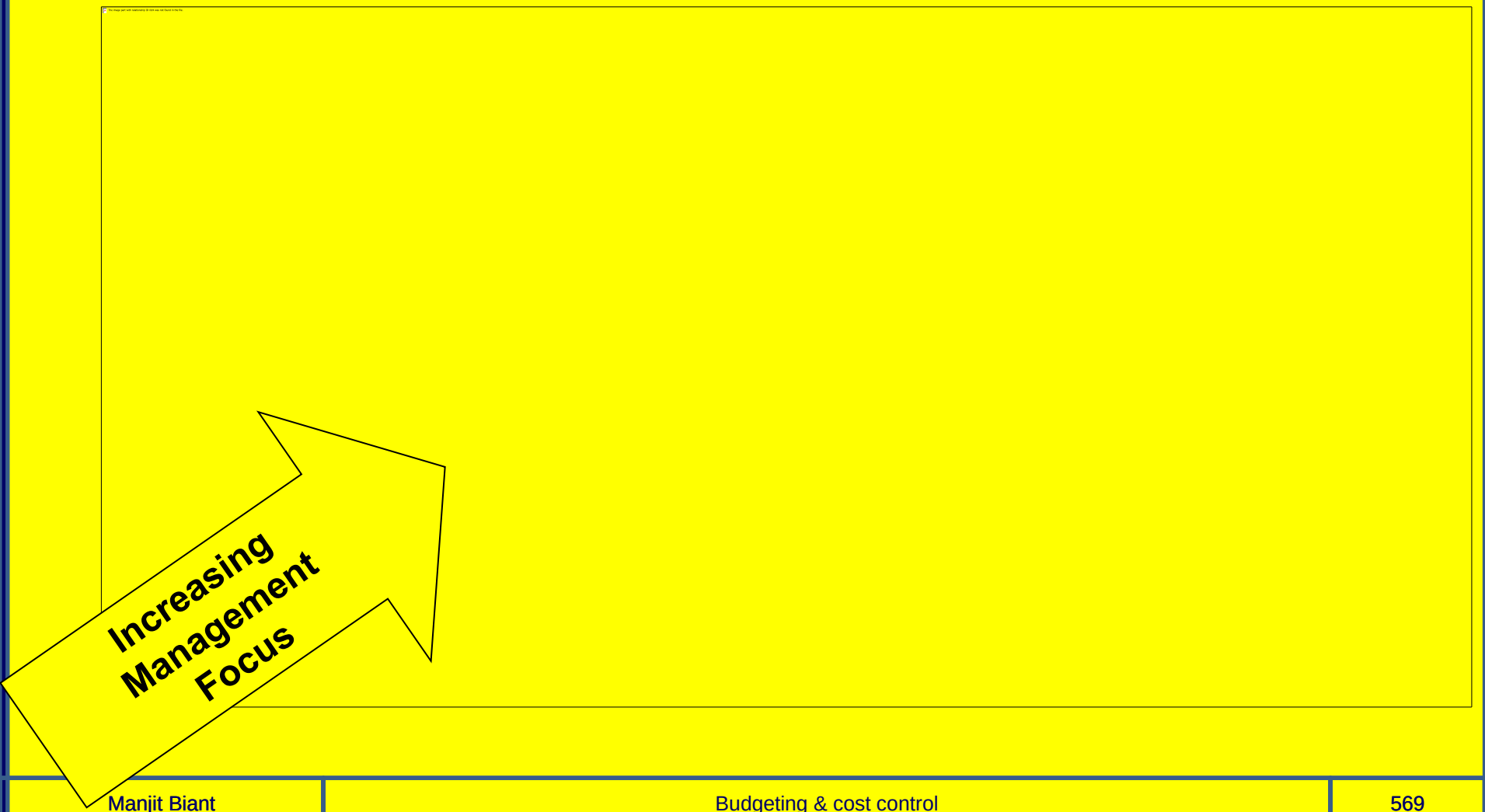
Typical Risk Map



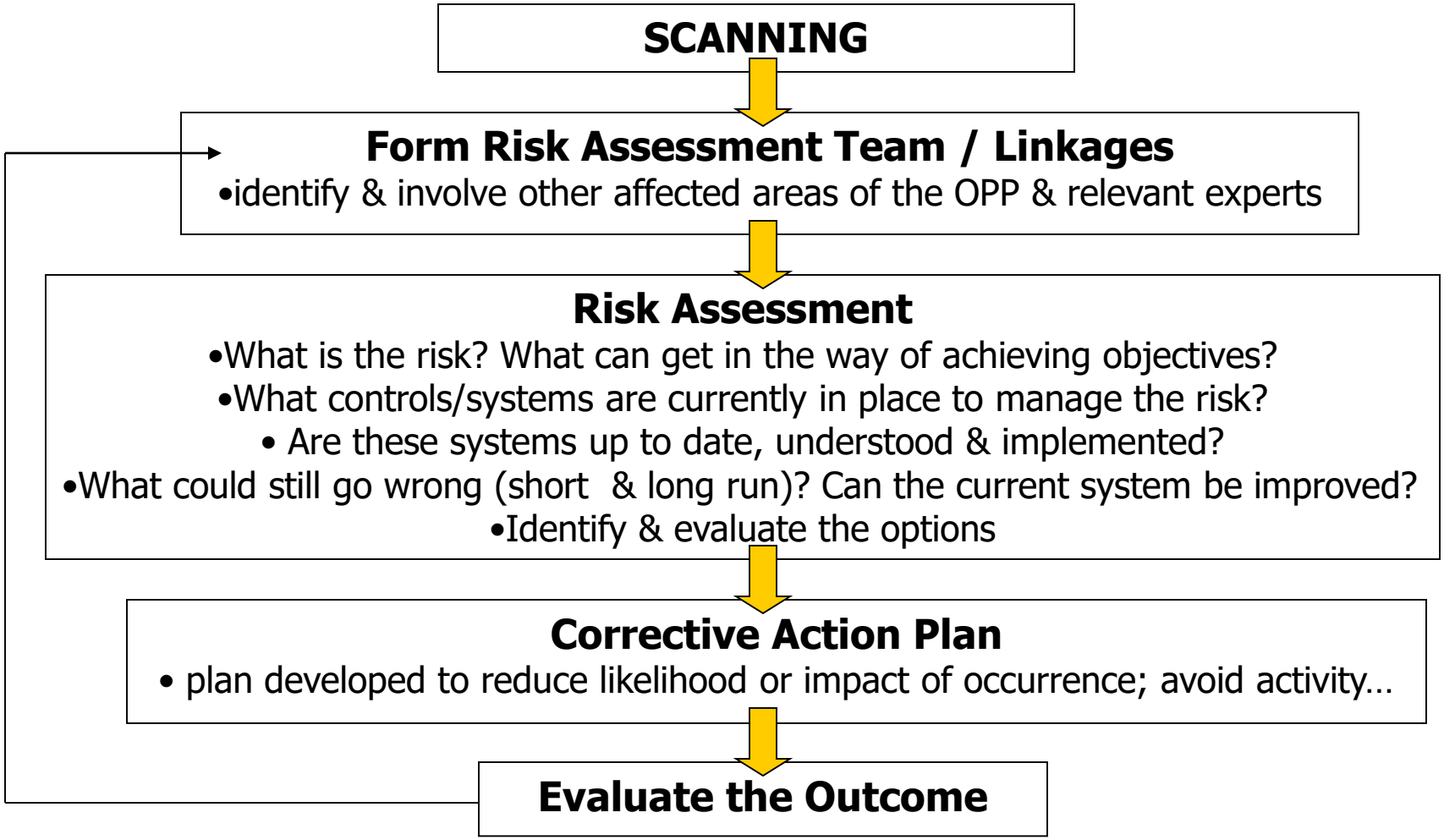
Typical Risk Map


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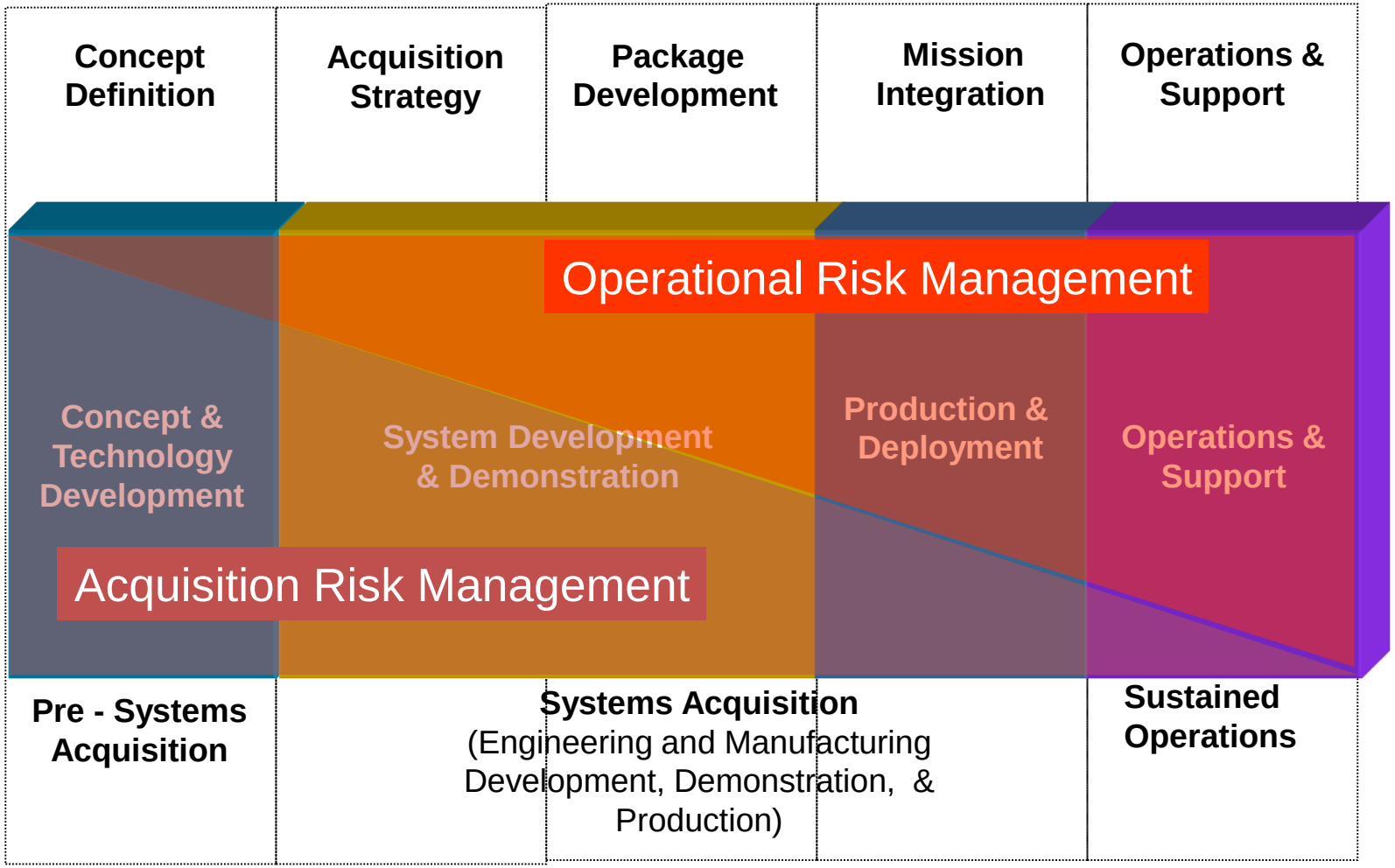
Example of a Risk Management Model for Decision-Making



The Process of Risk Management



A Risk Continuum in Systems Acquisition – An Example



Day 3

COST ANALYSIS AND MANAGEMENT

COST ANALYSIS AND MANAGEMENT

- Understanding cost structure and behaviour
- Costs as a relationship to outputs – cost/volume/price relationship
- The concept of contribution margin
- Break-even analysis for planning and control
- Cost allocation and apportionment
- Benefit-cost analysis

Understanding cost structure and behaviour

Different Ways to Describe Costs

- Costs can be defined by how they relate to a cost object, which is defined as any thing or activity for which we measure costs.

- Costs can also be categorized as to how they are used in decision making.

- Costs can also be distinguished by the way they change as activity or volume levels change.

Basic Cost Terminology

- Cost—a sacrificed or forgone resource to achieve a specific objective.
- Actual cost—a cost that has occurred.
- Budgeted cost—a predicted cost.
- Cost object—anything for which a cost measurement is desired.

Cost Object Examples at BMW

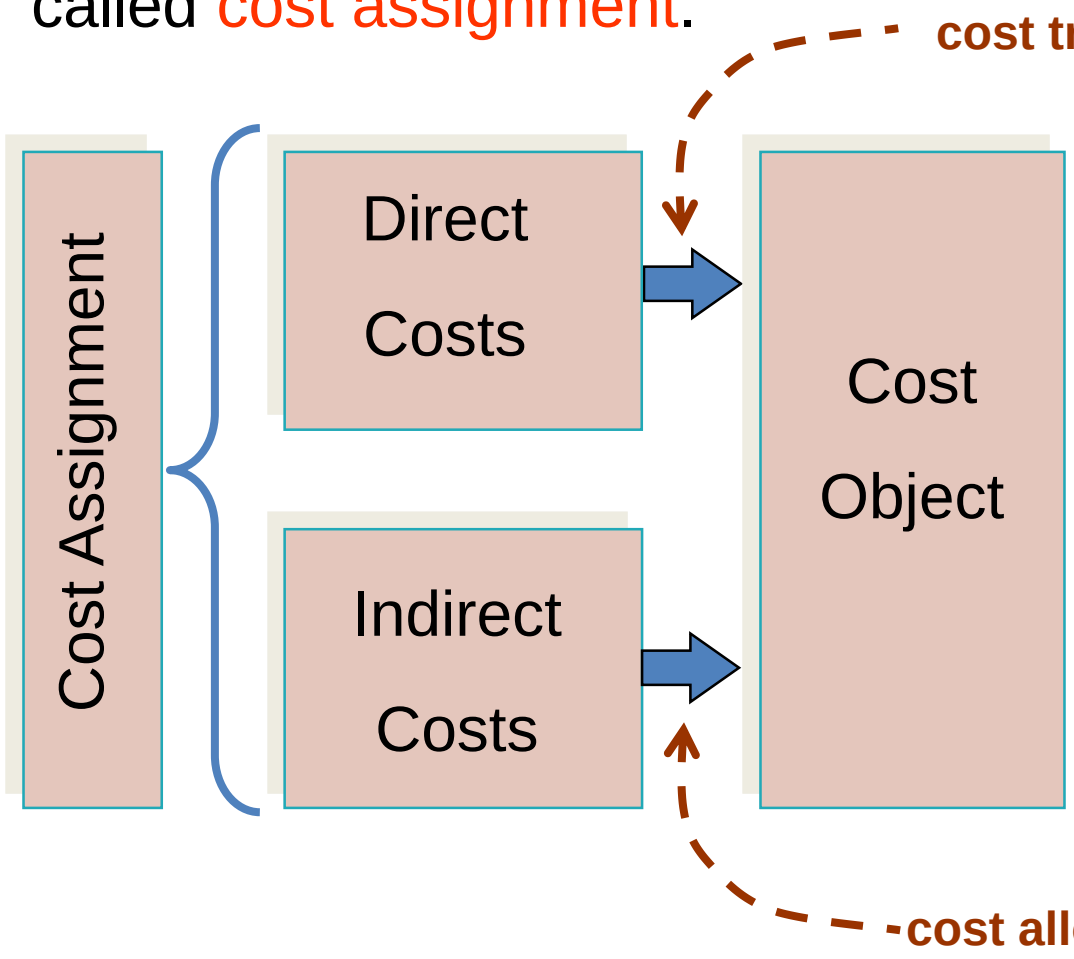
Cost Object	Illustration
Product	A BMW X6 sports activity vehicle
Service	Telephone hotline providing information and assistance to BMW dealers
Project	R&D project on DVD system enhancement in BMW cars
Customer	Herb Chambers Motors, a dealer that purchases a broad range of BMW vehicles
Activity	Setting up machines for production or maintaining production equipment
Department	Environmental, Health and Safety department

Basic Cost Terminology

- Cost accumulation—the collection of cost data in an organized way by means of an accounting system.
- Cost assignment—a general term that encompasses the gathering of accumulated costs to a cost object in two ways:
  - Tracing accumulated costs with a direct relationship to the cost object and
  - Allocating accumulated costs with an indirect relationship to a cost object.

Assigning Costs to a Cost Object

Determining the costs that should attach to a cost object is called cost assignment.



Direct costs are easily traced to the cost object.

Indirect costs are not easily traced to the cost object, and must be allocated.

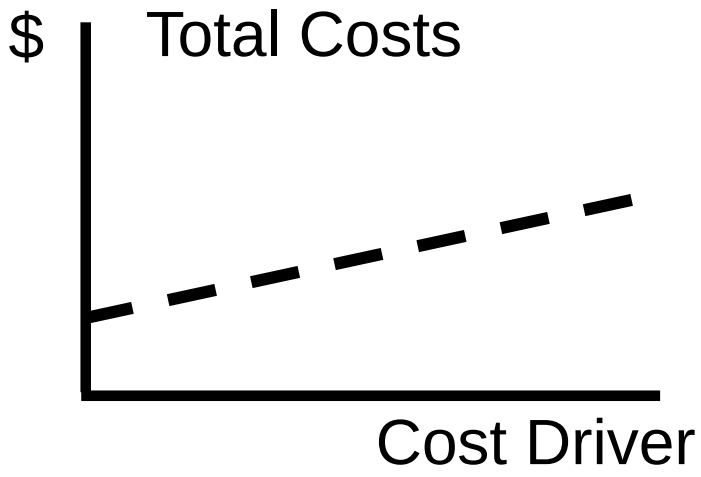
Direct and Indirect Costs

- In manufacturing:
  - all materials costs that are easily traced to the product are called direct material costs
  - all labor costs that are easily traced to the product are called direct labor costs
  - all other production costs are called overhead costs
- Whether or not a cost is a direct cost depends upon:
  - the definition of the cost object
  - the precision of the bookkeeping system that tracks costs
  - the technology available to capture cost information
  - whether the benefits of tracking the cost as direct exceed the resources expended to track the cost
  - the nature of the operations that produce the product or service

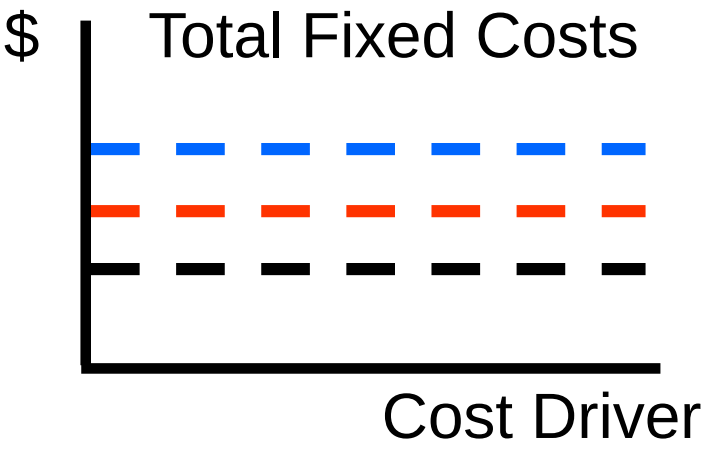
Linear Cost Behavior Terminology

- Total fixed costs are costs that do not change (in total) as activity levels change.
- Total variable costs are costs that increase (in total) in proportion to the increase in activity levels.
- Total costs equal total fixed costs plus total variable costs.
- The relevant range is the span of activity levels for which the cost behavior patterns hold.
- A cost driver is a measure of activity or volume level; increases in a cost driver cause total costs to increase.

Behavior of Total (Linear) Costs



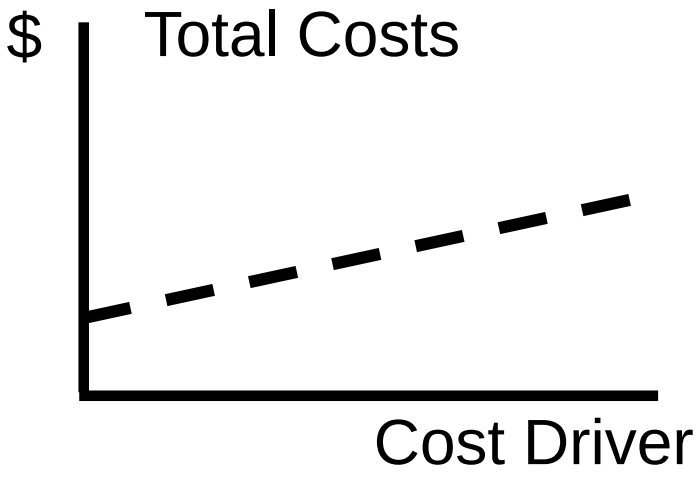
If costs are linear, then total costs graphically look like this.



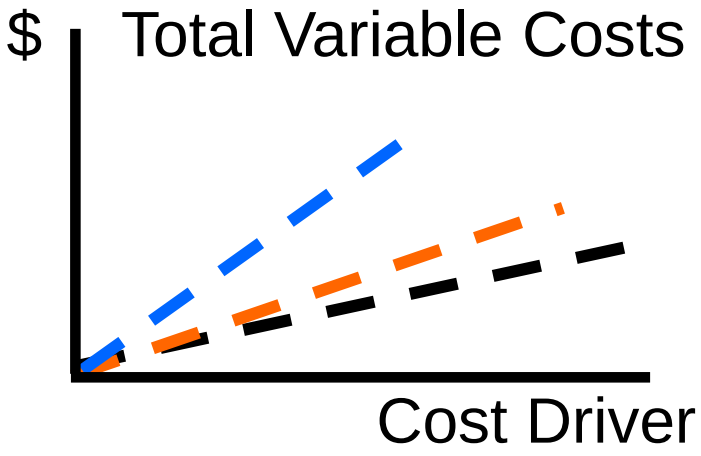
Total fixed costs do not change as the cost driver increases.

Higher total fixed costs are higher above the x axis.

Behavior of Total (Linear) Costs



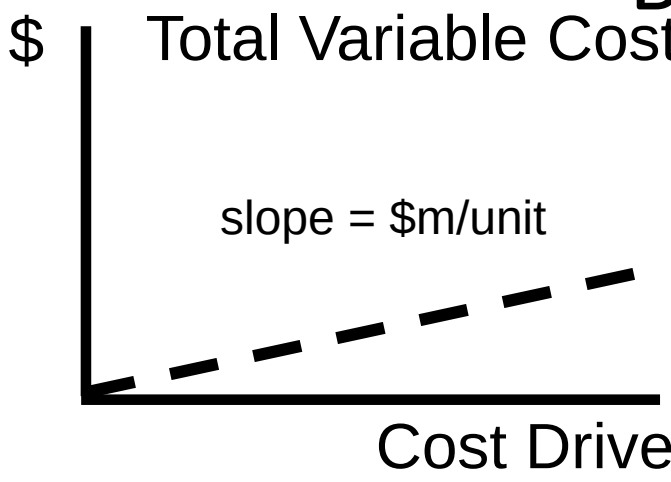
If costs are linear, then total costs graphically look like this.



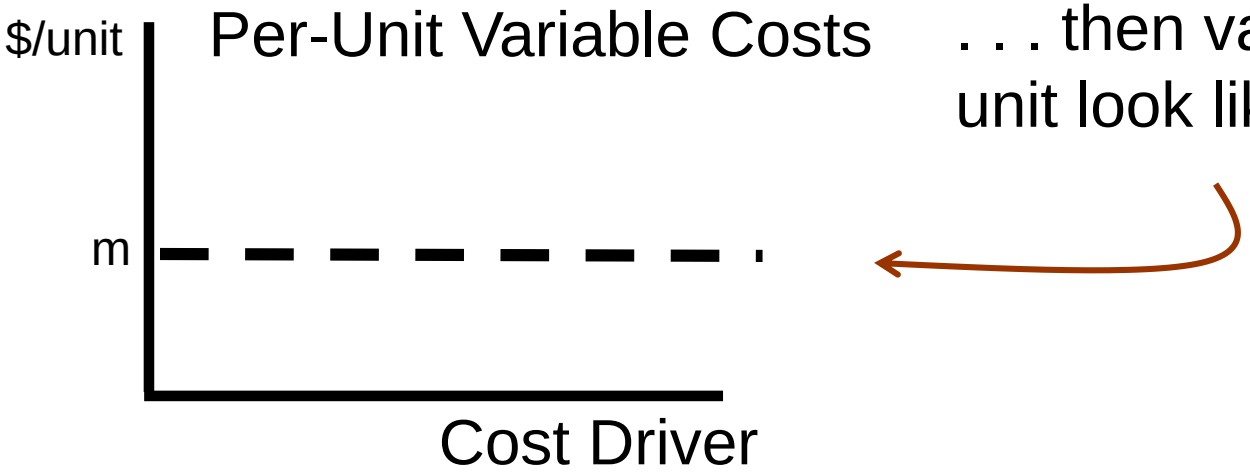
Total variable costs increase as the cost driver increases.

A steeper slope represents higher variable costs per unit of the cost driver.

Total Versus Per-unit (Average) Cost Behavior

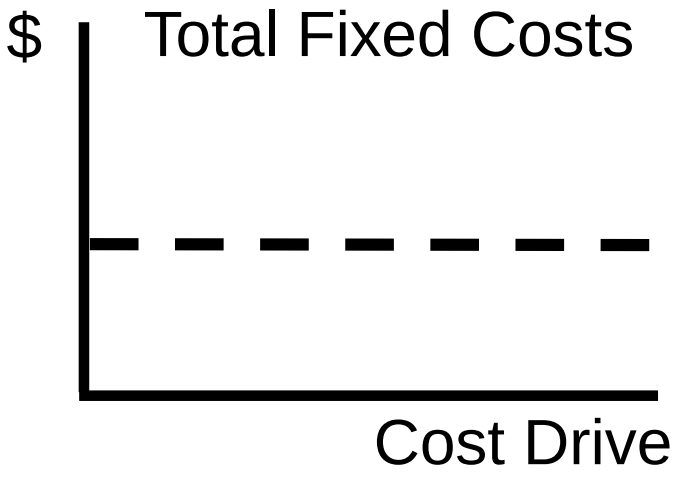


If total variable costs look like this . . .

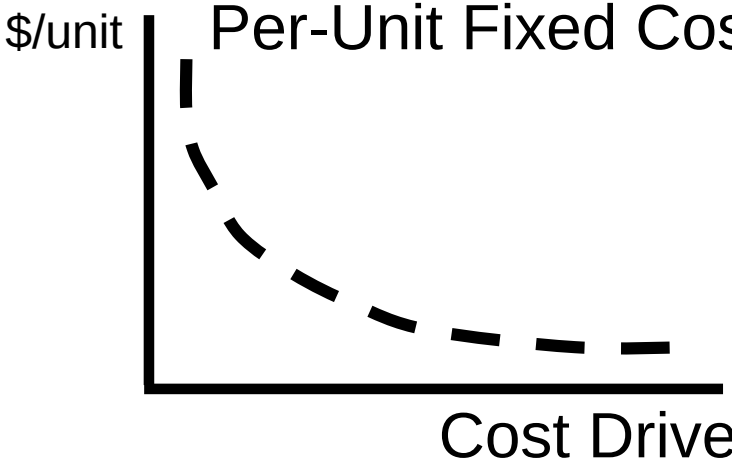


. . . then variable costs per unit look like this.

Total Versus Per-Unit (Average) Cost Behavior



If total fixed costs look like this . . .



. . . then fixed costs per unit look like this.

Total Versus Per-Unit (Average) Cost Behavior

Lari's Leather produces customized motorcycle jackets. The leather for one jacket costs $50, and Lari rents a shop for $450/month. Compute the total costs per month and the average cost per jacket if she made only one jacket per month. What if she made 10 jackets per month?

Average variable costs are constant

Total variable costs go up

1 Jacket

	Total Costs/ Month	Average Cost/ Jacket
Leather	$50	$50
Rent	$450	$450
Total	$500	$500

10 Jackets

	Total Costs/ Month	Average Cost/ Jacket
Leather	$500	$50
Rent	$450	$45
Total	$950	$95

Total fixed costs are constant

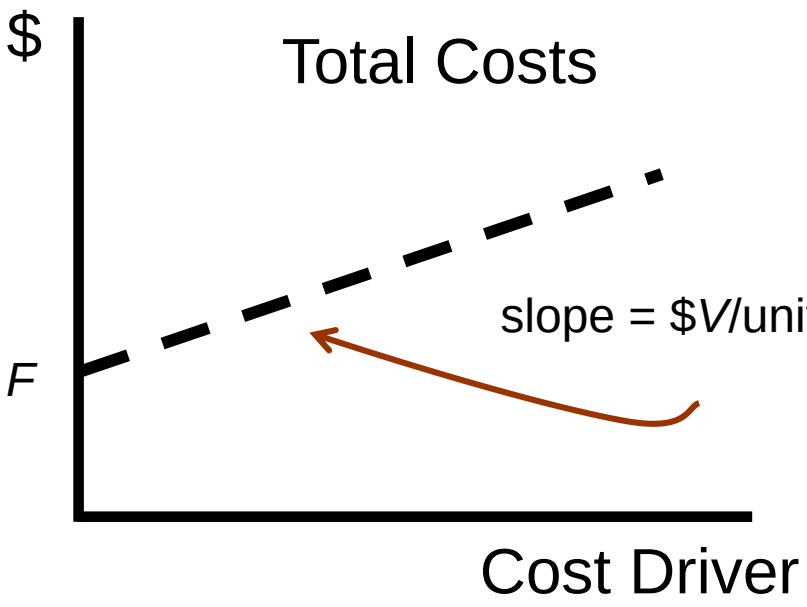
Average fixed costs go down

The Cost Function

When costs are linear, the cost function is:

TC = $F + V \times Q$, where

F = total fixed cost, V = variable cost per unit of the cost driver, and Q = the quantity of the cost driver.



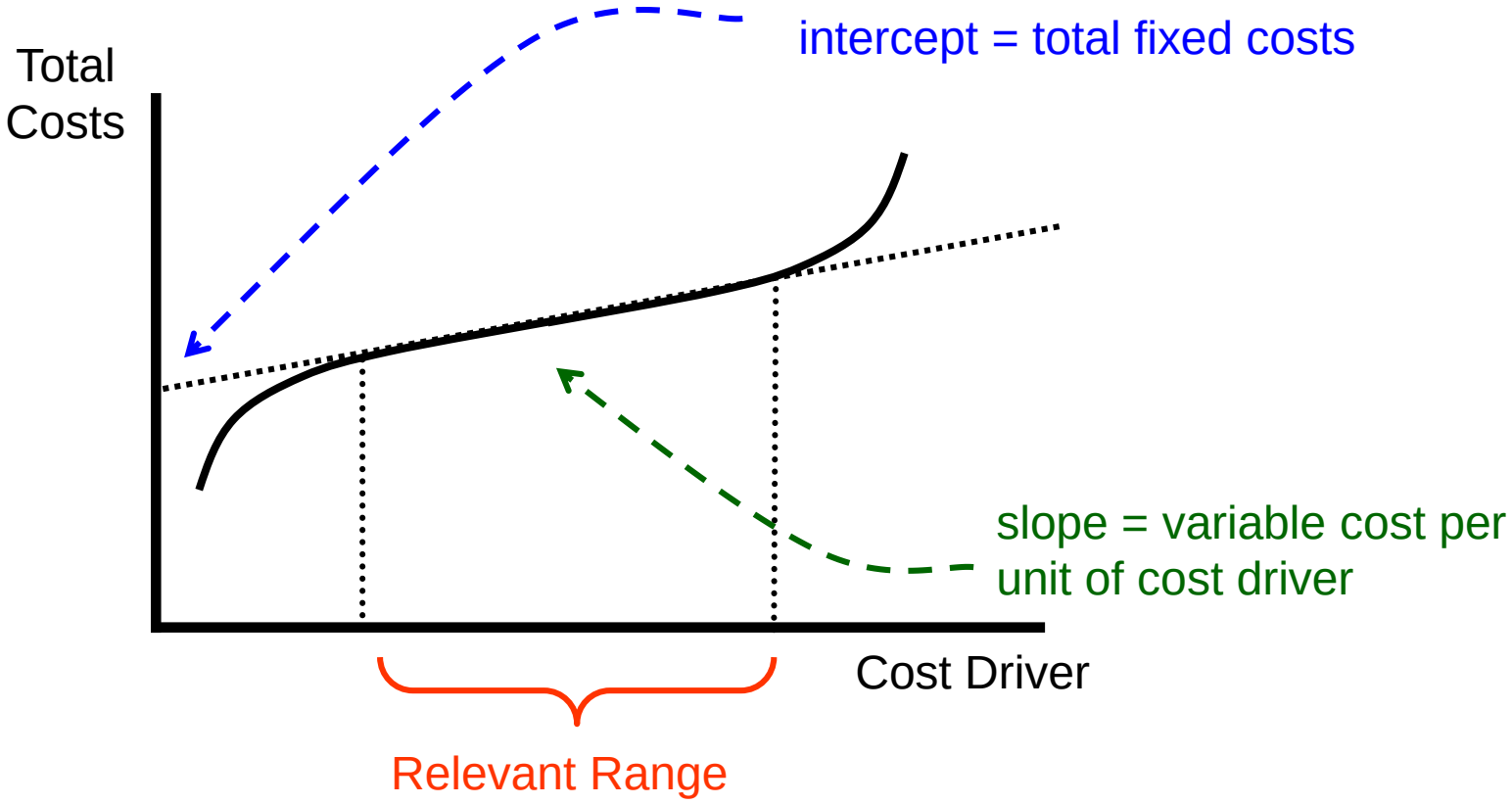
The intercept is the total fixed cost.

The slope is the variable cost per unit of the cost driver.

A cost that includes a fixed cost element and a variable cost element is known as a mixed cost.

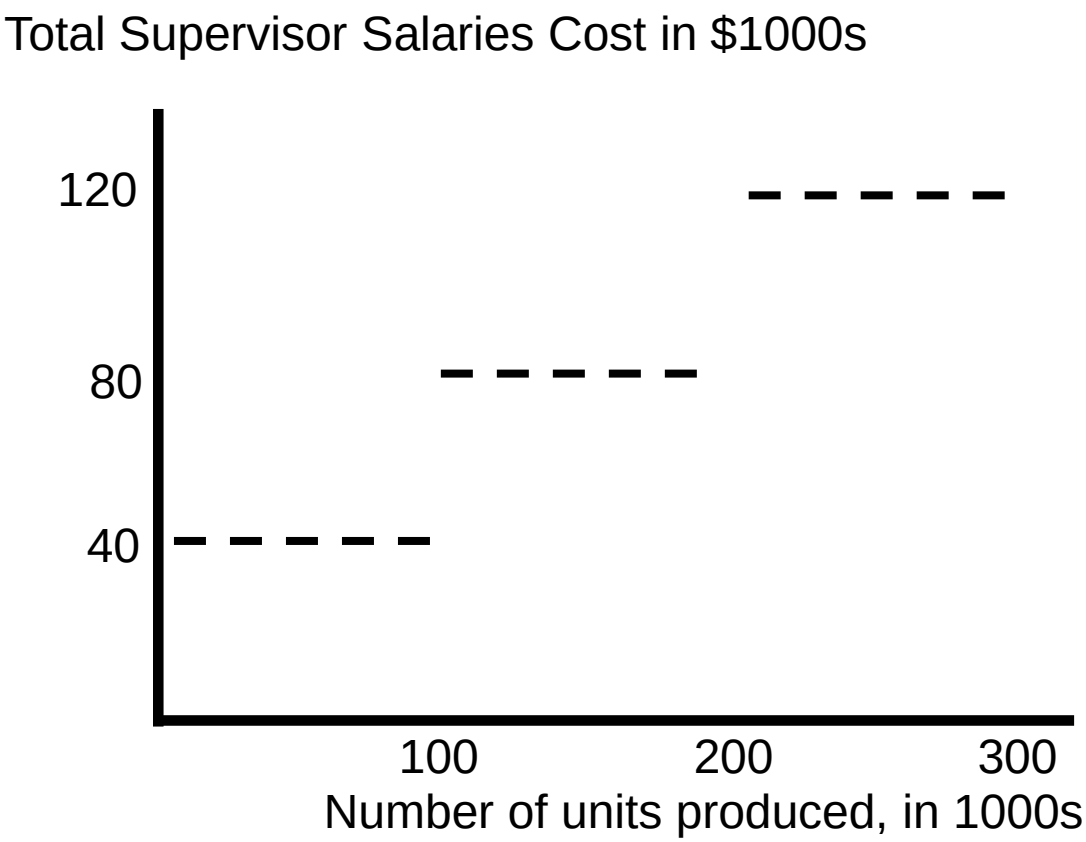
Nonlinear Cost Behavior

Sometimes nonlinear costs exhibit linear cost behavior over a range of the cost driver. This is the relevant range of activity.



Stepwise Linear Cost Behavior

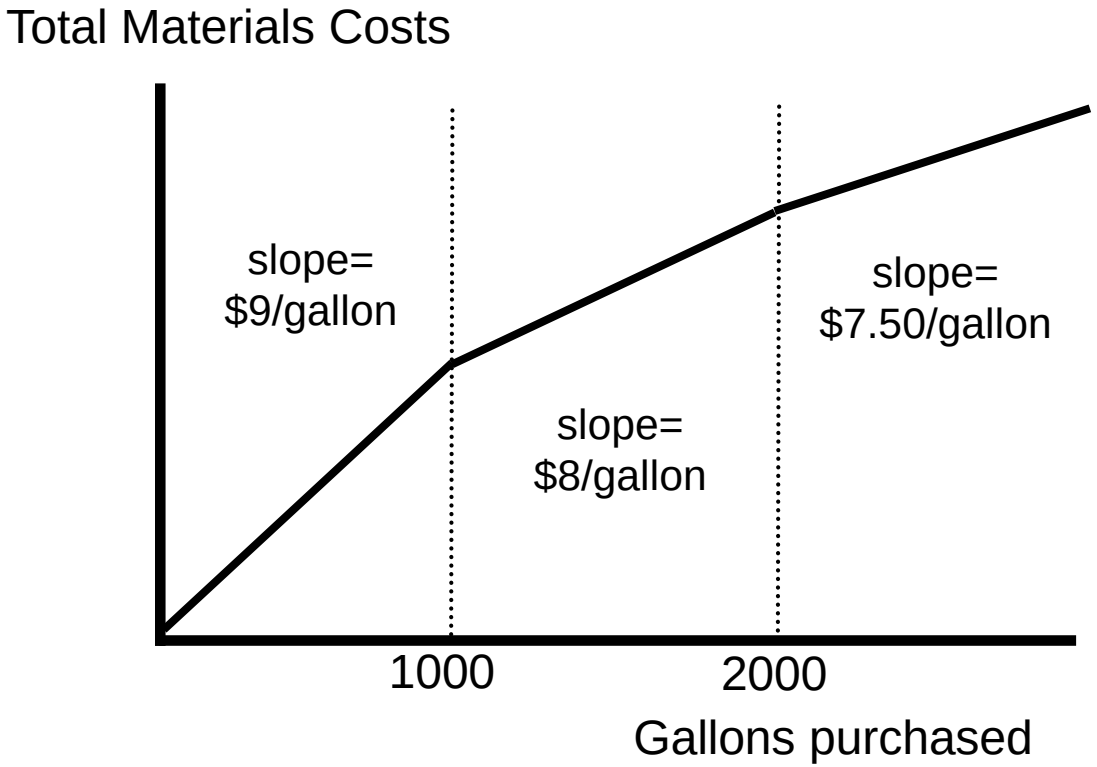
Some costs are fixed at one level for one range of activity and fixed at another level for another range of activity. These are known as stepwise linear costs.



Example: A production supervisor makes $40,000 per year and the factory can produce 100,000 units annually for each 8-hour shift it operates.

Piecewise Linear Cost Behavior

Some variable costs per unit are constant at one level for one range of activity and constant at another level for another range of activity. These are known as piecewise linear costs.



Example: A supplier sells us raw materials at $9/gallon for the first 1000 gallons, $8/gallon for the second 1000 gallons, and at $7.50/gallon for all gallons purchased over 2000 gallons.

Cost Terms for Decision Making

- We learned the distinction between relevant and irrelevant cash flows.

- Opportunity costs are the benefits of an alternative one gives up when that alternative is not chosen.
  - Opportunity costs are difficult to measure because they are associated with something that did not occur.
  - Opportunity costs are always relevant in decision making.

- Sunk costs are costs that were incurred in the past.
  - Sunk costs are never relevant for decision making.

Cost Terms for Decision Making

- Discretionary costs are periodic costs incurred for activities that management may or may not determine are worthwhile.
  - These costs may be variable or fixed costs.
  - Discretionary costs are relevant for decision making only if they vary across the alternatives under consideration.
- Marginal cost is the incremental cost of producing the next unit.
  - When costs are linear and the level of activity is within the relevant range, marginal cost is the same as variable cost per unit.
  - Marginal costs are often relevant in decision making.

What Process is Used to Estimate Future Costs?

Past costs are often used to estimate future, non-discretionary, costs. In these instances, one must also consider:

- whether the past costs are relevant to the decision at hand
- whether the future cost behavior is likely to mimic the past cost behavior
- whether the past fixed and variable cost estimates are likely to hold in the future

Engineered Estimates of Cost Functions

- Use accountants, engineers, employees, and/or consultants to analyze the resources used in the activities required to complete a product, service, or process.

- For example, a company making inflatable rubber kayaks would estimate some of the following:
  - the amount and cost of the rubber required
  - the amount and cost of labor required in the cutting department
  - the amount and cost of labor required in the assembly department
  - overhead costs and the best cost allocation base to use
  - the selling costs, including commissions and advertising
  - the distribution costs

Account Analysis Method of Estimating a Cost Function

- Review past costs in the general ledger and past activity levels to determine each cost's past behavior.
- For example, a company producing clay wine goblets might review its records and find:
  - the cost of clay is piecewise linear with respect to the number of pounds of clay purchased
  - skilled production labor is variable with respect to the number of goblets produced
  - unskilled production labor is mixed, and the variable portion varies with respect to the number of times the kiln is operated
  - production supervisors' salary costs are stepwise linear
  - distribution costs are mixed, with the variable portion dependent upon the number of retailers ordering goblets

Example - Account Analysis Method of Estimating a Cost Function

- The table on the right contains the expenditures for Scott Manufacturing during the last year.
- 100,000 units were produced and sold
- $500,000 of sales revenue was recorded

Required:

1. Determine the cost function using units produced as the driver
2. Repeat using sales dollars as the driver

Expense	Amount	Variable	Fixed
Direct Materials	$500,000		
Direct Labor	300,000		
Rent	25,000		
Insurance	15,000		
Commissions	200,000		
Property Tax	20,000		
Telephone	10,000		
Depreciation	85,000		
Power & Light	30,000		
Admin Salaries	100,000		
Total	1,285,000		

Example - Account Analysis Method of Estimating a Cost Function

- Steps in estimating a cost function using account analysis
  - Separate fixed and variable costs
  - Total the fixed costs
  - Total the variable costs
  - Calculate a variable cost per driver
  - Write out the cost function

Solution - Account Analysis Method of Estimating a Cost Function

Expense	Amount	Variable	Fixed
Direct Materials	$500,000	500,000	
Direct Labor	300,000	300,000	
Rent	25,000		25,(
Insurance	15,000		15,(
Commissions	200,000	200,000	
Property Tax	20,000		20,(
Telephone	10,000		10,(
Depreciation	85,000		85,(
Power & Light	30,000		30,000
Admin Salaries	100,000		100,000
Total	1,285,000	1,000,000	285,000

Cost Function on Units:

TC = FC + VC/Unit * Qty
TC = $285,000 + ($10/unit) * Qty

Cost Function on Dollars:

TC = FC + VC/Sales $ * Sales $
TC = $285,000 + ($0.20) * Sales $

Two-Point Method of Estimating a Cost Function

- Use the information contained in two past observations of cost and activity to separate mixed and variable costs.
- It is much easier and less costly to use than the account analysis or engineered estimate of cost methods, but:
  - it estimates only mixed cost functions,
  - it is not very accurate, and
  - it can grossly misrepresent costs if the data points come from different relevant ranges of activity

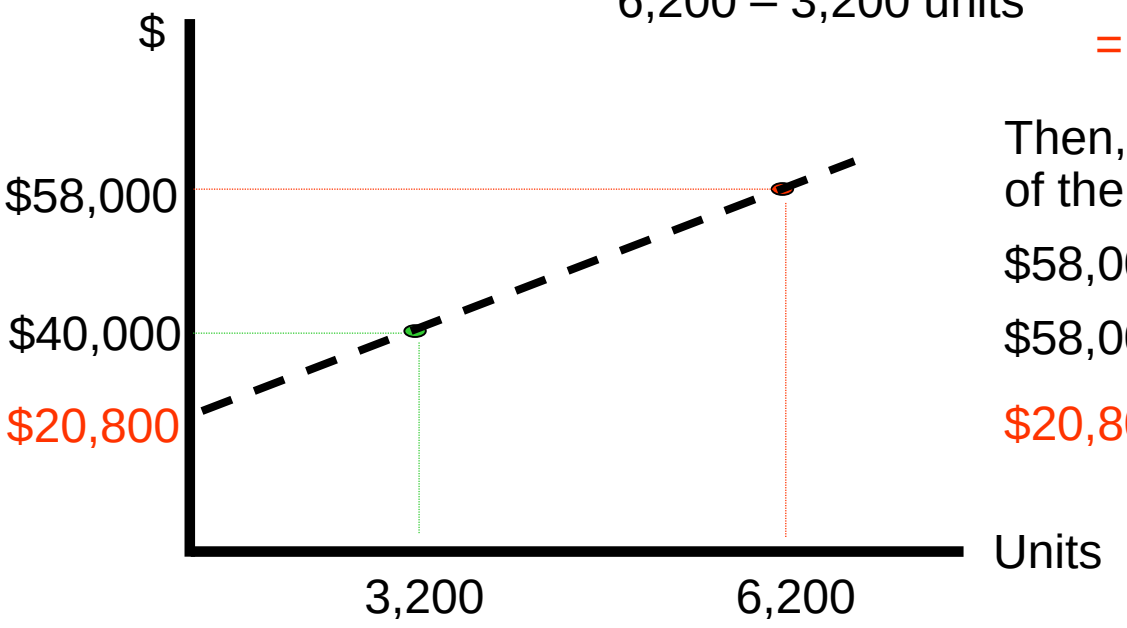
Example - Two-Point Method of Estimating a Cost Function

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?

We first need to determine *V*, using the equation for the slope of a line.

$$\text{rise/run} = \frac{\$58{,}000 - \$40{,}000}{6{,}200 - 3{,}200 \text{ units}} = \$18{,}000/3{,}000 \text{ units}$$

= $6/unit



Then, using TC = *F* + *V* x *Q*, and one of the data points, determine F.

$58,000 = *F* + $6/unit x 6,200 units

$58,000 = *F* + $37,200

$20,800 = *F*

High-Low Method of Estimating a Cost Function

- The high-low method is a two-point method
  - the two data points used to estimate costs are observations with the highest and the lowest activity levels
- The extreme points for activity levels may not be representative of costs in the relevant range
  - this method may underestimate total fixed costs and overestimate variable costs per unit,
  - or vice versa.

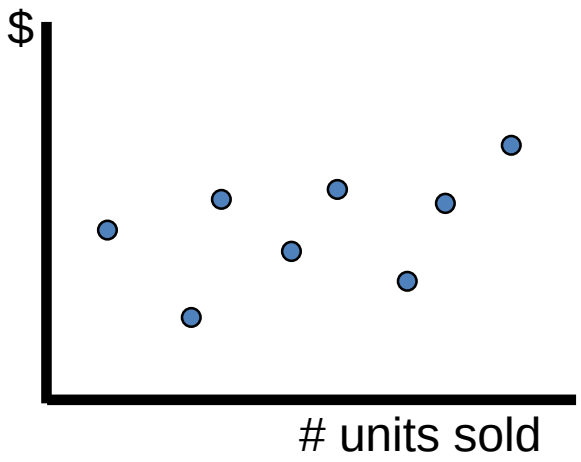
How Does a Scatterplot Assist with Categorizing a Cost?

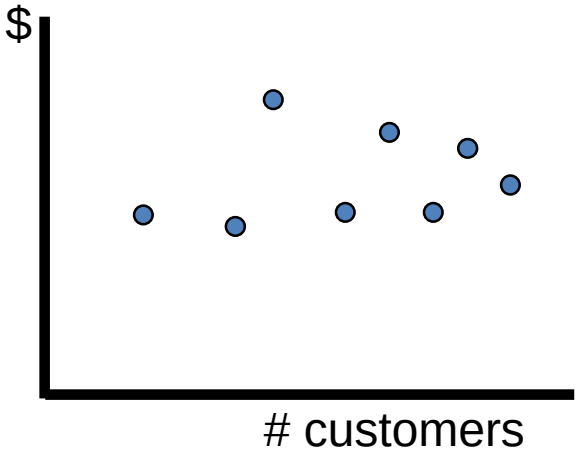
- A scatterplot shows cost observations plotted against levels of a possible cost driver.

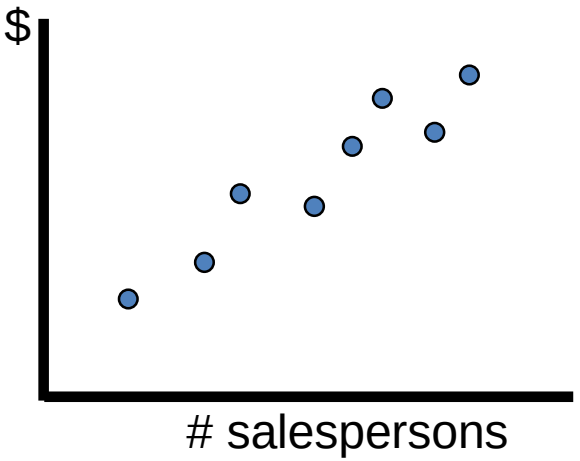
- A scatterplot can assist in determining:
  - which cost driver might be the best for analyzing total costs, and
  - the cost behavior of the cost against the potential cost driver.

Which Cost Driver Has the Best Cause & Effect Relationship with Total Cost?

8 observations of total selling expenses plotted against 3 potential cost drivers

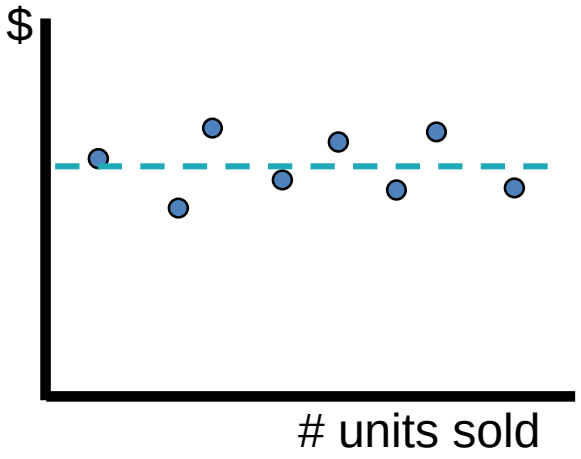






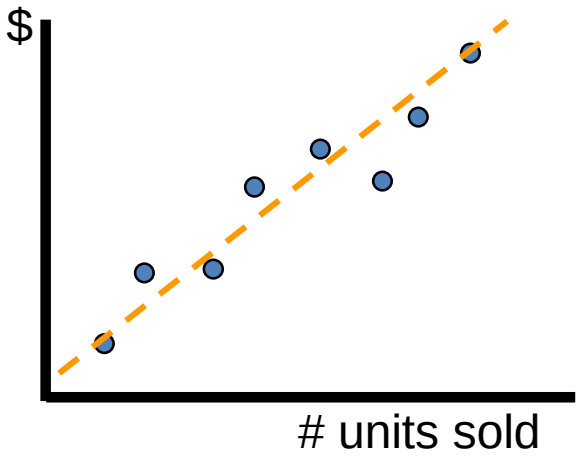
The number of salespersons appears to be the best cost driver of the 3.

What is the Underlying Cost Behavior?

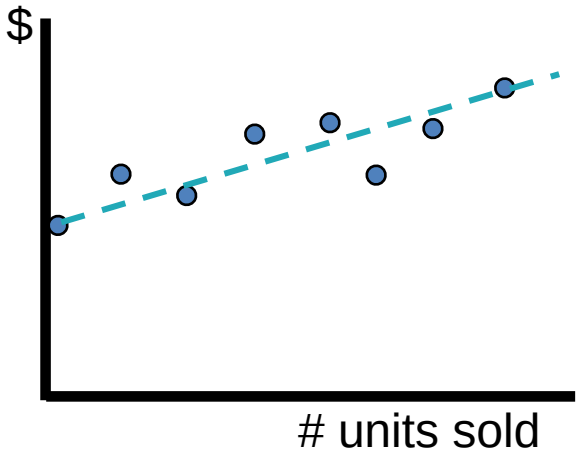


This cost is probably linear and fixed.

This cost is probably linear and variable.

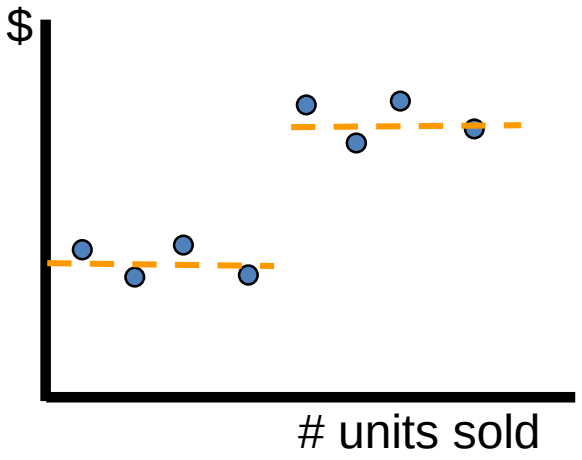


What is the Underlying Cost Behavior?

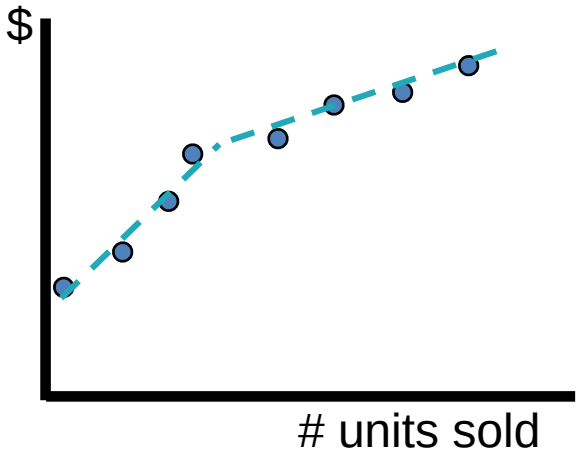


This cost is probably linear and mixed.

This is likely a stepwise linear cost.

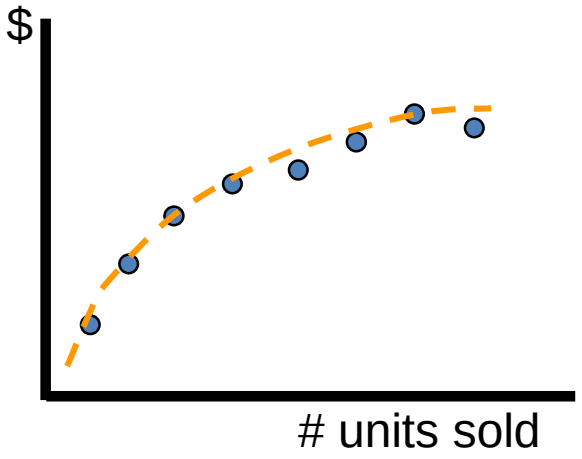


What is the Underlying Cost Behavior?



This cost may be piecewise linear.

This cost appears to have a nonlinear relationship with units sold.



How is Regression Analysis Used to Estimate a Mixed Cost Function?

- Regression analysis estimates the parameters for a linear relationship between a dependent variable and one or more independent (explanatory) variables.
- When there is only one independent variable, it is called simple regression.
- When there is more than one independent variable, it is called multiple regression.

$$Y = \alpha + \beta X + \varepsilon$$

dependent variable

independent variable

α and β are the parameters; ε is the error term (or residual)

How is Regression Analysis Used to Estimate a Mixed Cost Function?

We can use regression to separate the fixed and variable components of a mixed cost.

$$Y_i = \alpha + \beta X_i + \varepsilon_i$$

Y_i is the actual total costs for data point i

ε_i is the difference between the predicted total cost for X_i and the actual total cost for observation i

X_i is the actual quantity of the cost driver for data point i

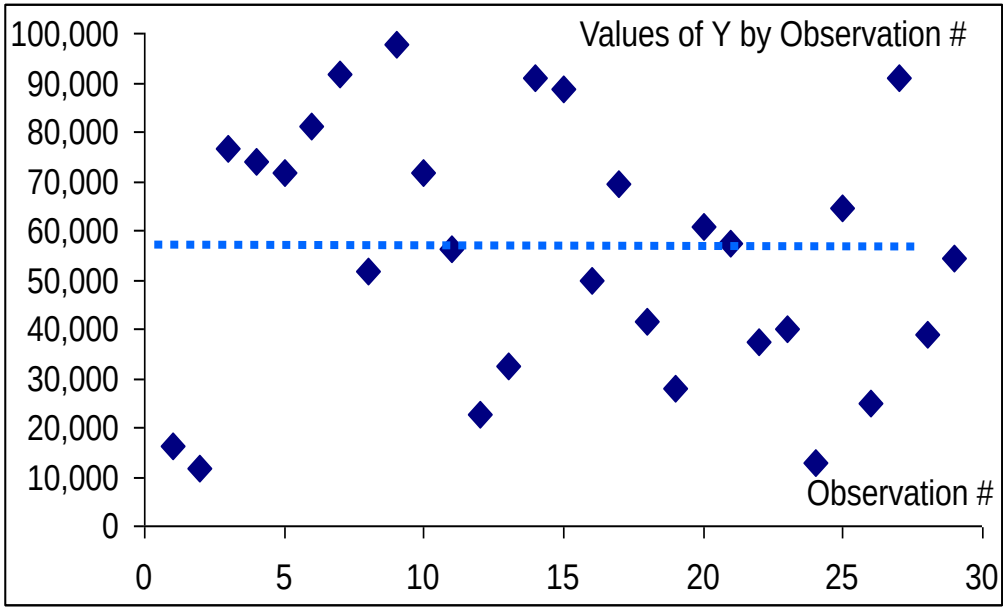
the intercept term is total fixed costs

the slope term is the variable cost per unit

Regression Output Terminology: Adjusted *R*-Square

- Goodness of fit
  - How well does the line from the regression output fit the actual data points?
  - The adjusted *R*-square statistic shows the percentage of variation in the Y variable that is explained by the regression equation.
  - The next slide has an illustration of how a regression equation can explain the variation in a Y variable.

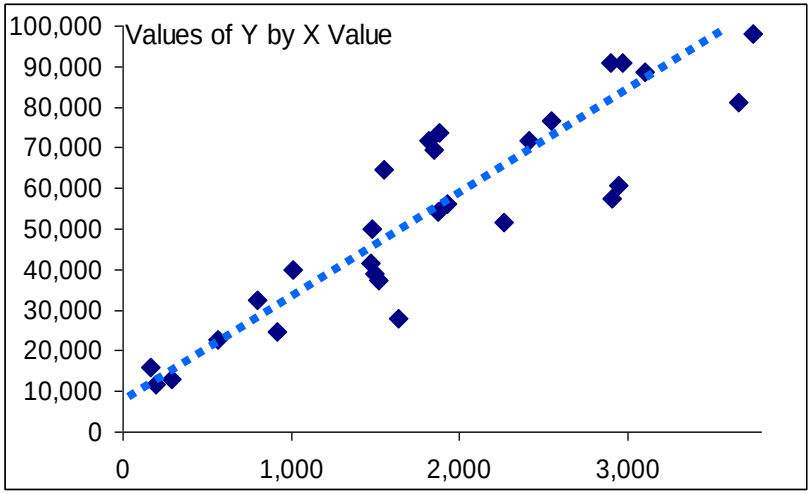
Regression Output Terminology: Adjusted *R*-Square



- We have 29 observations of a Y variable, and the average of the Y variables is 56,700.
- If we plot them in order of the observation number, there is no discernable pattern.
- We have no explanation as to why the observations vary about the average of 56,700.

Regression Output Terminology: Adjusted *R*-Square

If each Y value had an associated X value, then we could reorder the Y observations along the X axis according to the value of the associated X.



Now we can measure how the Y observations vary from the "line of best fit" instead of from the average of the Y observations. Adjusted *R*-Square measures the portion of Y's variation about its mean that is explained by Y's relationship to X.

Considerations When Using Estimates of Future Costs

- The future is always unknown, so there are uncertainties when estimating future costs.
  - The estimated cost function may have mis-specified the cost behavior.
  - The cost function may be using an incorrect cost driver.
  - Future cost behavior may not mimic past cost behavior.
  - Future costs may be different from past costs.

Considerations When Using Estimates of Future Costs

- The data used to estimate past costs may not be of high-quality.
  - The accounting system may aggregate costs in a way that mis-specifies cost behavior.
  - Information from outside the accounting system may not be accurate.
- The true cost function may not be in agreement with the cost function assumptions.
  - For example, if variable costs per unit of the cost driver are not constant over any reasonable range of activity, the linearity of total cost assumption is violated.

Costs as a relationship to outputs – cost/volume/price relationship

CVP Analysis

- CVP analysis is a planning tool for analyzing how operating decisions and marketing decisions affect short-term operating profit

- CVP relies on an understanding of the relationship between variable costs, fixed costs, unit selling price, and output level (volume)

CVP Analysis

CVP analysis can be used in:

- Setting prices for products and services
- Determining whether to introduce a new product or service
- Replacing a piece of equipment
- Determining breakeven point
- Making “Make-or-buy” (i.e., sourcing) decisions
- Determining the best product mix
- Performing strategic “what-if” (sensitivity) analysis

CVP Analysis

The CVP model is as follows:

Operating profit = Sales – Total costs

or

Sales = Fixed costs + Variable costs + Operating profit

or

Operating profit = (Units sold × selling price/unit) – (Units sold × variable cost/unit) – Fixed costs

CVP Analysis

For convenience, the (single-product) model is commonly shown in symbolic form:

$$\pi_B = (p \times Q) - (v \times Q) - F$$

Where:

Q = units sold (i.e., sales volume)
p = selling price per unit
F = total fixed cost
v = variable cost per unit
π_B = operating profit (before tax)

CVP Analysis

Three additional concepts regarding the CVP model:

1. Contribution margin:

- *Unit contribution margin* (cm) = Unit sales price (p) – Unit variable cost (v)
- Unit contribution margin (cm) = the increase in operating profit for a unit increase in sales = (p – v)
- *Total contribution margin* (CM) = Unit contribution margin (cm) × Units sold (Q)

CVP Analysis

– *Contribution margin ratio* = Unit contribution margin (cm)÷ unit sales price (p)

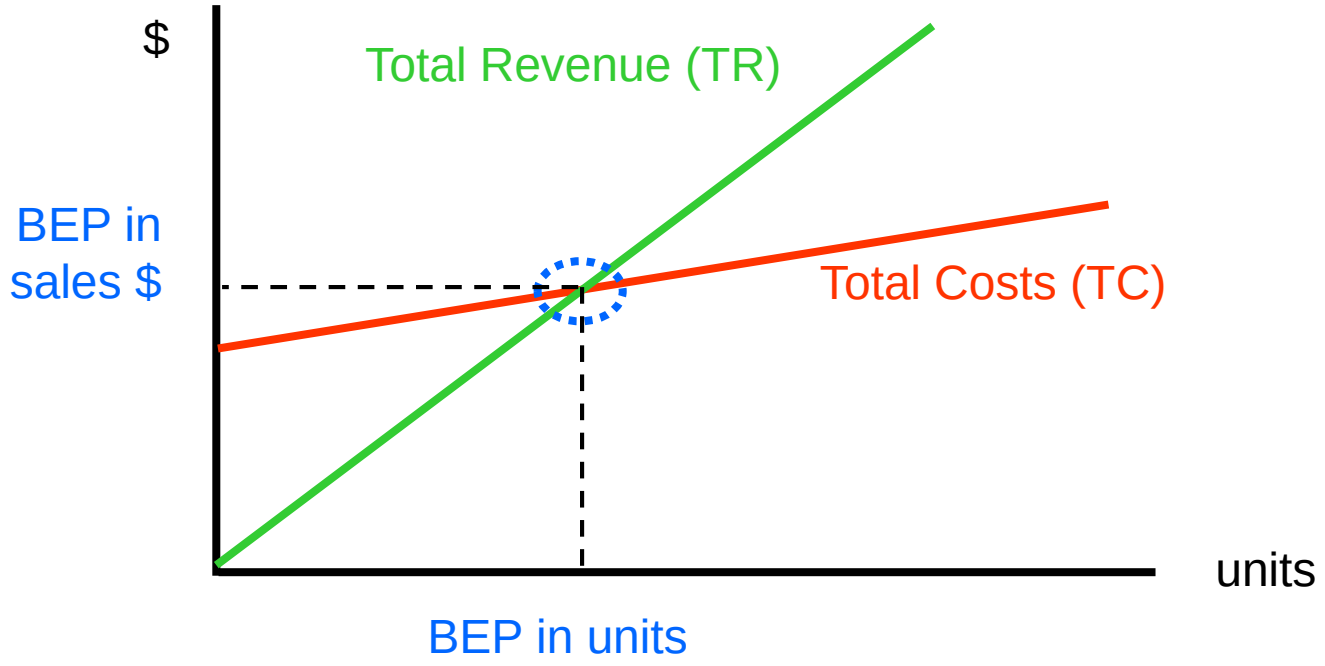
$$= (p - v) \div p \quad = \quad cm/p$$

– The *contribution income statement*:

- A useful way to show information developed in CVP analysis
- Classifies costs based on cost *behavior* (fixed versus variable) rather than cost type (product versus period)
- Provides an easy and accurate prediction of the effect of a change in sales on operating profit

CVP Analysis and the Breakeven Point

- CVP analysis looks at the relationship between selling prices, sales volumes, costs, and profits.
- The breakeven point (BEP) is where total revenue equal total costs.



How is CVP Analysis Used?

- CVP analysis can determine, both in units and in sales dollars:
  - the volume required to break even
  - the volume required to achieve target profit levels
  - the effects of discretionary expenditures
  - the selling price or costs required to achieve target volume levels
- CVP analysis helps analyze the sensitivity of profits to changes in selling prices, costs, volume and sales mix.

CVP Calculations for a Single Product

$$\text{Units required to achieve target pretax profit} = Q = \frac{F + \text{Profit}}{P - V}$$

where F = total fixed costs

P = selling price per unit

V = variable cost per unit

$P - V$ = contribution margin per unit

To find the breakeven point in units, set Profit = 0.

CVP Calculations for a Single Product

$$\text{Sales \$ required to achieve target pretax profit} = \frac{F + \text{Profit}}{CMR}$$

where F = total fixed costs

CMR = contribution margin ratio

$= (P - V)/P$

Note that CMR can also be computed as

$$CMR = \frac{\text{Total Revenue} - \text{Total Variable Costs}}{\text{Total Revenue}}$$

To find the breakeven point in sales \$, set Profit = 0.

Strategic Role of CVP Analysis

CVP analysis can help a firm choose its competitive position and execute its strategy by providing an understanding of how changes in sales volume affect costs and profits

- This process is most important for cost leadership firms during the manufacturing stage
- Differentiated firms use CVP analysis to assess profitability and desirability of new products and features

Strategic Role of CVP Analysis

CVP analysis is also important in life-cycle costing and target costing

- CVP analysis can assist in *life-cycle costing* by helping to determine whether a product is likely to achieve its desired profitability, the most cost-effective manufacturing process, the best marketing and distribution channels, the best compensation plan, whether to offer discounts, etc.
- CVP analysis can assist in *target costing* by showing the effect on profit of alternative product designs that have different target costs

CVP Analysis in Profit Planning

CVP analysis can be used to determine the sales volume needed to achieve a desired level of before tax profit:

$$Q = \frac{F + \pi_B}{p - v}$$

$$Q = \frac{\$60{,}000 + \$48{,}000}{(\$75 - \$35)/\text{unit}}$$

$$Q = 2{,}700 \text{ units per year}$$

In sales dollars the result is

$$p \times Q = \$75/\text{unit} \times 2{,}700 \text{ units/year}$$

$$p \times Q = \$202{,}500 \text{ per year}$$

CVP and Profit Planning

Assume that HFI has the option to choose between two machines that will complete the same operation with the same quality, but with different variable costs per unit (v) and different total fixed costs (F). B/E analysis can help HFI find the level of sales (called the "indifference point"), such that having sales > that this level will favor the option with the higher fixed costs, and having sales < this level will favor the low fixed cost option.

Which alternative should be chosen?

CVP and Profit Planning

Cost of Machine A	=	Cost of Machine B
$5,000 + ($10 × *Q*)	=	$15,000 + ($5 × *Q*)
Q	=	$10,000 ÷ $5/unit
Q	=	2,000 units

CVP and Profit Planning

Management decisions about costs and prices usually must include *income taxes* because taxes affect the amount of net profit at a given level of sales

In the HFI example, if we assume that the average income tax rate is 20 percent, to achieve the desired annual *after-tax* profit of $48,000, HFI must generate before-tax profits of ....

$$\text{Before-tax profit, } \pi_B = \text{After-tax profit, } \pi_A/(1 - \text{Tax Rate})$$

$$\pi_B = \pi_A \div (1 - t)$$

$$\pi_B = \$48{,}000 \div (1 - 0.2)$$

$$\pi_B = \$60{,}000$$

CVP and Profit Planning

Thus, when taxes are considered, the CVP model is as follows, with t = average tax rate

$$Q = \frac{F + \dfrac{\text{After-Tax Profit}}{(1 - t)}}{(p - v)}$$

$$Q = \frac{\$60{,}000 + [\$48{,}000 \div (1 - 0.20)]}{(\$75 - \$35)/\text{unit}}$$

$$Q = 3{,}000 \text{ units}$$

CVP Analysis and Activity-Based Costing (ABC)

The conventional approach to CVP analysis is to use a volume-based measure to forecast costs, but an ABC approach is also possible:

- If the assumption is made that total batch-level costs are fixed relative to the number of batches, both approaches will produce the same result
- On the other hand, if the activity cost pool is a mixed cost, the ABC approach will provide a more accurate estimate of cost because the volume-based approach treats all activity costs that do not vary with output volume, such as machine setup, materials handling, inspection, and engineering, as fixed

CVP Analysis and ABC

In the ABC approach, additional terms are needed to define the fixed cost element (HFI's results are in parentheses below):

- F^{VB} = the level of *volume-based fixed costs*, or the portion of fixed costs that do not vary with the activity cost driver, $50,000 ($60,000 – $10,000)
- F^{AB} = the portion of fixed costs that *does* vary with the activity cost driver ($10,000)
- v^{AB} = the cost per batch for the ABC driver ($100/batch)
- b = the number of units in a batch (30)
- v^{AB}/b = the cost per unit for batch-related costs when the batch is size b, $3.333 ($100/batch ÷ 30 units/batch)

CVP Analysis and ABC

The CVP model under ABC (for batch-related costs):

$$Q = \frac{F^{VB} + \pi_B}{p - v - (v^{AB}/b)}$$

Therefore, output quantity for HFI is:

$$Q = \frac{\$50{,}000 + \$48{,}000}{\$75 - \$35 - (\$100/30)} = 2{,}673 \text{ units } (2{,}673/30 = 89.1 \text{ batches})$$

There are no partial batches so \$9,000 (90 batches × \$100 per batch) must be figured into the equation

$$Q = \frac{\$50{,}000 + \$9{,}000 + \$48{,}000}{\$75 - \$35} = 2{,}675 \text{ units in 90 batches}$$

Dealing with Risk and Uncertainty

Sensitivity analysis is the name for a variety of methods that examine how an amount (e.g., B/E point) changes if factors involved in predicting that amount change (e.g., sales volume or unit variable cost). For CVP, three methods of *sensitivity analysis* are commonly employed:

(1) ***What-if analysis*** *(using the contribution margin and contribution margin ratio)*

(2) Construction of ***decision tables/decision trees***, and

(3) ***Monte Carlo Simulation*** (MCS)

Other Approaches to handling risk/uncertainty:

(1) Margin of safety and Margin of safety Ratio

(2) Degree of operating leverage (DOL)

Handling Risk and Uncertainty: What-if analysis

What-if analysis is the calculation of an amount given different levels of a factor that influences that amount

- Example: if contribution margin (cm) is $40 per unit and the cm ratio is 0.53333, each unit change in sales volume affects profit by $40 and each dollar change in sales affects profits by $0.53333

Risk and Uncertainty: Some Useful Metrics

Margin of safety (MOS) is the dollar amount of sales above the B/E point (i.e., forecasted (or actual) sales level minus the B/E sales level):

MOS = planned (or actual) sales − breakeven sales
(in units or in dollars)

Margin of safety ratio (MOS%) = MOS ÷ planned (or actual) sales volume = the percentage that sales could fall (from planned or actual levels) before losses occur

Handling Risk and Uncertainty: Degree of Operating Leverage

- Operating leverage refers to the extent of fixed costs in the cost structure of an organization. The greater the operating leverage, the greater the operating risk (i.e., not being able to cover fixed costs via operations).
- Degree of operating leverage (DOL), at any sales volume level, represents the sensitivity of operating income to changes in sales volume.

$$\text{DOL} = \text{CM} \div \text{operating profit}$$

The Five Steps of Strategic Decision Making for CVP Analysis: A Real Estate Business Example

1. **Determine the Strategic Issues Surrounding the Problem:** *the business competes on quality and reliability of service*
2. **Identify the Alternative Actions**: *choose among printer and cartridge options*
3. **Obtain Information and Conduct Analyses of the Alternatives:** *CVP analysis favors the larger cartridge and determines an indifference point for the new printer*
4. **Based on Strategy and Analysis, Choose and Implement the Desired Alternative***: because of concerns for the print quality of the new printer, the current printer is chosen*
5. **Provide an On-going Evaluation of the Effectiveness of implementation in Step 4.**

Multi-Product (or Service) CVP Analysis

- If all fixed costs are traceable to individual products, then the organization can develop a separate CVP model for each product
- Alternatively, the multi-product firm can make an assumption regarding a standard sales mix in which its products are sold
- Sales mix can be determined on the basis of sales dollars or unit sales
- The assumption of sales mix allows the firm to calculate and use a weighted-average contribution margin (cm) *per unit* and weighted average cm *ratio* to complete the multi-product CVP analysis

Example: Multi-Product CVP Analysis

Windbreakers, Inc. sells light-weight sports/recreational jackets and currently has three products: Calm, Windy, and Gale. Total (joint) fixed costs for the period are expected to be $168,000, and we assume the windbreakers' sales mix, measured by sales ***dollars***, will remain constant. Additional information is provided below. (Since sales mix is constant in $, we will use the contribution margin ratio in the analysis. See next slide…)

	Calm	Windy	Gale	Total
Last period's sales	$ 750,000	$ 600,000	$ 150,000	$ 1,500,000
Percent of sales	50%	40%	10%	100%
Price	$ 30	$ 32	$ 40	
Unit variable cost	24	24	36	
Contribution margin	$ 6	$ 8	$ 4	
Contribution margin ratio	0.20	0.25	0.10	

Example: Multi-Product CVP

From this information, we can calculate the wtd. avg. cm ratio:

Weighted-average CMR = 0.5(0.2) + 0.4(0.25) + 0.1(0.1) = 0.21

The breakeven point for all three products can be calculated as follows:

Y = \$168,000 ÷ 0.21

Y = \$800,000

This means that for Windbreakers to break even, \$800,000 of all three products must be sold in the same proportion as last year's sales mix. The sales for each product need to be as follows:

For Calm	0.5(\$800,000) =	\$400,000	(13,334 units)
For Windy	0.4(\$800,000) =	320,000	(10,000 units)
For Gale	0.1(\$800,000) =	80,000	(2,000 units)
		\$800,000	

CVP Analysis for Multiple Products

When a company sells more than one product the CVP calculations must be adjusted for the sales mix. The sales mix should be stated as a proportion

- of total units sold when performing CVP calculations for in units.

- of total revenues when performing CVP calculations in sales $.

Assumptions in CVP Analysis

CVP analysis assumes that costs and revenues are linear within a relevant range of activity.

- Linear total revenues means that selling prices per unit are constant and the sales mix does not change.
  - Offering volume discounts to customers violates this assumption.
- Linear total costs means total fixed costs are constant and variable costs per unit are constant.
  - If volume discounts are received from suppliers, then variable costs per unit are not constant.
  - If worker productivity changes as activity levels change, then variable costs per unit are not constant.

Assumptions in CVP Analysis

- These assumptions may induce a small relevant range.
  - Results of CVP calculations must be checked to see if they fall within the relevant range.
- Linear CVP analysis may be inappropriate if the linearity assumptions hold only over small ranges of activity.
  - Nonlinear analysis techniques are available.
  - For example, regression analysis, along with nonlinear transformations of the data, can be used to estimate nonlinear cost and revenue functions.

Degree of Operating Leverage

- The degree of operating leverage measures the extent to which the cost function is comprised of fixed costs.
- A high degree of operating leverage indicates a high proportion of fixed costs.
- Businesses operating at a high degree of operating leverage
  - face higher risk of loss when sales decrease,
  - but enjoy profits that rise more quickly when sales increase.

Degree of Operating Leverage

The degree of operating leverage can be computed 3 ways.

degree of operating leverage =

$$\frac{\text{Contribution margin}}{\text{Profit}}$$



$$\frac{1}{\text{Margin of safety percentage}}$$

Degree of Operating Leverage

Suppose that Bill's Briefcases has budgeted next year's sales at 5,000 units. Compute Bill's degree of operating leverage. Recall that P = \$200, V = \$80, F = \$360,000, and the margin of safety percentage at 5,000 units is 40%.

First, compute contribution margin and profit at 5,000 units:

Contribution margin = (\$200 - \$80) x 5,000 = \$600,000

Profit = \$600,000 - \$360,000 = \$240,000

$$\text{Degree of operating leverage} = \frac{\$600,000}{\$240,000} = 2.5$$

$$\text{or, degree of operating leverage} = \frac{\$360,000}{\$240,000} + 1 = 2.5$$

$$\text{or, degree of operating leverage} = \frac{1}{40\%} = 2.5$$

Summary Assumptions of CVP Analysis

- The CVP model assumes revenues and costs are *linear* over a "relevant range" (even though the actual cost behavior may not be linear)
- Outside the *relevant range*, these calculations may not be accurate
- *Step costs* also make approximation via the relevant range unworkable; CVP analysis becomes much more cumbersome
- The basic model is *deterministic*.

Using the Degree of Operating Leverage

- The degree of operating leverage shows the sensitivity of profits to changes in sales.
- On the prior slide Bill's degree of operating leverage was 2.5 and profits were $240,000.
    - If expected sales were to increase to 6,000 units, a 20% increase, then profits would increase by 2.5 x 20%, or 50%, to $360,000.*
    - If expected sales were to decrease to 4,500 units, a 10% decrease, then profits would decrease by 2.5 x 10%, or 25%, to $180,000.**

* $240,000 x 1.5 = $360,000

** $240,000 x 0.75 = $180,000

Summary

- CVP analysis is a method for analyzing how operating and marketing decisions affect profit
- CVP analysis depicts the relationship between variable costs, fixed costs, unit selling price, and output level (volume)
- CVP analysis can help a firm choose its strategic position and execute its strategy by providing an understanding of how changes in its volume of sales affect costs and profits

Summary

- *CVP analysis* can be used to determine the level of sales needed to achieve a desired level of profit through revenue planning, cost planning, and accounting for the effect of income taxes

- The conventional approach to CVP analysis is to use a volume-based measure, but an activity-based costing (ABC) approach to CVP analysis is preferred when batch-level cost behavior is significant

Summary

- Two general approaches for addressing risk/uncertainty in CVP analysis:
  - *Sensitivity analysis*
  - *Other approaches*
- *Sensitivity analysis* is the name for a variety of methods that examine how an amount changes if factors involved in predicting that amount change.

Summary

- The session provides three different approaches to sensitivity analysis:
  - What-if analysis
  - Decision tables/trees
  - Monte Carlo Simulation (MCS)
- Other approaches to dealing with risk/uncertainty:
  - Margin of safety (MOS) and Margin of Safety Ratio (MOS%)
  - Degree of Operating Leverage (DOL)

Summary

CVP analysis can be used in the multi-product/service case, but it is often impractical to apply CVP analysis separately for each product

- The existence of joint/common (i.e., non-traceable) fixed costs complicates short-run profit planning through CVP analysis

- If the firm can assume that its sales mix (either in units or in dollars) remains relatively constant as total volume changes, then it can use for profit-planning purposes a *weighted-average cm per unit* (sales mix constant in units) or a *weighted-average cm ratio* (sales mix constant in dollars) for short-term profit-planning purposes.

Summary

CVP analysis relies for its validity on a number of assumptions:

- For conventional CVP analysis, volume of sales (units) is the only important cost driver
- Costs, both variable and fixed, are linear within the relevant range of output
- The revenue function is linear within the relevant range (i.e., the firm's price is constant)

Summary

- Total costs can be reliably split into fixed and variable components
- The inputs in the CVP model are known with certainty; for this purpose, conventional CVP uses point estimates for the factors in the model
- For the multi-product firm, either fixed costs can be traced (or reliably allocated) to individual products OR the firm's products are sold in a constant sales-mix (expressed either in dollars or units)

The concept of contribution margin

What is CVP? How is it used?

- Managers want to know how profits will change as the units sold of a product or service changes.
- Managers like to use “what-if” analysis to examine the possible outcomes of different decisions so they can make the best one.
- Total revenues, total costs and income. Take a closer look at the relationship among the elements (selling price, variable costs, fixed costs).

A Five-Step Decision-Making Process in Planning and Control - Revisited

1. Identify the problem and uncertainties.
2. Obtain information.
3. Make predictions about the future.
4. Make decisions by choosing between alternatives, using cost-volume-profit (CVP) analysis.
5. Implement the decision, evaluate performance, and learn.

Foundational Assumptions USED in CVP ANALYSIS

- Changes in production/sales volume are the sole cause for cost and revenue changes.
- Total costs consist of fixed costs and variable costs.
- Revenue and costs behave and can be graphed as a linear function (a straight line).
- Selling price, variable cost per unit, and fixed costs are all known and constant.
- In many cases only a single product will be analyzed. If multiple products are studied, their relative sales proportions are known and constant.
- The time value of money (interest) is ignored.

CVP: Contribution Margin

- Manipulation of the basic equations yields an extremely important and powerful tool extensively used in cost accounting: contribution margin (CM).
- Contribution margin equals revenue less variable costs.
- Contribution margin per unit equals unit selling price less unit variable costs or can be obtained by taking contribution margin divided by number of units sold.

CVP: Contribution Margin Additional calculations

You can also calculate:

- Contribution margin which is equal to the contribution margin per unit multiplied by the number of units sold.
- Contribution margin percentage which is the contribution margin per unit divided by unit selling price or Contribution margin divided by revenue.

Cost–Volume–Profit Equation

REVENUE – VARIABLE - FIXED = OPERATING
COSTS COSTS INCOME

(Selling Price * Quantity of Units Sold) - (Unit Variable Costs * Quantity of Units Sold) - Fixed Costs = Operating Income

Keep in mind the following:

Selling Price * Quantity of Units Sold = Revenue
Unit Variable Costs * Quantity of Units Sold = Variable Costs
Revenue – Variable Costs = Contribution Margin
Contribution Margin – Fixed Costs = Operating Income

Breakeven Point

- At the breakeven point, a firm has *no profit or loss* at the given sales level. Breakeven is where:
  - Sales – Variable Costs – Fixed Costs = 0
- Calculation of breakeven number of units
  - Breakeven Units = $\frac{\text{Fixed Costs}}{\text{Contribution Margin per Unit}}$
- Calculation of breakeven revenues
  - Breakeven Revenue = $\frac{\text{Fixed Costs}}{\text{Contribution Margin Percentage}}$

Breakeven Point, extended: Profit Planning

- The breakeven point formula can be modified to become a profit planning tool by adding Target Operating Income to fixed costs in the numerator.

$$\text{Quantity of Units Required to Be Sold} = \frac{\text{(Fixed Costs+Target Operating Income)}}{\text{Contribution Margin per Unit}}$$

Let's review: emma

Emma has fixed costs of $2,000 and a contribution margin percentage of 40%.

If Emma wants to make a profit of $2,000, what must revenue equal?

What if Emma wants to make a profit of $3,000, what must revenue equal?

Remember the formula: (Fixed Cost+ Target Operating Income) / Contribution Margin %

Let's look at the details:

EMMA's ANALYSIS FOR TARGET OPERATING INCOME

For OPERATING INCOME of $2,000

Revenue=(FC+TOI)/CM%

Revenue = (2,000+2,000)/.40 =

Revenue = $10,000

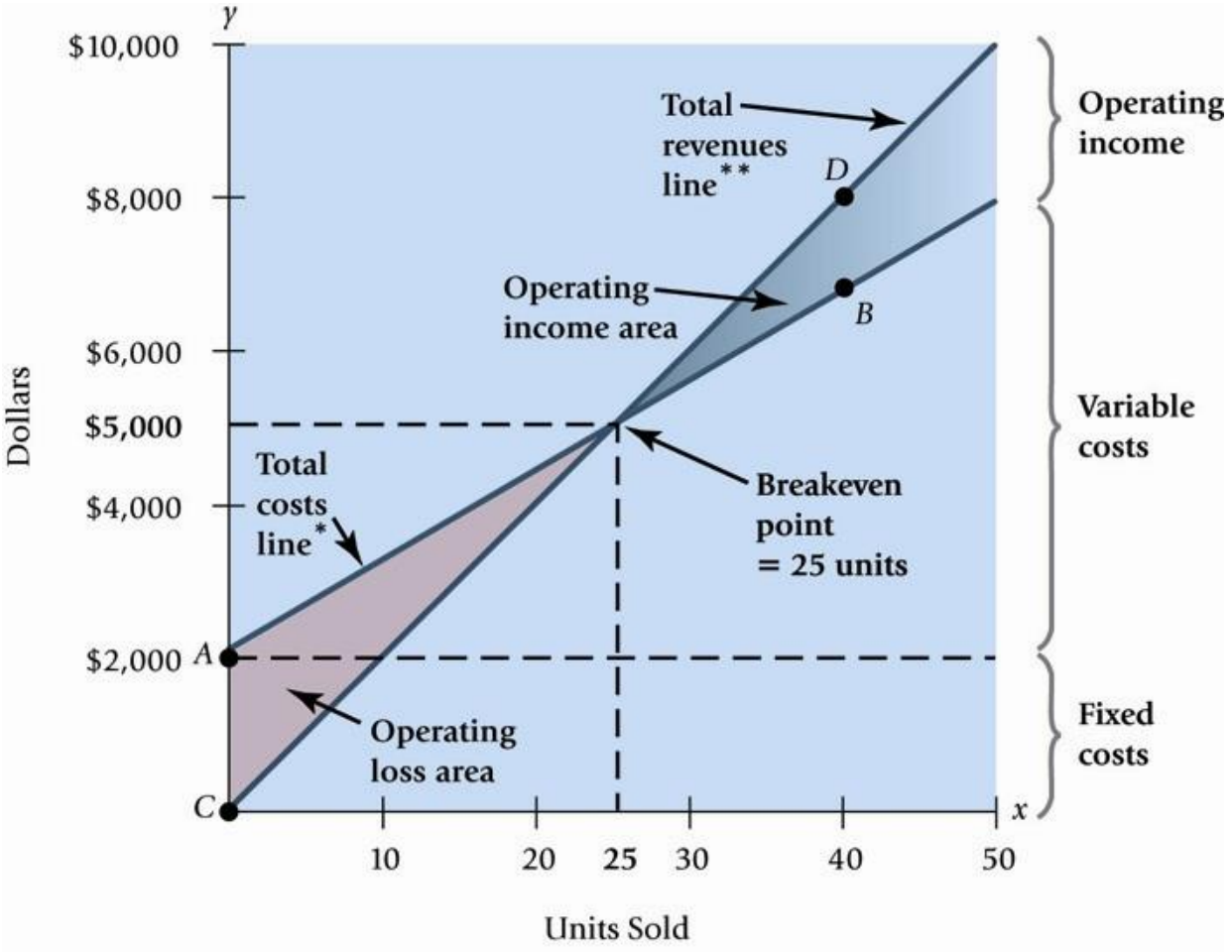
For OPERATING INCOME of $3,000

Revenue=(FC+TOI)/CM%

Revenue = (2,000+3,000)/.40 =

Revenue = $12,500

CVP: Graphically



*Slope of the total costs line is the variable cost per unit = $120

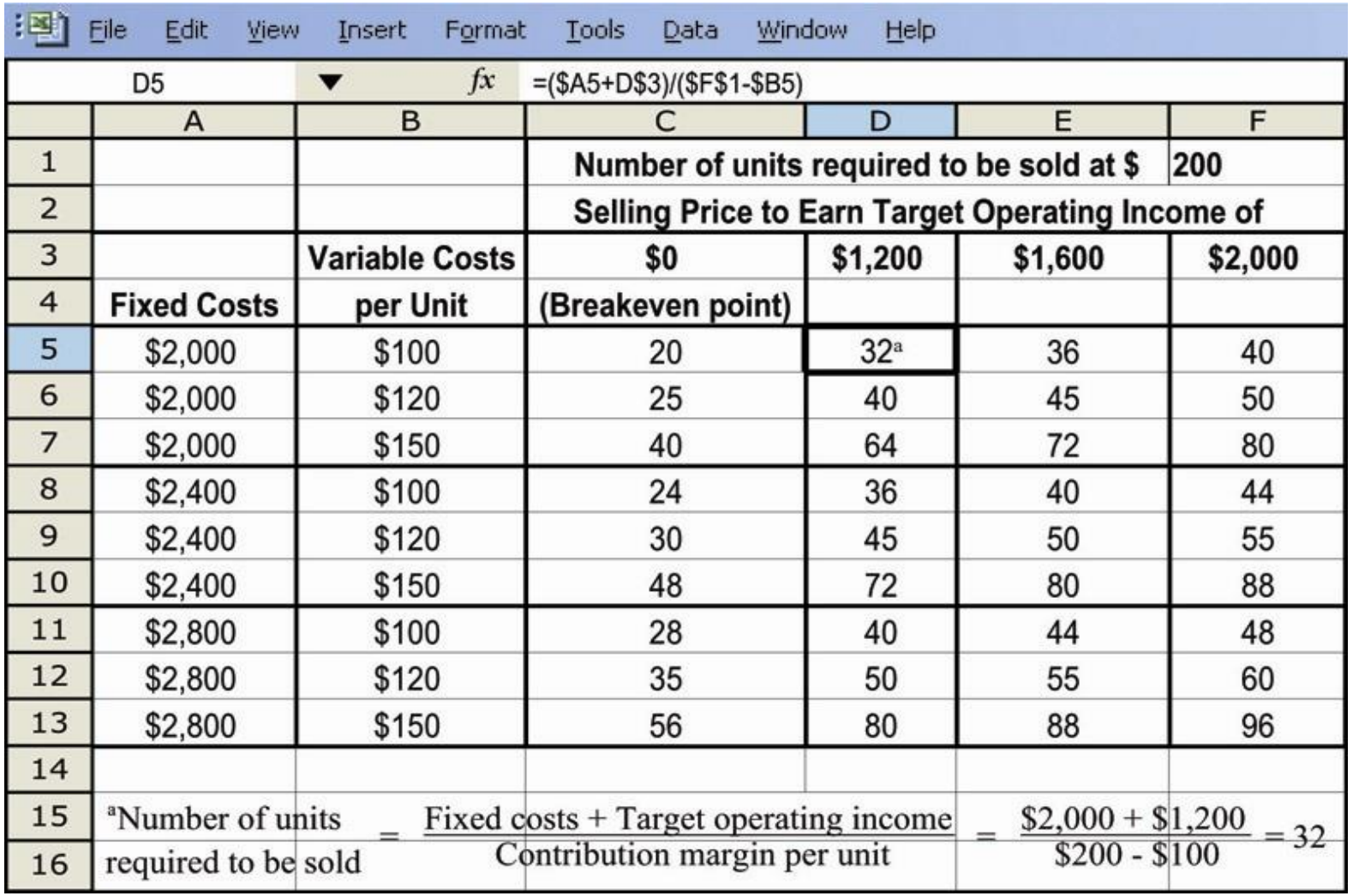
**Slope of the total revenues line is the selling price = $200

CVP and Income Taxes

- After-tax profit (Net Income) can be calculated by:
  - Net Income = Operating Income * (1-Tax Rate)
- Net income can be converted to operating income for use in CVP equation
  - $\text{Operating Income} = \frac{\text{Net Income}}{(1\text{-Tax Rate})}$

Note: The CVP equation will continue to use operating income. We'll use this conversion formula to obtain the operating income value when provided with Net Income.

Profit Planning, Illustrated



File Edit View Insert Format Tools Data Window Help

D5 fx =($A5+D$3)/(F1-$B5)

	A	B	C	D	E	F
1			Number of units required to be sold at $			200
2			Selling Price to Earn Target Operating Income of			
3		Variable Costs	$0	$1,200	$1,600	$2,000
4	Fixed Costs	per Unit	(Breakeven point)			
5	$2,000	$100	20	32[a]	36	40
6	$2,000	$120	25	40	45	50
7	$2,000	$150	40	64	72	80
8	$2,400	$100	24	36	40	44
9	$2,400	$120	30	45	50	55
10	$2,400	$150	48	72	80	88
11	$2,800	$100	28	40	44	48
12	$2,800	$120	35	50	55	60
13	$2,800	$150	56	80	88	96
14						

[a]Number of units required to be sold $= \frac{\text{Fixed costs + Target operating income}}{\text{Contribution margin per unit}} = \frac{\$2,000 + \$1,200}{\$200 - \$100} = 32$

Sensitivity Analysis

- CVP provides structure to answer a variety of "what-if" scenarios.
- "What" happens to profit "if":
  - Selling price changes.
  - Volume changes.
  - Cost structure changes.
    - Variable cost per unit changes.
    - Fixed costs change.

As an example, if a company determines that an ad campaign costing $15,000 is expected to increase sales 25%, should they proceed? That question cannot be properly answered without doing this type of analysis.

Margin of Safety-Defined

- The margin of safety calculation answers a very important question:
- If budgeted revenues are above the breakeven point, how far can they fall before the breakeven point is reached. In other words, how far can they fall before the company will begin to lose money.

Margin of Safety

- An indicator of risk, the margin of safety (MOS), measures the distance between budgeted sales and breakeven sales:
  - MOS = Budgeted Sales – BE Sales
- The MOS ratio removes the firm's size from the output, and expresses itself in the form of a percentage:
  - MOS Ratio = MOS ÷ Budgeted Sales

COST STRUCTURE

- Managers make strategic decisions that affect the cost structure of the company.
- The cost structure is simply the relationship of fixed costs and variable costs to total costs.
- We can use CVP-based sensitivity analysis to highlight the risks and returns as fixed costs are substituted for variable costs in a company's cost structure.
- The risk-return trade-off across alternative cost structures can be measured as operating leverage.

Operating Leverage

- Operating leverage (OL) describes the effect that fixed costs have on changes in operating income as changes occur in units sold and contribution margin.
  - OL = $\frac{\text{Contribution Margin}}{\text{Operating Income}}$

Notice that the difference between the numerator and the denominator in our formula = our fixed costs.

USING OPERATING LEVERAGE TO ESTIMATE CHANGES IN OPERATING INCOME

The formula to estimate the change in operating income that will result from a percentage change in sales is:

Operating Leverage X % Change in Sales

If sales increase 50% and operating leverage is 1.67, you should expect operating income to increase 83.5%.

Effects of Sales Mix on CVP

- The formulae presented to this point have assumed a single product is produced and sold.
- A more realistic scenario involves multiple products sold, in different volumes, with different costs and different margins.
- In this case, we use the same formulae, but use average contribution margins for the multiple products.
- This technique assumes a constant mix at different levels of total unit sales.

CVP for SERVICE and Not-For-Profit organizations

- CVP isn't just for merchandising and manufacturing companies.
- Service and Not-for-Profit businesses need to focus on measuring their output which is different from the units sold that we've been dealing with.
- For example, a service agency might measure how many persons they assist or an airline might measure how many passenger miles they fly.

Alternative Income Statement Formats-especially significant in THE manufacturing sector

Contribution Income Statement Emphasizing Contribution Margin (in 000s)			Financial Accounting Income Statement Emphasizing Gross Margin (in 000s)	
Revenues		$1,000	Revenues	$1,000
Variable manufacturing costs	$250		Cost of goods sold (variable manufacturing costs, $250 + fixed manufacturing costs, $160)	410
Variable nonmanufacturing costs	270	520		
Contribution margin		480	Gross margin	590
Fixed manufacturing costs	160		Nonmanufacturing costs	
Fixed nonmanufacturing costs	138	298	(variable, $270 + fixed $138)	408
Operating income		$ 182	Operating income	$ 182

Break-even analysis for planning and control

Breakeven (B/E) Planning

Determining the “breakeven point” is the starting point of many business plans:

- *Breakeven* is the point at which revenues equal total costs and profit is zero
- The breakeven (B/E) point can be determined in either of two ways:
  - Based on Units Sold (Q)
  - Based on Sales Dollars (Y)

B/E Planning (continued)

Breakeven in Units, Q (@ B/E, π_B = $0)

$$\$0 = (p \times Q) - (v \times Q) - F$$

$$\$0 = (p - v)Q - F$$

$$F = (p - v)Q$$

$$Q = F/(p - v)$$

That is, Q = Fixed costs ÷ contribution margin per unit

B/E Planning

Breakeven in Sales Dollars, Y (@ B/E, π_B = $0)

Operating profit = Sales – total variable costs – Fixed costs

$$\$0 = (p \times Q) - (v \times Q) - F$$

$$\$0 = [p \times (Y/p)] - [v \times (Y/p)] - F$$

$$p \times (Y/p) = [v \times (Y/p)] + F$$

$$Y = [(v/p) \times Y] + F$$

$$Y = F \div (p - v)/p$$

= fixed costs ÷ contribution margin ratio

Example: Breakeven Planning

Household Furnishings, Inc. (HFI) wants to perform a B/E analysis given the following expected results for 2013 and 2014:

	Per Unit	2013	2014
Fixed cost (per year)		$60,000	$60,000
Selling price	$75		
Variable cost	35		
Planned production		2,400 units	2,600 units
Planned sales volume		2,400 units	2,600 units

	2013		2014			
	Amount	Percent	Amount	Percent	Change	Notes
Sales	$180,000	100.00%	$195,000	100.00%	$15,000	
Variable costs	84,000	46.67	91,000	46.67	7,000	
Total contribution margin	$ 96,000	53.33%	$104,000	53.33%	$ 8,000	53.33% is the contribution margin ratio
Fixed costs	60,000		60,000		0	
Operating profit	$ 36,000		$ 44,000		$ 8,000	$8,000 = 0.5333 × $15,000

Breakeven Example

Breakeven in units, Q :

$$\text{Operating profit} = \text{Sales} - \text{Total variable costs} - \text{Fixed cost}$$

$$\pi_B = (p \times Q) - (v \times Q) - F$$

$$= (\$75 \times Q) - (\$35 \times Q) - \$5{,}000/\text{month}$$

$$0 = [(\$75 - \$35) \times Q] - \$5{,}000/\text{month}$$

$$\$40 \times Q = \$5{,}000/\text{month}$$

$$Q = \$5{,}000/\text{month}/\$40 \text{ per unit}$$

$$Q = 125 \text{ units/month}$$

Breakeven Example

Breakeven in dollars, Y:

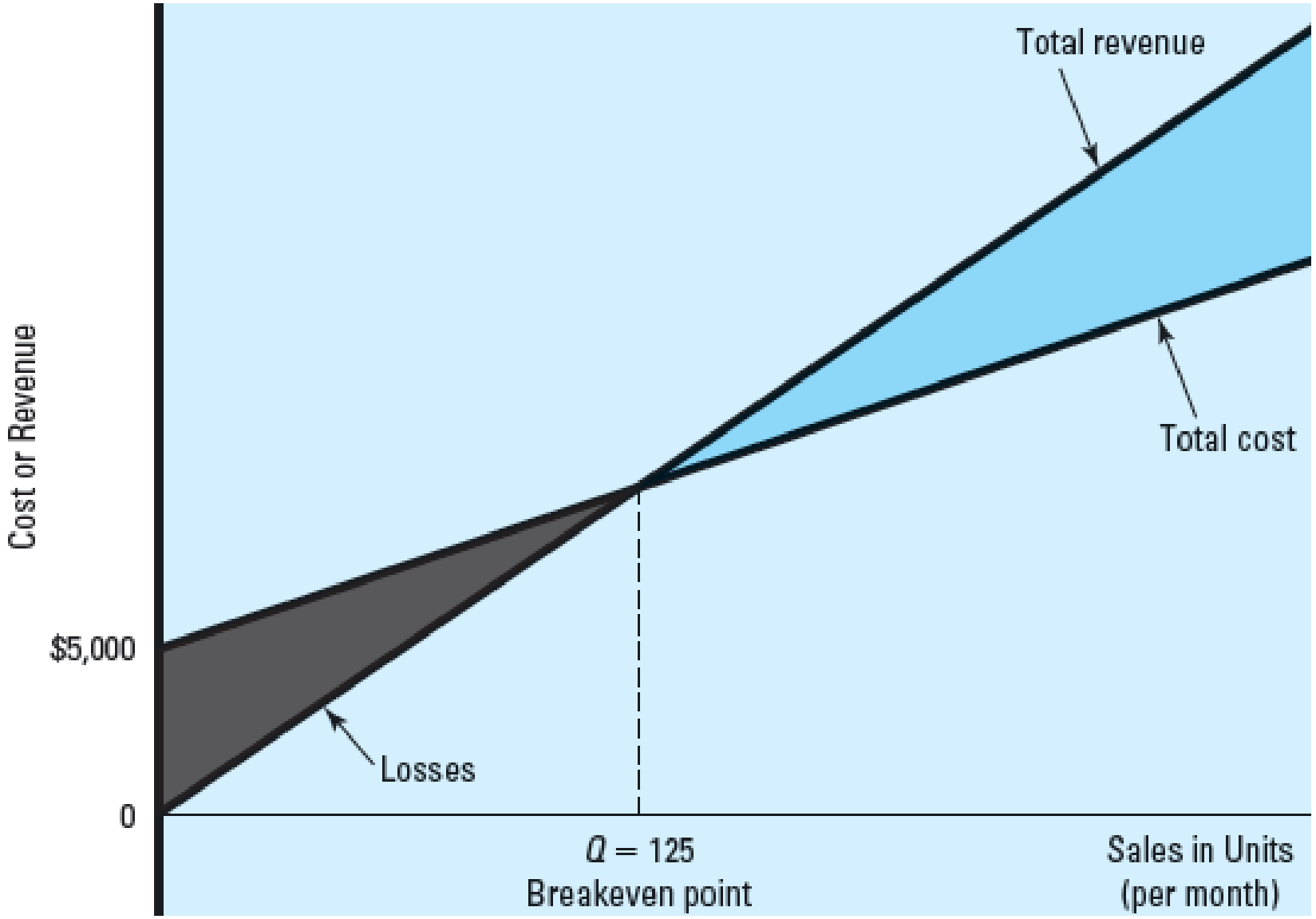
1. Breakeven in units, Q, times selling price per unit, p
   = 125 units/month × $75/unit = $9,375/month

2. Alternatively, breakeven point in sales dollars, Y
   = Fixed cost/month ÷ contribution margin ratio
   = $5,000/month ÷ ($75 – $35)/$75
   = $5,000/month ÷ 0.5333333= $9,375/month

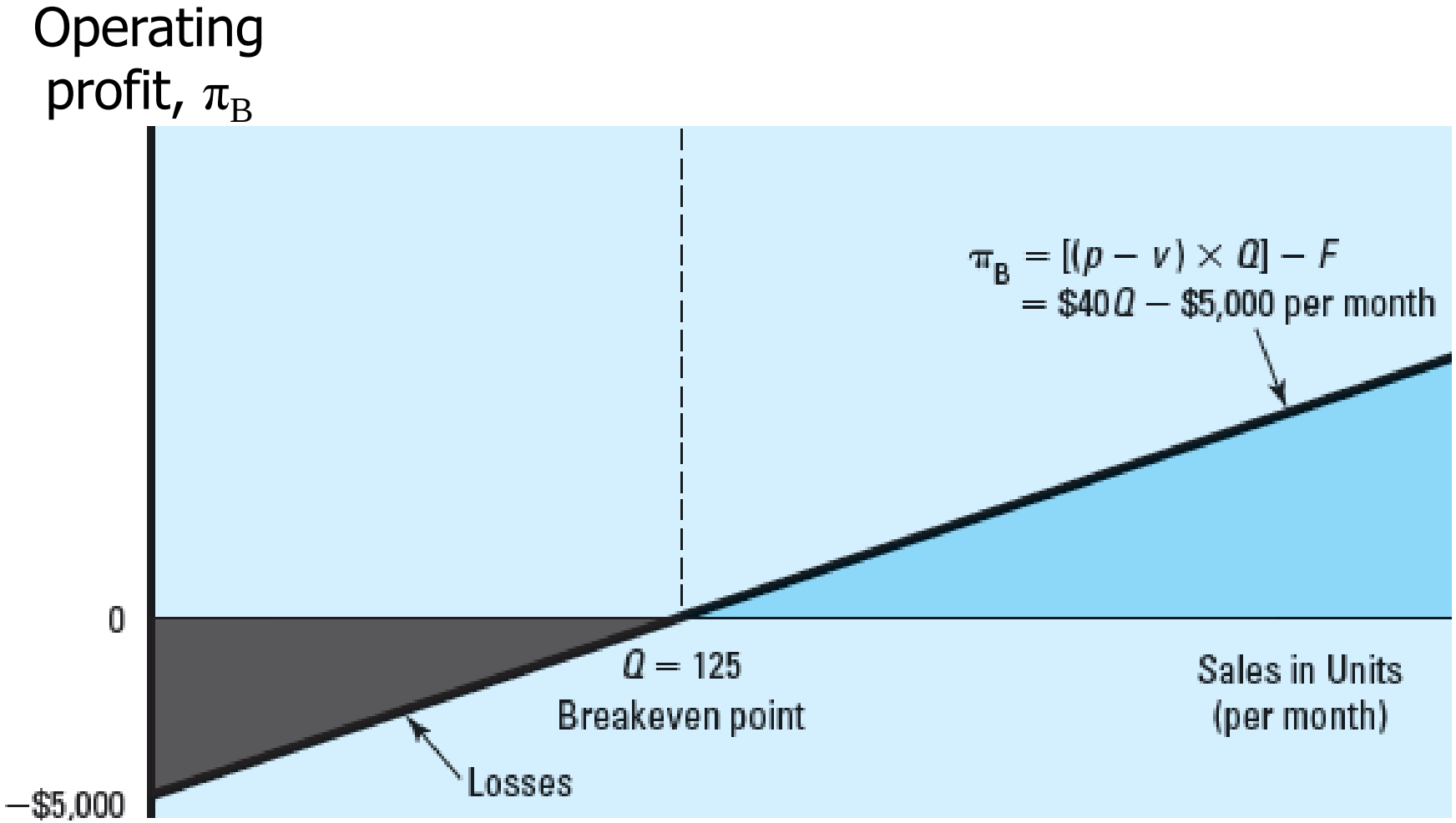
CVP Graph and Profit-Volume (PV) Graph

- The *CVP graph* illustrates how the levels of revenues and total costs change as output (sales volume) changes
- A *profit-volume (PV) graph* illustrates how the level of operating profit changes as output (sales volume) changes
  - This graph allows a person to clearly see how total contribution margin, and therefore profit, changes as the output level (i.e., volume) changes

CVP Graph


Total revenue
Total cost
Cost or Revenue
$5,000
0
Losses
Q = 125
Breakeven point
Sales in Units
(per month)

PV Graph


Operating profit, π_B
$\pi_B = [(p - v) \times Q] - F$
$= \$40Q - \$5{,}000$ per month
0
$-\$5{,}000$
$Q = 125$
Breakeven point
Losses
Sales in Units (per month)

Breakeven Point Calculations

Bill's Briefcases makes high quality cases for laptops that sell for $200. The variable costs per briefcase are $80, and the total fixed costs are $360,000. Find the BEP in units and in sales $ for this company.

$$\text{BEP in units} = \frac{F + 0}{P - V} = \frac{\$360{,}000}{\$200/\text{unit} - \$80/\text{unit}}$$

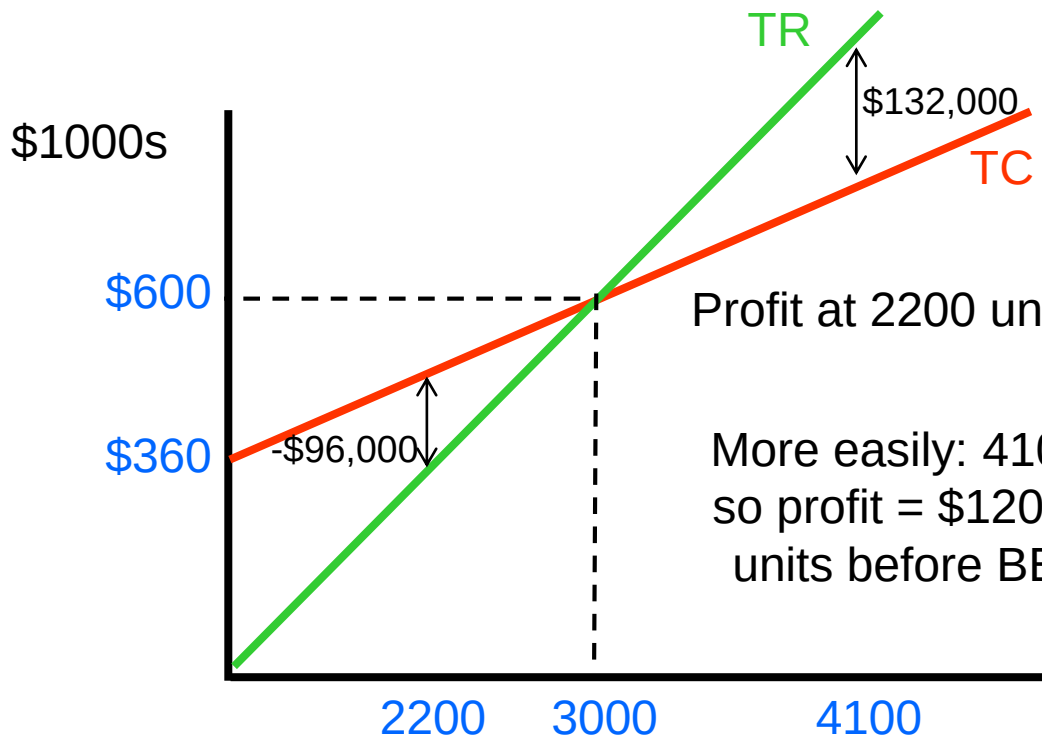
$$= \frac{\$360{,}000}{\$120/\text{unit}} = 3{,}000 \text{ units}$$

$$\text{BEP in sales \$} = \frac{F + 0}{CMR} = \frac{F}{(P - V)/P} = \frac{\$360{,}000}{(\$200 - \$80)/\$200}$$

$$= \frac{\$360{,}000}{60\%} = \$600{,}000$$

CVP Graph

Draw a CVP graph for Bill's Briefcases. What is the pretax profit if Bill sells 4100 briefcases? If he sells 2200 briefcases? Recall that P = $200, V = $80, and F = $360,000.



Profit at 4100 units = $120 x 4100 - $360,000.

Profit at 2200 units = $120 x 2200 - $360,000.

More easily: 4100 units is 1100 units past BEP, so profit = $120 x 1100 units; 2200 units is 800 units before BEP, so loss = $120 x 800 units.

CVP Calculations

How many briefcases does Bill need to sell to reach a target pretax profit of $240,000? What level of sales revenue is this? Recall that P = $200, V = $80, and F = $360,000.

Units needed to reach target pretax profit

$$= \frac{F + \text{Profit}}{P - V} = \frac{\$360{,}000 + \$240{,}000}{\$120/\text{unit}}$$

$$= 5{,}000 \text{ units}$$

Sales $ required to reach target pretax profit

$$= \frac{F + \$240{,}000}{CMR} = \frac{F}{(P - V)/P}$$

$$= \frac{\$600{,}000}{60\%} = \$1{,}000{,}000$$

Of course, 5,000 units x $200/unit = $1,000,000, too.

But sometimes you only know the CMR and not the selling price per unit, so this is still a valuable formula.

CVP Calculations

How many briefcases does Bill need to sell to reach a target after-tax profit of $319,200 if the tax rate is 30%? What level of sales revenue is this? Recall that *P* = $200, *V* = $80, and *F* = $360,000.

First convert the target after-tax profit to its target pretax profit:

$$\text{Pretax profit} = \frac{\text{After-tax profit}}{(1 - \text{Tax rate})} = \frac{\$319,200}{(1 - 0.3)} = \$456,000$$

$$\text{Units needed to reach target pretax profit} = \frac{\$360,000 + \$456,000}{\$120 / \text{unit}} = 6,800 \text{ units}$$

$$\text{Sales \$ needed to reach target pretax profit} = \frac{\$360,000 + \$456,000}{60\%} = \$1,360,000$$

Using CVP to Determine Target Cost Levels

Suppose that Bill's marketing department says that he can sell 6,000 briefcases if the selling price is reduced to $170. Bill's target pretax profit is $210,000. Determine the highest level that his variable costs can so that he can make his target. Recall that *F* = $360,000.

Use the CVP formula for units, but solve for V:

$$\text{Q} = 6{,}000 \text{ units} = \frac{\$360{,}000 + \$210{,}000}{\$170/\text{unit} - V}$$

$$\$170/\text{unit} - V = \frac{\$360{,}000 + \$210{,}000}{6{,}000 \text{ units}} = \$95/\text{unit}$$

$$V = \$75/\text{unit}$$

If Bill can reduce his variable costs to $75/unit, he can meet his goal.

Business Risk in Bill's Decision

- After this analysis, Bill needs to consider several issues before deciding to lower his price to $170/unit.
  - How reliable are his marketing department's estimates?
  - Is a $5/unit decrease in variable costs feasible?
  - Will this decrease in variable costs affect product quality?
  - If 6,000 briefcases is within his plant's capacity but lower than his current sales level, will the increased production affect employee morale or productivity?

Using CVP to Compare Alternatives

- CVP analysis can compare alternative cost structures or selling prices.
  - high salary/low commission vs. lower salary/higher commission for sales persons
  - highly automated production process with low variable costs per unit vs. lower technology process with higher variable costs per unit and lower fixed costs.
  - broad advertising campaign with higher selling prices vs. minimal advertising and lower selling prices
- The indifference point between alternatives is the level of sales (in units or sales $) where the profits of the alternatives are equal.

Using CVP to Compare Alternatives

Currently Bill's salespersons have salaries totaling $80,000 (included in F of $360,000) and earn a 5% commission on each unit ($10 per briefcase). He is considering an alternative compensation arrangement where the salaries are decreased to $35,000 and the commission is increased to 20% ($40 per briefcase). Compute the BEP in units under the proposed alternative. Recall that *P* = $200 and *V* = $80 currently.

First compute *F* and *V* under the proposed plan:

F = $360,000 - $45,000 decrease in salaries = $315,000

V = $80 + $30 increase in commission = $110

Then compute *Q* under the proposed plan:

Units needed to breakeven $= Q = \frac{F + 0}{P - V} = \frac{\$315{,}000}{\$200/\text{unit} - \$110/\text{unit}} = 3{,}500 \text{ units}$

Determining the Indifference Point

Compute the volume of sales, in units, for which Bill is indifferent between the two alternatives.

The indifference point in units is the *Q* for which the profit equations of the two alternatives are equal.

	Current Plan	Proposed Plan
Contribution margin per unit	$120	$90
Total fixed costs	$360,000	$315,000

Profit (current plan) = $120*Q* - $360,000

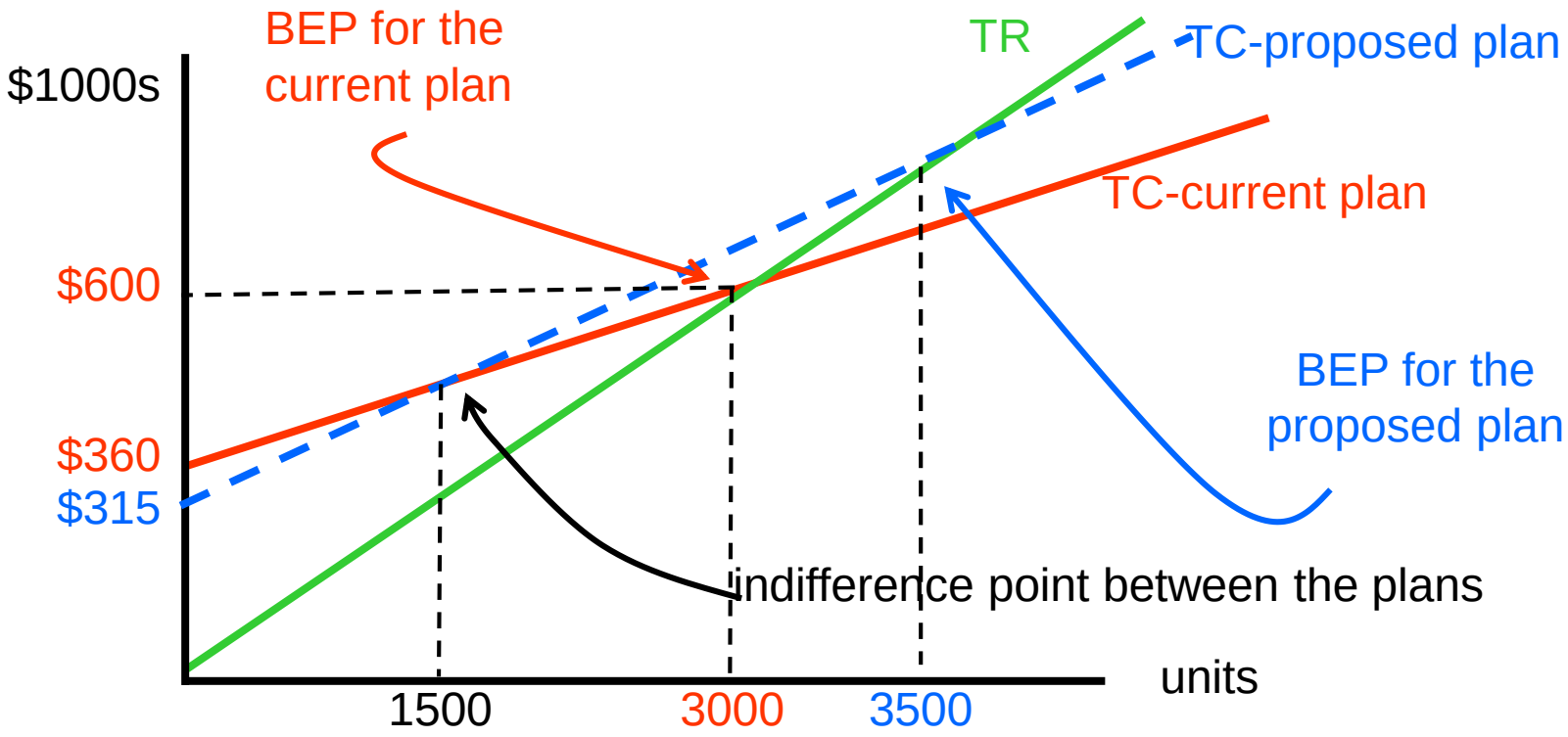
Profit (proposed plan) = $90*Q* - $315,000

$120*Q* - $360,000 = $90*Q* - $315,000

$30*Q* = $45,000 ⟶ *Q* = 1,500 units

CVP Graphs of the Indifference Point

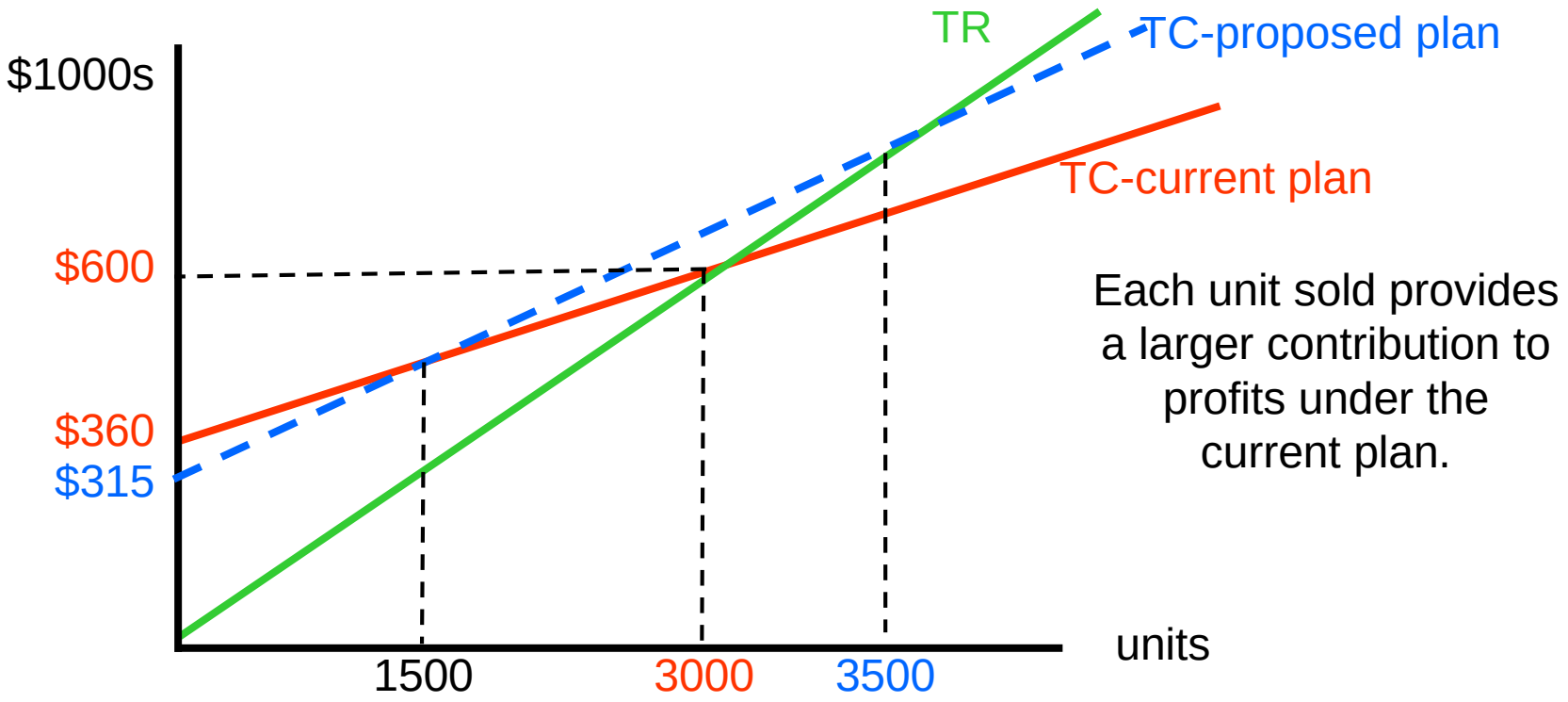
Draw a CVP graph for Bill's that displays the costs under both alternatives. Notice that the total revenue line for both alternatives is the same, but the total cost lines are different.



Comparing Alternatives

The current plan breaks even before the proposed plan.

At 1500 units, the plans have the same total cost.



Business Risk in Bill's Decision

- Hopefully Bill is currently selling more than 1500 briefcases, because profits are negative under BOTH plans at this point.

- The total costs of the current plan are less than the those of the proposed plan at sales levels past 1500 briefcases.

- Therefore, it seems the current plan is preferable to the proposed plan.

However, . . .

Business Risk in Bill's Decision

. . . this may not be true because the level of future sales is always uncertain.

- What if the briefcases were a new product line?
  - Estimates of sales levels may be highly uncertain.
  - The lower fixed costs of the proposed plan may be safer.
- The plans may create different estimates of the likelihood of various sales levels.
  - Salespersons may have an incentive to sell more units under the proposed plan.

Sales Mix Computations

- The weighted average contribution margin is the weighted sum of the products' contribution margins:

$$WACM = \sum_{i=1}^{n} \lambda_i CM_i$$

where λ_i is product i's % of total sales in units, CM_i is product i's contribution margin, and n= the number of products.

- The weighted average contribution margin ratio is the weighted sum of the products' contribution margin ratios:

$$WACMR = \sum_{i=1}^{n} \gamma_i CMR_i$$

where γ_i is product i's % of total sales revenues, CMR_i is product i's contribution margin ratio, and n= the number of products.

Multiple Product Breakeven Point

Peggy's Kitchen Wares sells three sizes of frying pans. Next year she hopes to sell a total of 10,000 pans. Peggy's total fixed costs are $40,800. Each product's selling price and variable costs is given below. Find the BEP in units for this company.

	Small	Medium	Large	Total
Expected sales in units	2,000	5,000	3,000	10,000
Selling price per unit	$10.00	$15.00	$18.00	
Variable costs per unit	$4.00	$8.00	$11.00	
Contribution margin per unit	$6.00	$7.00	$7.00	

First note the sales mix in units is 20%:50%:30%, respectively; then compute the weighted average contribution margin:

$$WACM = 20\%x\$6 + 50\%x\$7 + 30\%x\$7 = \$6.80$$



Multiple Product Breakeven Point

Next, compute the BEP in terms of total units:

$$\text{Total units needed to breakeven} = Q = \frac{F + 0}{P - V} = \frac{\$40{,}800}{\$6.80/\text{unit}} = 6{,}000 \text{ units}$$

But 6,000 units is not really the BEP in units; the BEP is only 6,000 units *if* the sales mix remains the same.

The BEP should be stated in terms of how many of each unit must be sold:

Units required to break even:		
Small pans	20%	1,200
Medium pans	50%	3,000
Large pans	30%	1,800
		6,000

Multiple Product Breakeven Point

Find the BEP in sales $ for Peggy's Kitchen Wares. The total revenue and total variable cost information below is based on the expected sales mix.

	Small	Medium	Large	Total
Expected sales in units	2,000	5,000	3,000	10,000
Total revenue	$20,000	$75,000	$54,000	$149,000
Total variable costs	$8,000	$40,000	$33,000	$81,000
Total contribution margin	$12,000	$35,000	$21,000	$68,000
Contribution margin ratio	60.0%	46.7%	38.9%	45.6%

First compute the weighted average contribution margin ratio:

WACMR = (20/149)x60% + (75/149)x46.7% + (54/149)x38.9% =



Multiple Product Breakeven Point

. . . = 45.6%, of course! Depending on how the given information is structured, it may be easier to compute the CMR as Total contribution margin/Total revenue.

Next compute the BEP in sales $:

$$\text{BEP in sales \$} = \frac{F + 0}{CMR} = \frac{\$40{,}800}{0.456} = \$89{,}474^{*}$$

* If you sum the number of units of each size pan required at breakeven times its selling price you get $89,400. The extra $74 in the answer above comes from rounding the contribution margin ratio to three decimals.

Margin of Safety

The margin of safety is a measure of how far past the breakeven point a company is operating, or plans to operate. It can be measured 3 ways.

$$\text{margin of safety in units} = \text{actual or estimated units of activity} - \text{BEP in units}$$

$$\text{margin of safety in \$} = \text{actual or estimated sales \$} - \text{BEP in sales \$}$$

$$\text{margin of safety percentage} = \frac{\text{Margin of safety in units}}{\text{Actual or estimated units}}$$

$$= \frac{\text{Margin of safety in \$}}{\text{Actual or estimated sales \$}}$$

Margin of Safety

Suppose that Bill's Briefcases has budgeted next year's sales at 5,000 units. Compute all three measures of the margin of safety for Bill. Recall that P = \$200, V = \$80, F = \$360,000, the BEP in units = 3,000, and the BEP in sales \$ = \$600,000.

margin of safety in units = 5,000 units – 3,000 units = 2,000 units

margin of safety in \$ = \$200 x 5,000 - \$600,000 = \$400,000

$$\text{margin of safety percentage} = \frac{2{,}000 \text{ units}}{5{,}000 \text{ units}} = \frac{\$400{,}000}{\$200 \times 5{,}000} = 40\%$$

The margin of safety tells Bill how far sales can decrease before profits go to zero.

Summary

The breakeven (B/E) point is the starting point of many business plans:

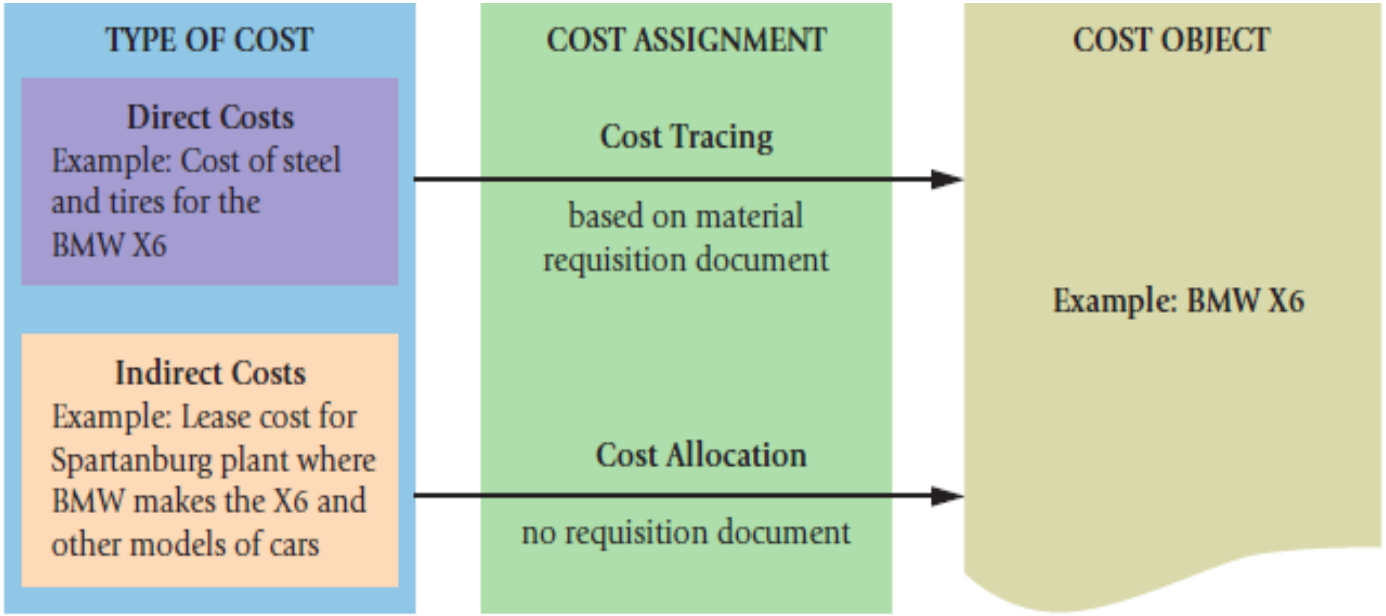
- B/E is the point at which total revenues equal total costs, i.e., point of sales at which operating profit is zero
- The B/E point can also be defined as the sales level at which total contribution margin = fixed costs, and profit is zero
- There are two methods, equation and contribution margin, that can be used for profit-planning (i.e., CVP analysis) purposes
  - In each method, sales volume can be expressed either on the basis of units or dollars

Cost allocation and apportionment

Direct and Indirect Costs

- Direct costs can be conveniently and economically traced (tracked) to a cost object.
- Indirect costs cannot be conveniently or economically traced (tracked) to a cost object. Instead of being traced, these costs are allocated to a cost object in a rational and systematic manner.

Cost assignment to a cost object (bmw example)



Cost Examples

- Direct Costs
  - Parts (steel or tires for a car, as an exampe)
  - Assembly line wages
- Indirect Costs
  - Electricity
  - Rent
  - Property taxes
  - Plant administration expenses

Factors Affecting Direct/Indirect Cost Classification

- The materiality of the cost in question.
- The available information-gathering technology.
- Design of operations.

- NOTE: a specific cost may be both a direct cost of one cost object and an indirect cost of another cost object.

Cost Behavior

- Variable costs—change in total in proportion to changes in the related level of activity or volume of output produced.
- Fixed costs—remain unchanged in total, for a given time period, despite changes in the related level of activity or volume of output produced.
- Costs are fixed or variable only with respect to a specific activity or a given time period.

Cost Behavior

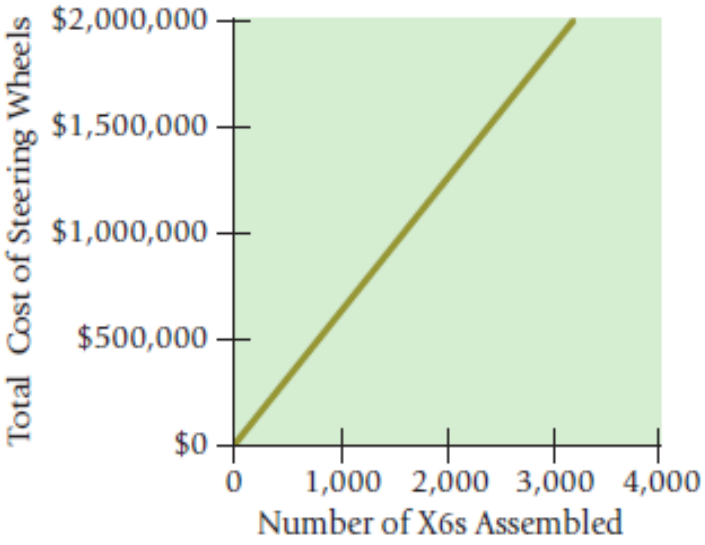
- Variable costs are constant on a per-unit basis. If a product takes 5 pounds of materials each, it stays the same per unit regardless if one, ten, or a thousand units are produced.
- Fixed costs per unit change inversely with the level of production. As more units are produced, the same fixed cost is spread over more and more units, reducing the cost per unit.

Cost Behavior Summarized

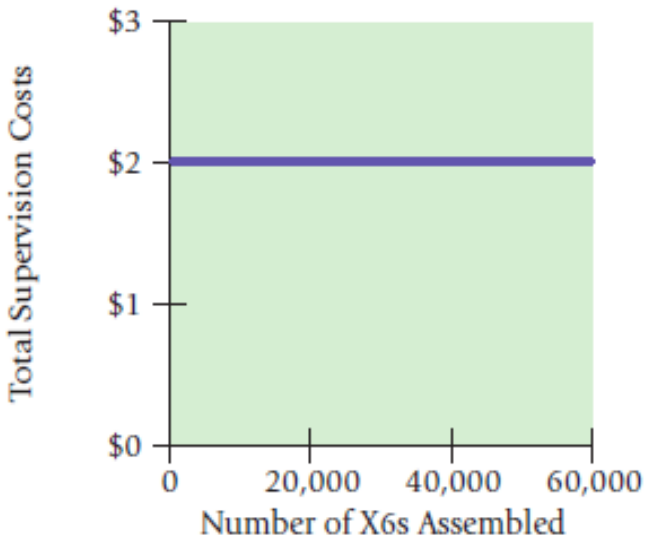
Variable Costs	**Total Dollars** Change in proportion with output More output = More cost	**Cost Per Unit** Unchanged in relation to output
Fixed Costs	Unchanged in relation to output	Change inversely with output More output = lower cost per unit

Graphs of variable and fixed costs

PANEL A: Variable Cost of Steering Wheels at $60 per BMW X6 Assembled



PANEL B: Supervision Costs for the BMW X6 assembly line (in millions)



Other Cost Concepts

- Cost driver—a variable, such as the level of activity or volume, that causally affects costs over a given time span.
- Relevant range—the band or range of normal activity level (or volume) in which there is a specific relationship between the level of activity (or volume) and the cost in question.
  - For example, fixed costs are considered fixed only within the relevant range.

Multiple Classifications of Costs

- Costs may be classified as:
  - Direct/Indirect, and
  - Variable/Fixed
- These multiple classifications give rise to important cost combinations:
  - Direct and variable
  - Direct and fixed
  - Indirect and variable
  - Indirect and fixed

A Cost Caveat

- Unit costs should be used cautiously. Because unit costs change with a different level of output or volume, it may be more prudent to base decisions on a total cost basis.
  - Unit costs that include fixed costs should always reference a given level of output or activity.
  - Unit costs are also called average costs.
  - Managers should think in terms of total costs rather than unit costs for many decisions.

Examples of the Multiple Classifications of Costs

Cost-Behavior Pattern	Assignment of Costs to Cost Object: Direct Costs	Assignment of Costs to Cost Object: Indirect Costs
Variable Costs	• Cost object: BMW X6s produced Example: Tires used in assembly of automobile	• Cost object: BMW X6s produced Example: Power costs at Spartanburg plant. Power usage is metered only to the plant, where multiple products are assembled.
Fixed Costs	• Cost object: BMW X6s produced Example: Salary of supervisor on BMW X6 assembly line	• Cost object: BMW X6s produced Example: Annual lease costs at Spartanburg plant. Lease is for whole plant, where multiple products are produced.

Different Types of Firms

- Manufacturing-sector companies purchase materials and components and convert them into finished products.
- Merchandising-sector companies purchase and then sell tangible products without changing their basic form.
- Service-sector companies provide services (intangible products) like legal advice or audits.

Types of inventory

- Direct materials—resources in-stock and available for use
- Work-in-process (or progress)—products started but not yet completed, often abbreviated as WIP
- Finished goods—products completed and ready for sale

- Note: Merchandising-sector companies hold only one type of inventory: merchandise inventory

Commonly used classifications of manufacturing costs

- Also known as inventoriable costs
  - Direct materials—acquisition costs of all materials that will become part of the cost object.
  - Direct labor—compensation of all manufacturing labor that can be traced to the cost object.
  - Indirect manufacturing—factory costs that are not traceable to the product in an economically feasible way. Examples include lubricants, indirect manufacturing labor, utilities, and supplies.

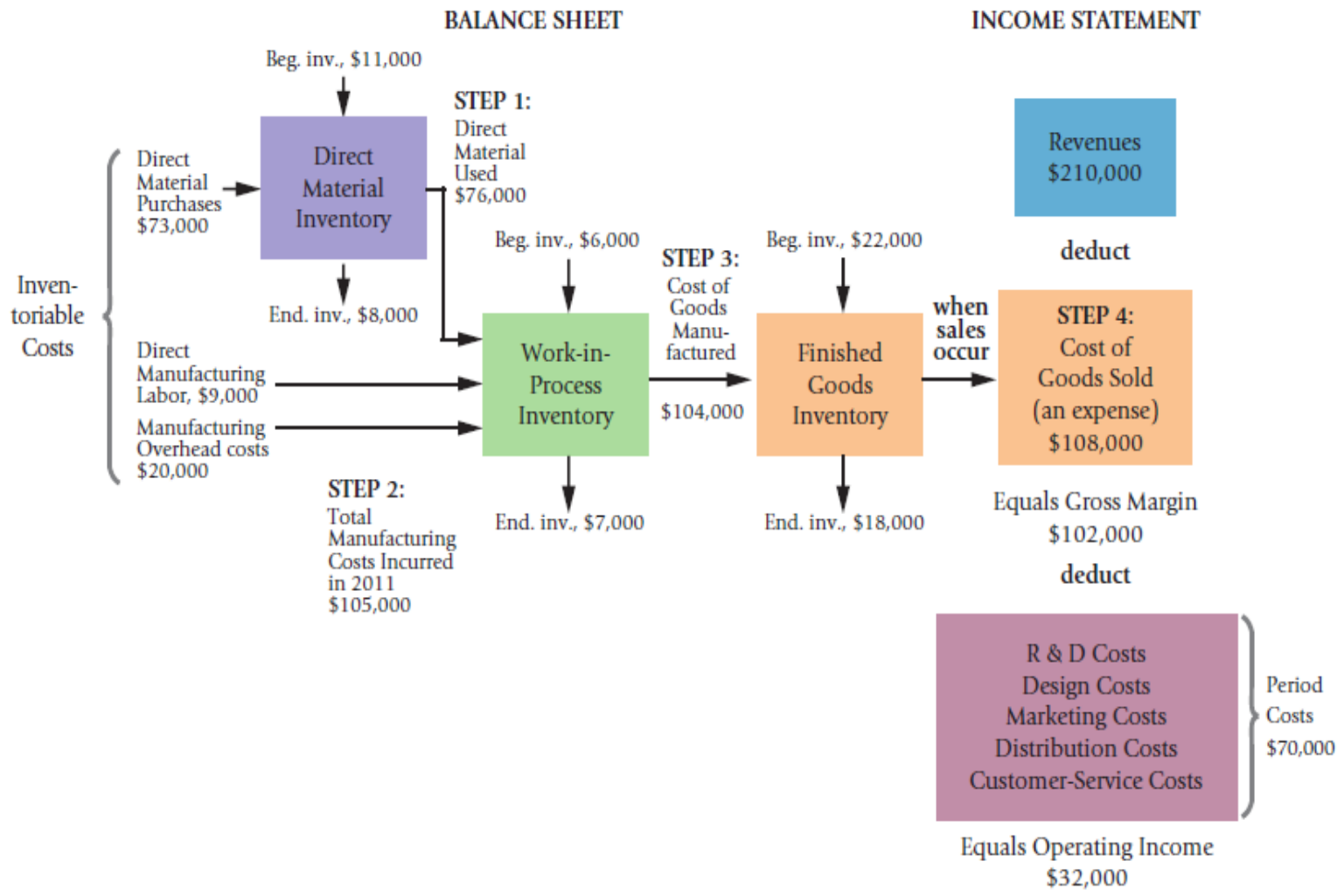
Inventoriable costs vs. period costs

- Inventoriable costs are all costs of a product that are considered assets in a company's balance sheet when the costs are incured and that are expensed as cost of goods sold only when the product is sold. For manufacturing companies, all manufacturing costs are inventoriable costs.
- Period costs are all costs in the income statement other than cost of goods sold. They are treated as expenses of the accounting period in which they are incurred.

Cost Flows

- The Cost of Goods Manufactured and the Cost of Goods Sold section of the Income Statement are accounting representations of the actual flow of costs through a production system.
  - Note how inventoriable costs to through the balance sheet accounts of work-in-process and finished goods inventory before entering the cost of goods sold in the income statement.

Cost flows illustrated



Multiple-step income statement, part one

STEP 4

	A	B	C	D
1	**PANEL A: INCOME STATEMENT**			
2	**Cellular Products**			
3	**Income Statement**			
4	**For the Year Ended December 31, 2014 (in thousands)**			
5	Revenues		$210,000	
6	Cost of goods sold:			
7	Beginning finished goods inventory, January 1, 2014	$ 22,000		
8	Cost of goods manufactured (see Panel B)	104,000		
9	Cost of goods available for sale	126,000		
10	Ending finished goods inventory, December 31, 2014	18,000		
11	Cost of goods sold		108,000	
12	Gross margin (or gross profit)		102,000	
13	Operating costs:			
14	R&D, design, mktg., dist., and cust.-service cost	70,000		
15	Total operating costs		70,000	
16	Operating income		$ 32,000	

Multiple-step income statement, part two

18	**PANEL B: COST OF GOODS MANUFACTURED**		
19	**Cellular Products**		
20	**Schedule of Cost of Goods Manufactured[a]**		
21	**For the Year Ended December 31, 2014 (in thousands)**		
22	Direct materials:		
23	Beginning inventory, January 1, 2014	$11,000	
24	Purchases of direct materials	73,000	
25	Cost of direct materials available for use	84,000	
26	Ending inventory, December 31, 2014	8,000	
27	Direct materials used		$ 76,000
28	Direct manufacturing labor		9,000
29	Manufacturing overhead costs:		
30	Indirect manufacturing labor	$ 7,000	
31	Supplies	2,000	
32	Heat, light, and power	5,000	
33	Depreciation—plant building	2,000	
34	Depreciation—plant equipment	3,000	
35	Miscellaneous	1,000	
36	Total manufacturing overhead costs		20,000
37	Manufacturing costs incurred during 2014		105,000
38	Beginning work-in-process inventory, January 1, 2014		6,000
39	Total manufacturing costs to account for		111,000
40	Ending work-in-process inventory, December 31, 2014		7,000
41	Cost of goods manufactured (to income statement)		$104,000
42	[a]Note that this schedule can become a schedule of cost of goods manufactured and sold simply by including the beginning and ending finished goods inventory figures in the supporting schedule rather than in the body of the income statement.		

STEP 1

STEP 2

STEP 3

Other Cost Considerations

- Prime cost is a term referring to all direct manufacturing costs (materials and labor).
- Conversion cost is a term referring to direct labor and indirect manufacturing costs.
- Overtime labor costs are considered part of indirect overhead costs.

Measuring costs requires judgment

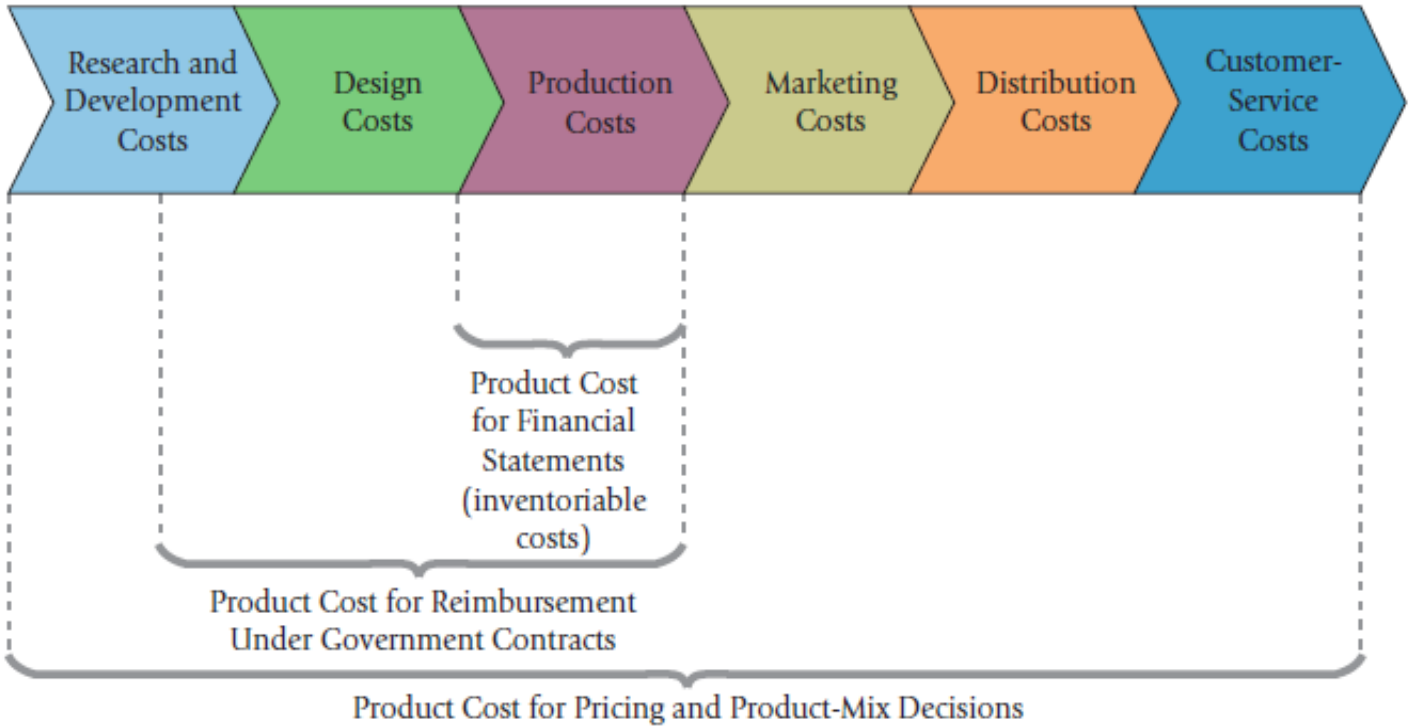
Because there are alternative ways for management to define and classify costs, judgment is required.

Managers, accountants, suppliers and others should agree on the classifications and meanings of the cost terms.

Different product Costs for Different purposes

- Pricing and product-mix decisions—decisions about pricing and maximizing profits
- Contracting with government agencies—very specific definitions of allowable costs for “cost plus profit” contracts
- Preparing external-use financial statements—GAAP-driven product costs only

Different product Costs for Different purposes



A framework for cost accounting and cost management

The following three features of cost accounting and cost management can be used for a wide range of applications (for helping managers make decisions):

1. Calculating the cost of products, services, and other cost objects
2. Obtaining information for planning and control, and performance evaluation
3. Analyzing the relevant information for making decisions

Basic Definitions

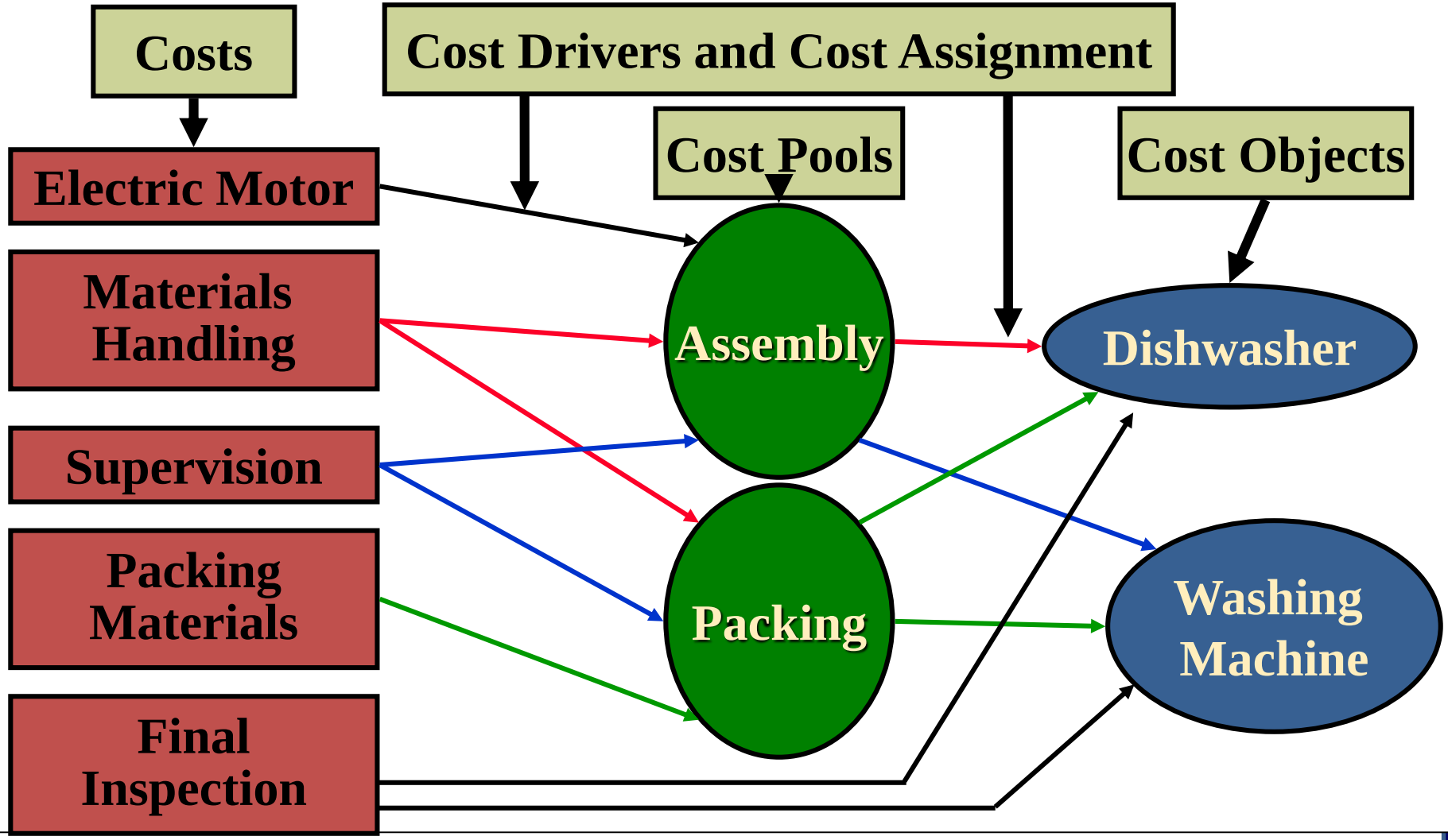
- A *cost* is incurred when a firm uses a resource for some purpose
- Costs are assembled into meaningful groups called *cost pools* (e.g., by type of cost or source)
- Any factor that has the effect of changing the level of total cost is called a *cost driver*
- A *cost object* is any product, service, customer, activity, or organizational unit to which costs are assigned for some management purpose

Product/Service Costing: Cost Assignment

The process of assigning costs to cost pools or from cost pools to cost objects

- *Direct costs* can be conveniently and economically traced to a cost pool or a cost object
- *Indirect costs* cannot be traced conveniently or economically to a cost pool or a cost object
- Because indirect costs cannot be traced, assignment is made through the use of cost drivers (*cost allocation*)
- These cost drivers are often called *allocation bases*

Cost Assignment: General Principles



Direct and Indirect Product Costs for a Manufacturer

- **Direct material costs** = cost of materials that can be readily traced to outputs = purchase price of materials + freight – purchase discounts + reasonable allowance for scrap and defective units
- **Indirect material costs** = cost of materials that cannot readily be traced to outputs (e.g., rags, lubricants, and small tools)
- **Direct labor costs** = labor that can be readily traced to outputs = wages paid plus a reasonable allowance for nonproductive time
- **Indirect labor costs** = labor costs that cannot be readily traced to outputs (i.e., they are manufacturing support costs)

Direct and Indirect Product Costs:

- **All indirect costs** for the manufacturer, including indirect materials, indirect labor, and other indirect items are often combined in a cost pool referred to as *overhead* (or, *factory overhead*, or *indirect manufacturing costs*)

- **The three main types of costs,** direct materials, direct labor, and overhead, are often condensed even further:
  - Direct materials + Direct labor = Prime costs
  - Direct labor + Overhead = Conversion costs

Cost Behavior: Cost Drivers

- ***Cost drivers*** **provide two roles for the management accountant**
  - Assigning costs to cost objects
  - Explaining cost behavior, i.e., how total cost changes as the cost driver changes
- **There are four types of *cost drivers*:**
  - Activity-based
  - Volume-based
  - Structural
  - Executional

Cost Drivers

- ***Activity-based* cost (ABC) drivers** are developed at a detailed level of operations using activity analysis–a cost driver is determined for each activity
- ***Volume-based* cost drivers** relate to the amount produced or quantity of service provided**:**
  - The relationship between the cost driver and total cost is approximately linear within the relevant range

Volume Based Cost Drivers: Classification by Behavior

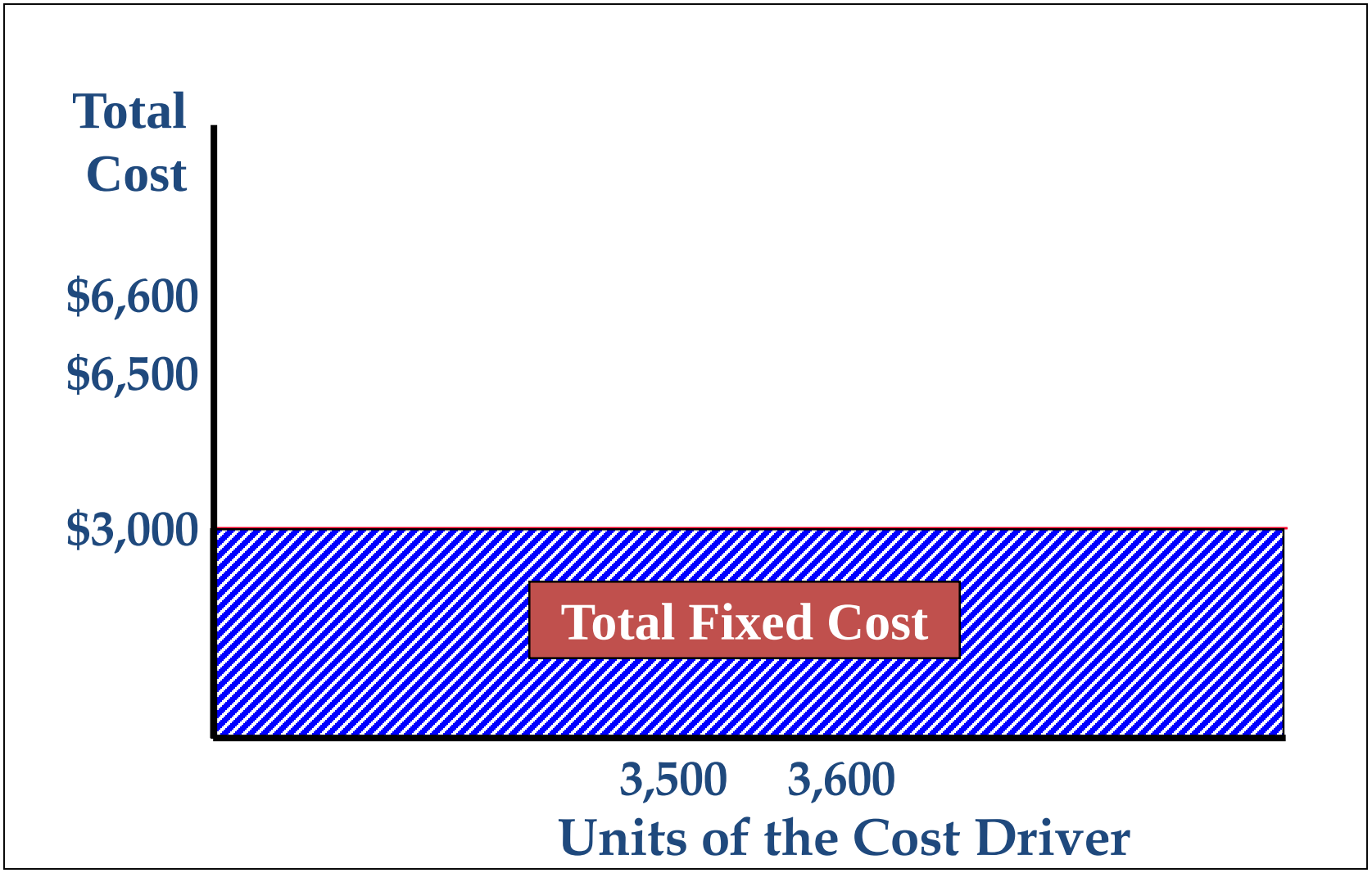
- *Fixed cost* is the portion of total cost that does not change with changes in output
- *Variable cost* is the change in total cost associated with each change in quantity of the cost driver
- *Mixed cost* is used to refer to a total cost figure that includes both a fixed and variable component
- *Step costs* vary with the cost driver but do so in steps

Cost Drivers

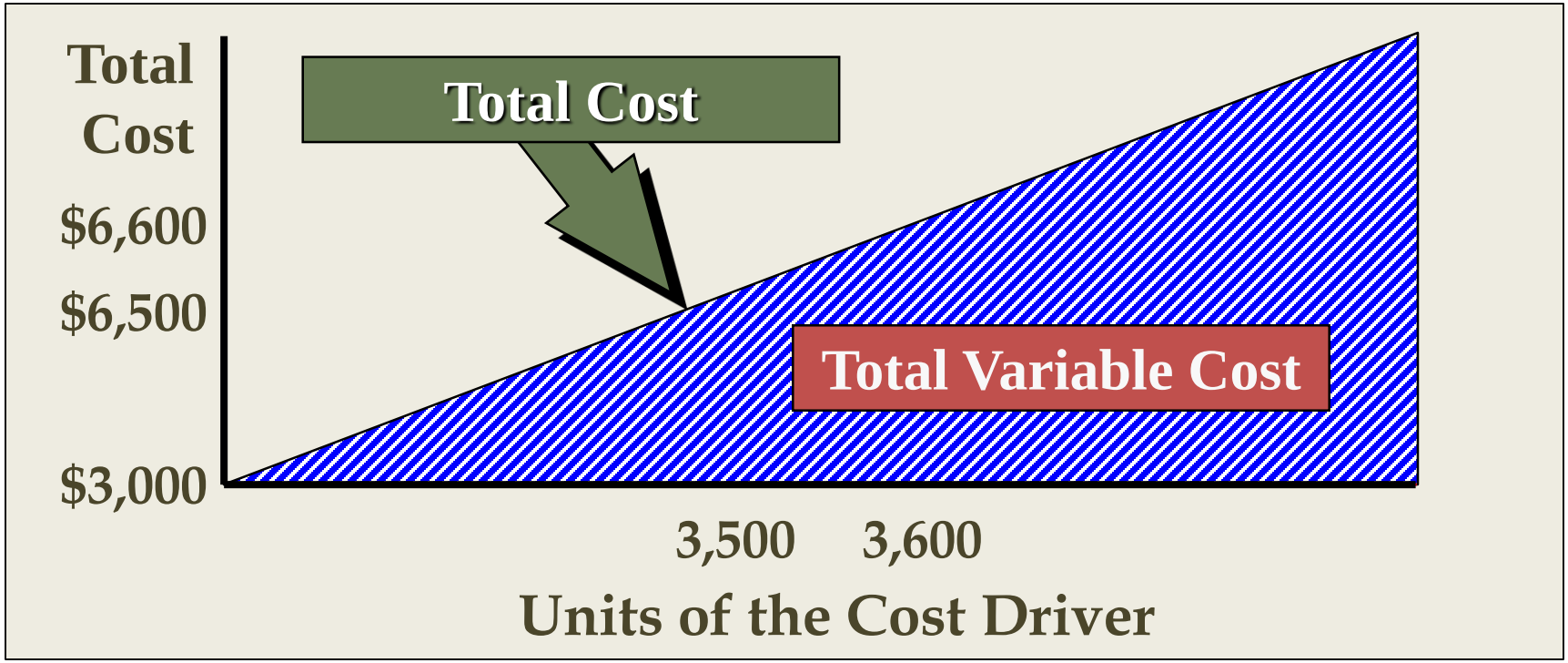
- ***Structural cost* drivers** facilitate strategic decision making because they involve plans and decisions that have long-term effects
  - Scale, experience, technology, and complexity are considered in hopes of improving competitive position

- ***Executional cost* drivers** facilitate operational decision making by focusing on short-term effects
  - Workforce involvement, design of the production process, and supplier relationships are considered in an attempt to reduce costs

Fixed Costs


Total Cost
$6,600
$6,500
$3,000
Total Fixed Cost
3,500
3,600
Units of the Cost Driver

Variable Costs



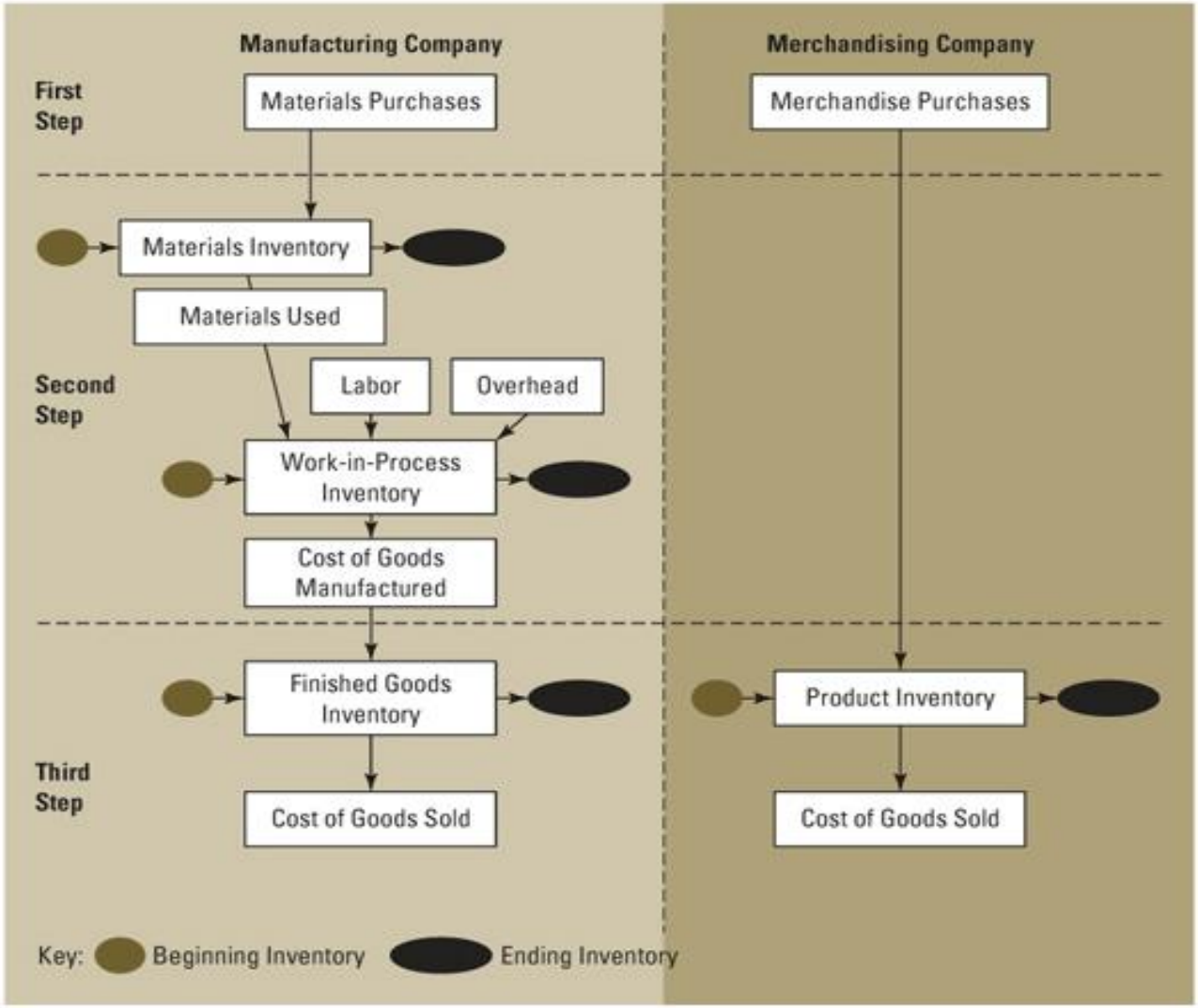
Product and Service Costing Concepts

- **Product costs** include only the costs necessary to complete the product at the manufacturing step in the value chain (manufacturing) or to purchase and transport the product to the location of sale (merchandising)

- **Period costs (also called non-product costs)** include all other costs incurred by the firm in managing or selling the product (indirect costs outside the manufacturing step of the value chain)

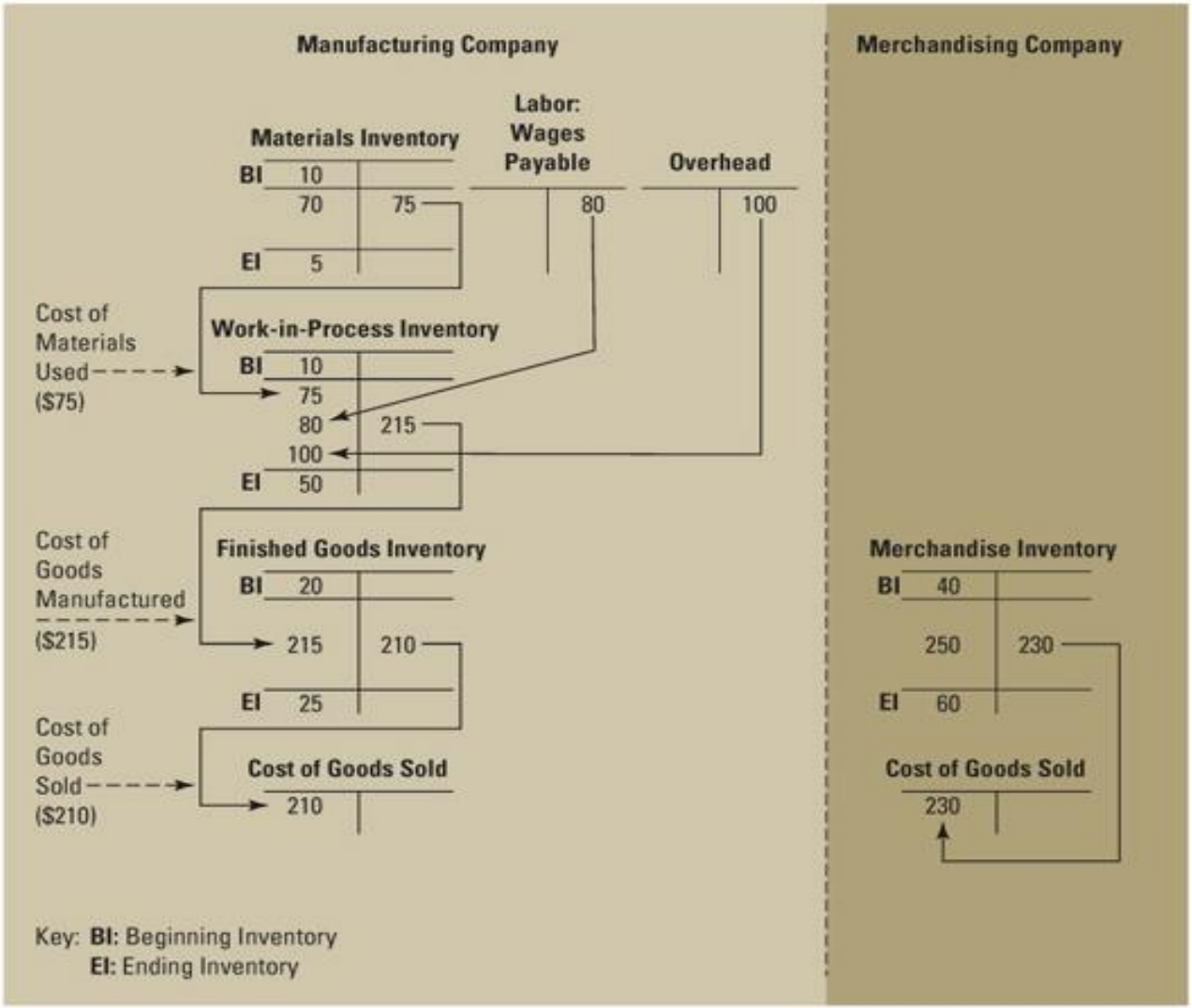
Manufacturing vs. Merchandising

EXHIBIT 3.13
Cost Flows in Manufacturing and Merchandising Firms



Inventory and Related Expense Accounts

EXHIBIT 3.14
Account Relationships for Manufacturing and Merchandising Companies



Qualitative Characteristics of Cost Information

- *Accuracy* (and the need to monitor internal accounting controls)
- *Cost and value of cost information* (the cost of information should be monitored by the management accountant to ensure that costs do not outweigh the associated benefits)
- *Timeliness* (often involves sacrificing in the other two areas)

Summary

- Cost assignment: the tracing (direct) or allocation (indirect) of costs to cost pools using cost drivers

- Four types of cost behavior (and cost drivers)
  - Volume based
    - Fixed cost
    - Variable cost
    - Mixed cost
    - Step cost
  - Activity based
  - Structural
  - Executional

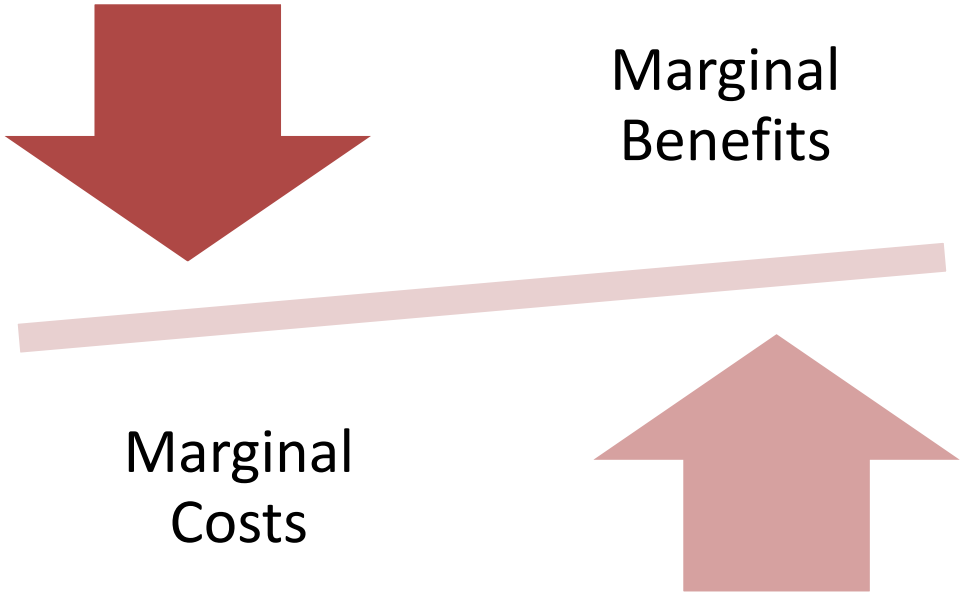
Summary

- Product and service costing focuses on differentiating product costs from period costs
- Costs flow through three inventory accounts in a manufacturing firm(raw materials, work-in-process, finished goods inventory); merchandising firms have one inventory account (inventory held for sale)

Benefit-cost analysis

The Cost-Benefit Principle

- Take an action *if and only if* the extra benefits are at least as great as the extra costs
- Costs and benefits are not just money



Applying the Cost – Benefit Principle

- ✓ Assume people are rational
  - A **rational person** has well defined goals and tries to fulfill those goals as best they can
- ✓ Would you walk to town to save $10 on an item?
  - Benefits are clear
  - Costs are harder to define

Cost – Benefit Principle Examples



Should there be 32 separate groups of Euromatech classes with 25 students each?



**Students learn more effectively in smaller classes.

**But smaller classes are also more expensive.

Or should there be only one class, with 800 students?~

32x25 = 800



Cost-Benefit Analysis (CBA)

Should I do activity **x**?

- **C(x)** = the costs of doing x or value of resources one needs to give up to do x.
- **B(x)** = the benefits of doing x
- If **B(x) > C(x)**, do **x**; otherwise don't.

Should we make the econ class larger?

❖Benefit of making the class size larger = the reduction in cost per student = B(x)

❖Cost of making the class size bigger = The amount people would be willing to pay to avoid the reduced quality of instruction = C(x)

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Some relevant costs

Let the Faculty salary: $60,000 per course

Per student faculty salary cost:

1 section: $60,000/800 = $75—large class

32 sections: $60,000/25 = $2400-small class

Benefit (to Euromatech) of increasing class size from 25 students to 800 students

= ($2400 - $75) = $2,325 = B(x)

If you were currently in a class with 25 students, how much would you be willing to pay to avoid switching to one with 800 students? = C(x)

If C(x) < B(x)=$2,325, then it makes sense to offer the larger class.

The Cost-Benefit Principle

1. An individual (or a firm, or a society) should take an action ***if, and only if,*** the extra benefits from taking the action are at least as great as the extra costs.
2. Critics of the cost-benefit approach often object that people don't really calculate costs and benefits when deciding what to do
3. People often behave *as if* they were comparing the relevant costs and benefits

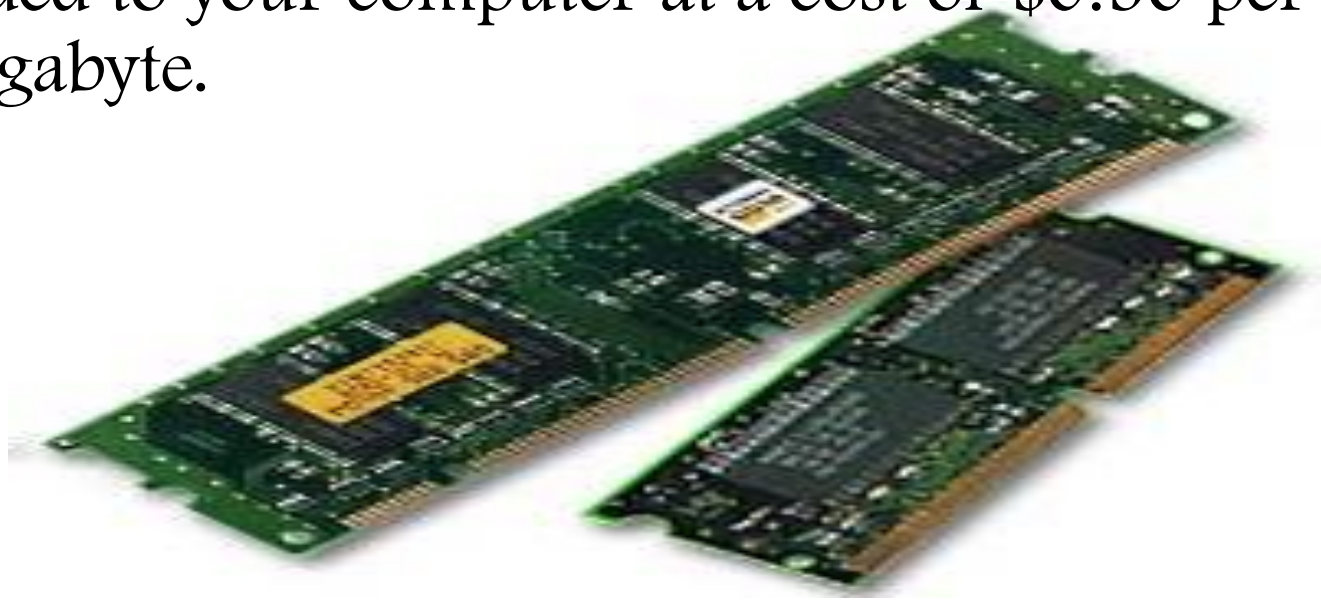
People often make bad decisions because they fail to compare the relevant costs and benefits



"The Budweiser "or "Corona " Walk

Example How much memory should your computer have?

Suppose that random access memory (RAM)can be added to your computer at a cost of $0.50 per megabyte.



How many megabytes of memory should you purchase?

"Should I do X?"

"How much X should I buy?"

"Should I buy an additional unit of X?"

Cost-Benefit principle

Rule:

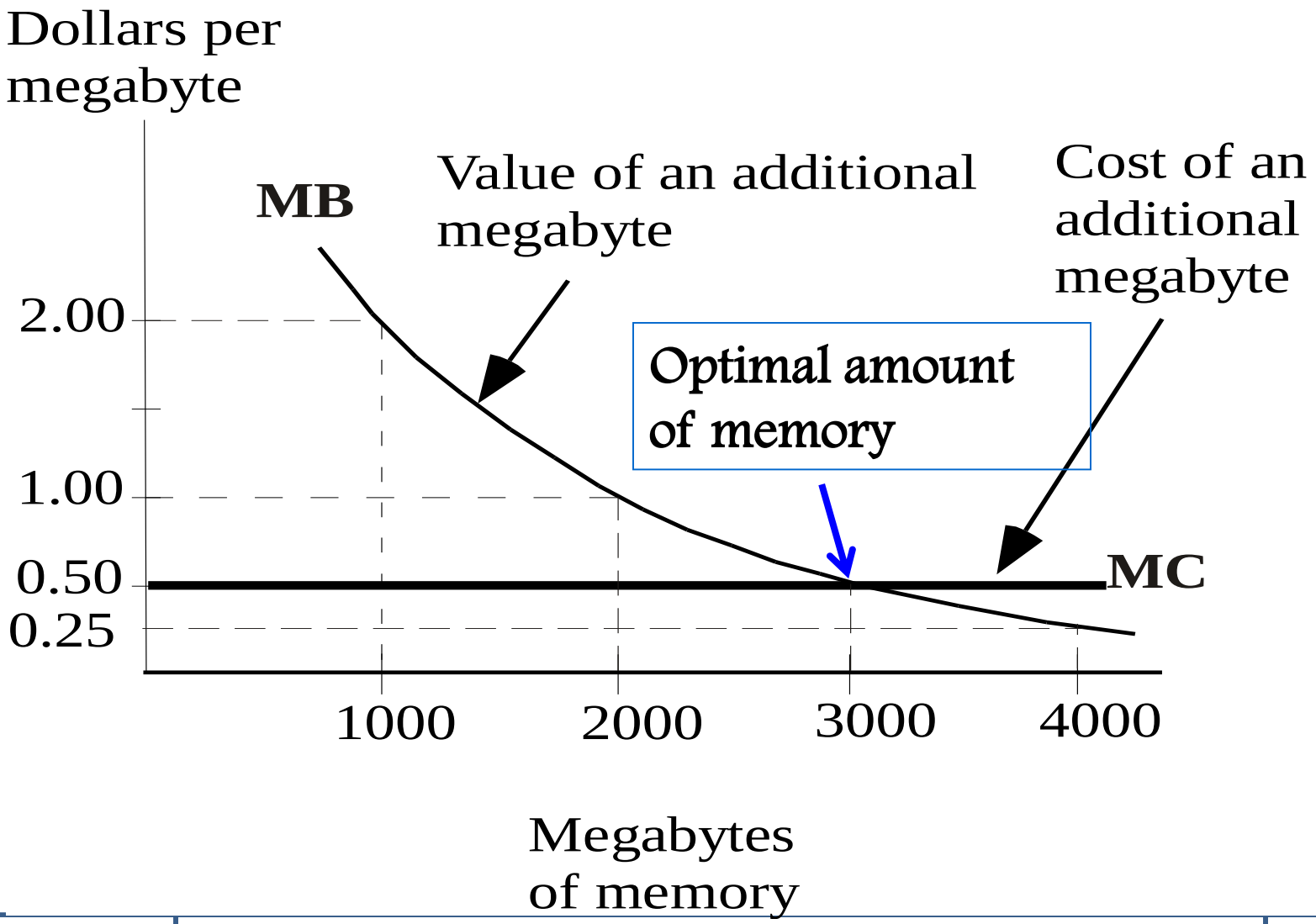
a. Buy an additional megabyte if the marginal benefit of RAM is at least as great as its marginal cost, i.e. MB ≥MC

b. Do not buy an additional megabyte if the marginal benefit of RAM is less than its marginal cost, i.e. MB < MC

c. You are indifferent if the marginal benefit of RAM equivalent to its marginal cost, i.e. MB ≈ MC

where

- Marginal benefit (MB)= added benefit from having 1 more unit
- Marginal cost (MC)= added cost of having 1 more unit


Dollars per megabyte
MB
Value of an additional megabyte
Cost of an additional megabyte
Optimal amount of memory
MC
2.00
1.00
0.50
0.25
1000
2000
3000
4000
Megabytes of memory

Marginal Analysis Ideas

Marginal cost is the increase in total cost from one additional unit of an activity (q)

$MC = \Delta TC / \Delta q$

- **Average cost** is total cost divided by the number of units, $AC = TC/q$

Marginal benefit is the increase in total benefit from one additional unit of an activity

$MB = \Delta TB / \Delta q$

- **Average benefit** is total benefit divided by the number of units, $AB = TB/q$

Working with Equations, Graphs, and Tables

Definitions

- Equation
- Variable
  - Dependent variable
  - Independent variable
- Parameter (constant)
  - Slope
  - Intercept

From Words to an Equation

- Identify the variables
- Calculate the parameters
  - Slope
  - Intercept
- Write the equation (B)
- **Example:** Phone bill is $5 per month plus 10 cents per minute (T =time)

$$B = \$5 + \$0.10\ T$$

From Equation to Graph

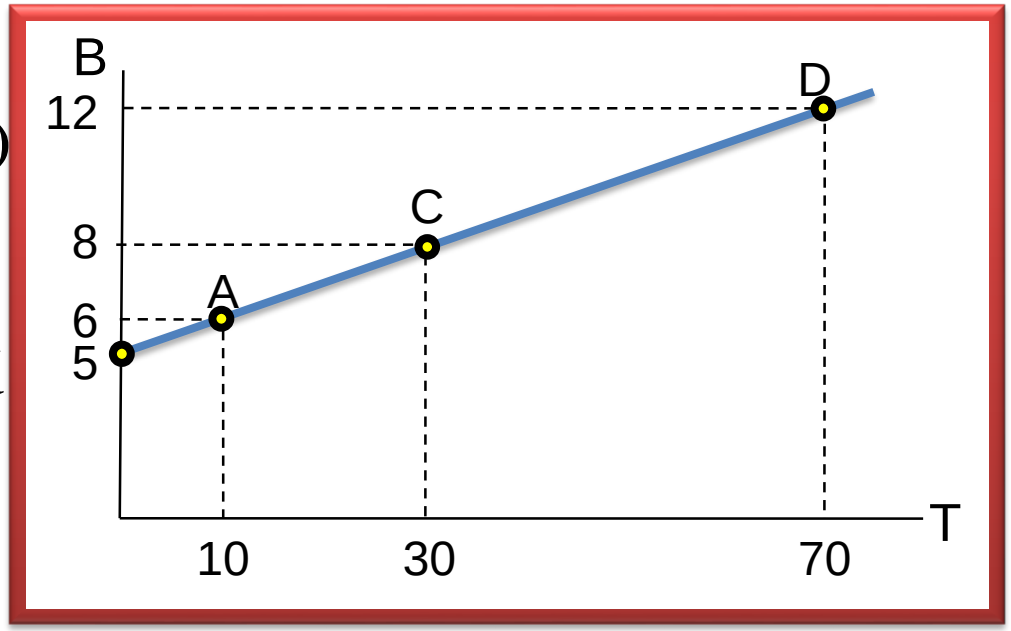
$$B = 5 + 0.10\,T$$

- Draw and label axes
  - Horizontal is independent variable =T
  - Vertical is dependent variable =B
- To graph,

•Plot the intercept (T=0; B=5)

•Plot one other point(T=30; B=8)

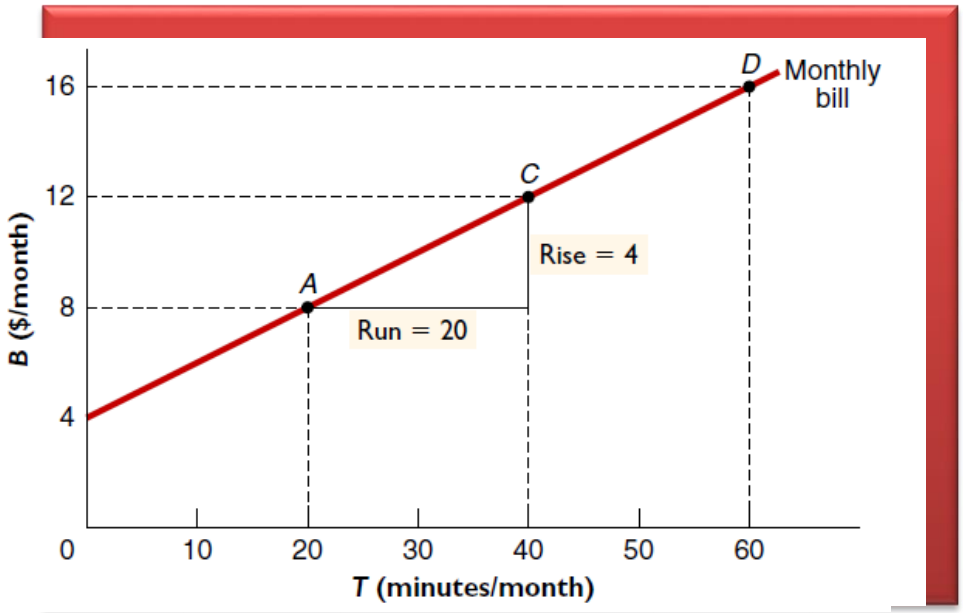
•Connect the points (0,5) and (30,8)



From Graph to Equation

- Identify variables
  - Independent (T)
  - Dependent (B)
- Identify parameters
  - Intercept (=4 if T=0)
  - Slope (4/20=0.2)

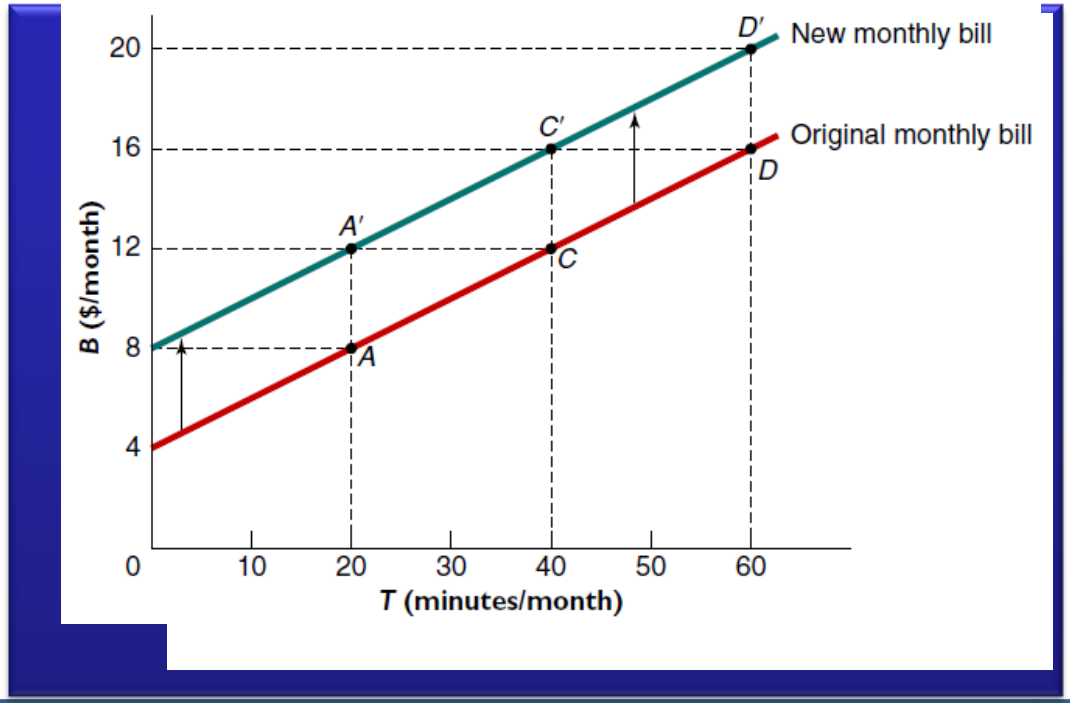
Thus, we can write the equation as:



$$B = 4 + 0.2\,T$$

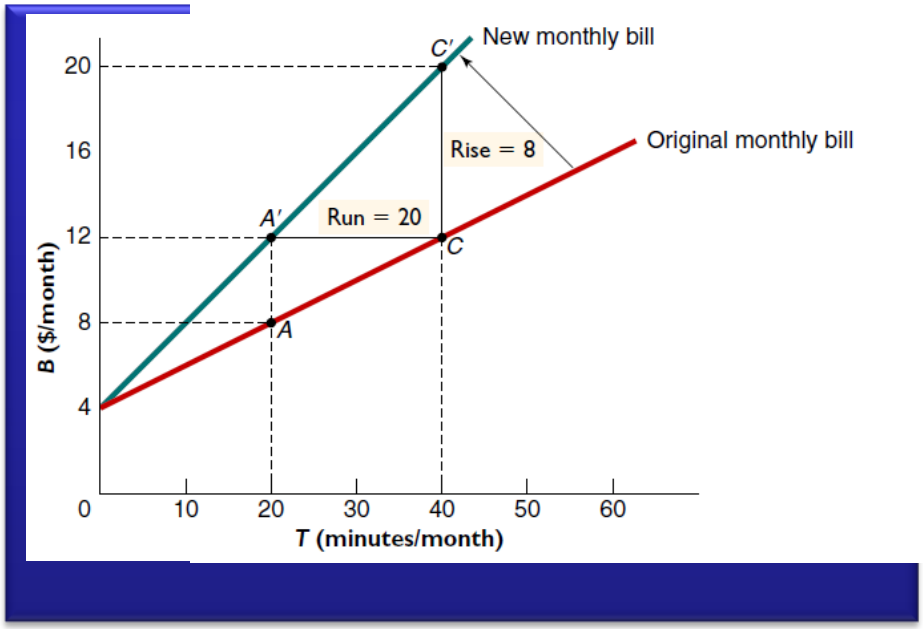
Changes in the Intercept (from 4 to 8)

- An increase in the intercept shifts the curve up
  - Slope is unchanged
  - Caused by an increase in the monthly fee
- A decrease in the intercept shifts the curve down
  - Slope is unchanged



Changes in the Slope (from 4/20=0.2 to 8/20=0.4)

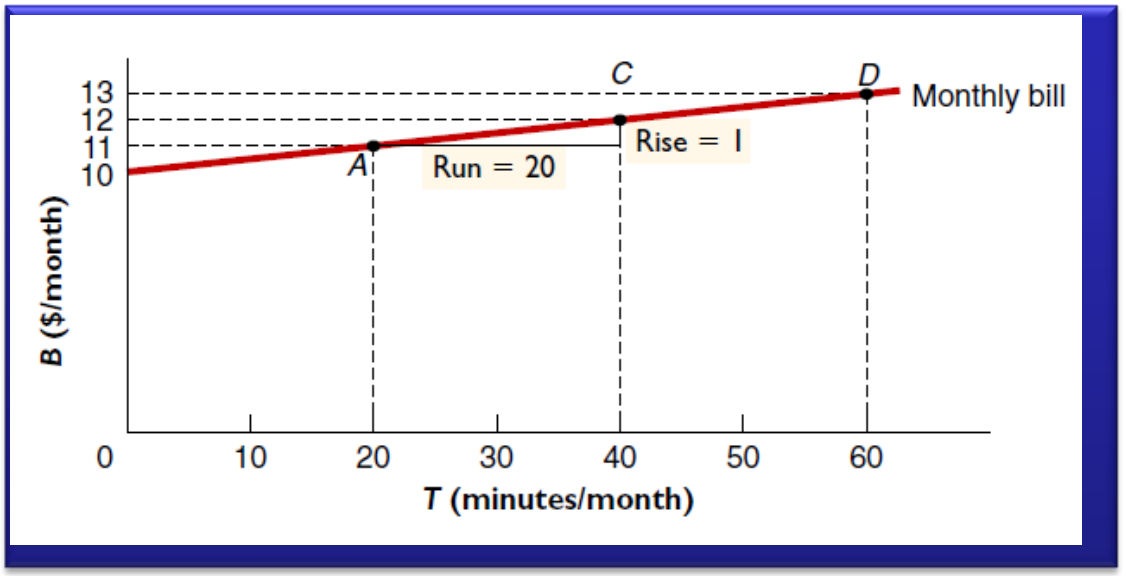
- An increase in the slope makes the curve steeper
  - Intercept is unchanged
  - Caused by an increase in the per minute fee
- A decrease in the slope makes the curve flatter
  - Intercept is unchanged



From Table to Graph

Time =T (minutes/month)	10	20	30	40
Bill ($/month) =B	$10.50	$11.00	$11.50	$12.00

- Identify variables
  - Independent
  - Dependent
- Label axes
- Plot points
  - Connect points



From Graph to Equation: is B= 10 + 0.05T

From Table to Equation

B= f + bT

Time (minutes/month)	10	20	30	40
Bill ($/month)	$10.50	$11.00	$11.50	$12.00

- Identify independent and dependent variables
- Calculate slope
  - Slope = (11.5 – 10.5) / (30 – 10) = 1/20 = 0.05
- Solve for intercept, f, using any point

B = f + 0.05 T; At B =12 and T=40

12 = f + 0.05 (40) = f + 2

f = 12 – 2 = 10

B = 10 + 0.05 T

Simultaneous Equations

- Two equations, two unknowns
- Solving the equations gives the values of the variables where the two equations intersect
  - Value of the independent and dependent variables are the same in each equation

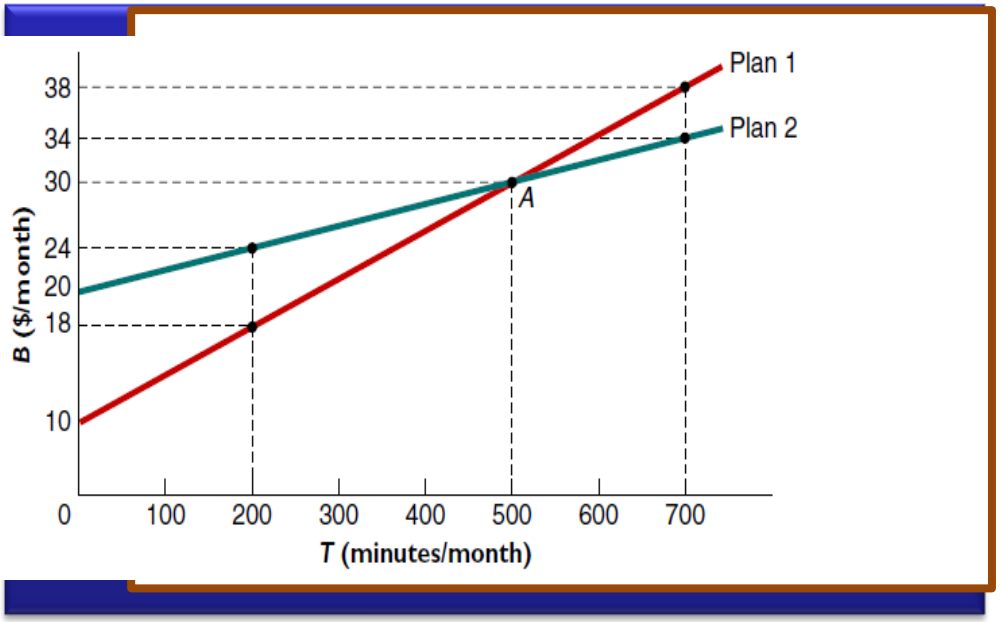
Example

- Two billing plans for phone service
  - How many minutes make the two plans cost the same?

Simultaneous Equations

- Plan 1 $B = 10 + 0.04\,T$
- Plan 2 $B = 20 + 0.02\,T$
  - Plan 1 has higher per minute price ($0.04) while Plan 2 has a higher monthly fee ($20)

Find B and T for point A



Simultaneous Equations

- Plan 1 $B = 10 + 0.04\ T$
- Plan 2 $B = 20 + 0.02\ T$
- Subtract Plan 2 equation from Plan 1 and solve for T

$$B = 10 + 0.04\ T$$
$$\underline{-B = -20 - 0.02\ T}$$
$$0 = -10 + 0.02\ T$$

T = 500

- Find B when T = 500

$B = 10 + 0.04\ T$

$B = 10 + 0.04\ (500)$

B = $30

OR

$B = 20 + 0.02\ T$

$B = 20 + 0.02\ (500)$

B = $30

Day 4

FULL COSTING, MARGINAL COSTING AND ACTIVITY BASED COSTING

FULL COSTING, MARGINAL COSTING AND ACTIVITY BASED COSTING

- Comparing full and marginal costing
- Direct and indirect costs in budgeting for decision making
- Role of costs in pricing strategies
- Activity Based Costing (ABC)
- Managing cost control

Comparing full and marginal costing

Cost classification

- Fixed costs
- Variable costs

Marginal costing

- Contribution (marginal costing)
- Calculation (gross profit per unit)

Marginal cost is the incremental cost of producing the next unit.

- When costs are linear and the level of activity is within the relevant range, marginal cost is the same as variable cost per unit.
- Marginal costs are often relevant in decision making.

Marginal costing

- Cost of producing one extra unit of output
- Increase in variable cost
- Fixed costs unchanged

Contribution

- Unit selling price
- less
- Unit marginal cost

Marginal costing

MARGINAL COSTING

Departmental profitability

	FURNITURE	CARPETS	CURTAINS	TOTAL
	£'000	£'000	£'000	£'000
Sales	3,000	1,500	1,000	5,500
Materials	1,500	1,050	333	2,850
Labour	300	250	100	650
Overheads (fixed)	600	300	300	1,200
TOTAL COSTS	2,400	1,600	700	4,700
PROFIT/(LOSS)	600	(100)	300	800

Using marginal costing

	FURNITURE	CARPETS	CURTAINS	TOTAL
	£'000	£'000	£'000	£'000
Sales	3,000	1,500	1,000	5,500
Materials	1,500	1,050	300	2,850
Labour	300	250	100	650
VARIABLE COSTS	1,800	1,300	400	3,500
CONTRIBUTION	1,200	200	600	2,000
Overheads (fixed)				1,200
PROFIT/(LOSS)				800

Use of spare capacity

- Maximise extra contribution

Spare capacity

SPARE CAPACITY

100 UNITS ARE PRODUCED AND SOLD FOR £100 EACH

VARIABLE COST = £45 PER UNIT

FIXED OVERHEADS = £3,500

REVENUE = £10,000

VARIABLE COST = £4,500

FIXED COSTS = £3,500

PROFIT = £2,000

OFFER (A): 50 UNITS @ £80 EACH

OFFER (B): 100 UNITS @ £60 EACH

	NOW	EXTRA 50 UNITS	EXTRA 100 UNITS
REVENUE			
100 units	10,000	10,000	10,000
Extra 50 units		4,000	
Extra 100 units			6,000
	10,000	14,000	16,000
COSTS			
Variable	4,500	6,750	9,000
Fixed	3,500	3,500	3,500
	8,000	10,250	12,500
PROFIT	2,000	3,750	3,500
Extra 50 units @ £35		+1,750	
Extra 100 units @ £15			+1,500

Make or buy decisions

- Alternative uses of equipment
- Opportunity costs (the cost of NOT doing something due to the loss of profit)

Make or buy

MAKE OR BUY DECISIONS

CURRENT PRODUCTION **5,000 UNITS**

INCREASE IN DEMAND **5,000 UNITS**

DO WE MAKE THE EXTRA 5000 UNITS IN-HOUSE?
OR DO WE BUY THEM IN FROM OUTSIDE?

ALTERNATIVE 1: MAKE IN-HOUSE

Current cost structure:

VARIABLE COST	**£9.50 per unit**
FIXED COST	**£5.50 per unit**
TOTAL COST	**£15.00 per unit**

ALTERNATIVE 2: BUY IN FROM OUTSIDE

QUOTED PRICE	**£10.00 per unit**

DO WE COMPARE £10 WITH (a) £9.50 or (b) £15.00?

Allocation of scarce resources

- Materials
- Skilled labour
- Factory space
- Finance
- Sales

Scarce resources

LIMITING FACTORS – SCARCE RESOURCES

	Model A	Model B
Unit selling price	£50	£100
Unit contribution	£20	£30
Labour hours per unit	2	4

*** Weekly labour hours available = 240

Weekly fixed overheads = £2,000

*** All output can be sold

Question – how many of each model to make next week?

	Model A	Model B
C/S ratio	40%	30%
Contribution per labour hour	£10	£7.50

Therefore choose to make model A

Proof:

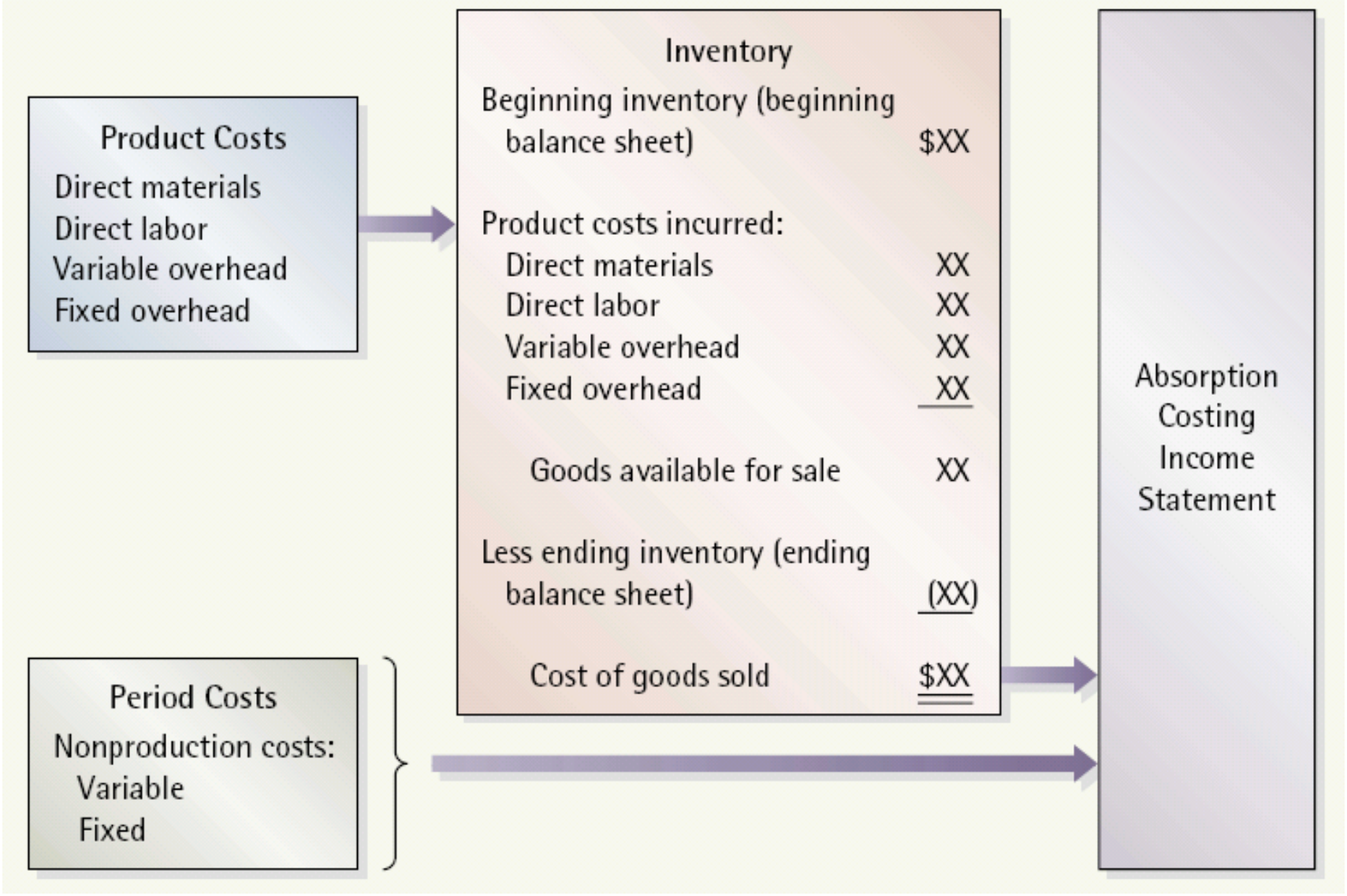
Sales	(120 x £50)	£6,000	(60 x £100)	£6,000
Contribution	(120 x £20)	£2,400	(60 x £30)	£1,800
Fixed costs		£2,000		£2,000
Profit		£400		(£200)

Direct and indirect costs in budgeting for decision making

Absorption Costing Income Statements

- Under absorption costing, fixed manufacturing overhead is an inventoriable cost.
- GAAP requires the use of absorption costing.
- Absorption costing income statements are prepared using the traditional format.
  - Expenses are grouped by function.
  - Manufacturing costs deducted above the gross margin subtotal.
  - Nonmanufacturing costs deducted below the gross margin subtotal.

Absorption Costing Income Statements



Absorption Costing Income Statements

Revenue	
(Units sold x Price per unit)	$XX
Cost of goods sold	
[Units sold x (Variable production cost per unit + Allocated fixed production cost per unit)]	(XX)
Gross margin	XX
Nonproduction costs	
(Selling, administrative, and other)	(XX)
Operating Income	$XX

Absorption Costing Income Statement Example

Russell Corporation produces a product that sells for $10. In 2011, there were 10,000 units in beginning finished goods inventory. The company expected to produce, and actually did produce, 80,000 units, and 62,000 units were sold. The costs incurred in 2011 are shown below. Given the cost information below, compute the inventoriable costs per unit under absorption costing.

	2011
Direct materials	$60,000
Direct labor	128,000
Variable factory overhead	68,000
Variable non-mfg costs	55,800
Fixed mfg overhead	100,000
Fixed non-mfg costs	70,000

Direct materials	$0.75
Direct labor	1.60
Variable mfg overhead	0.85
Fixed mfg overhead	1.25
	$4.45

Absorption Costing Income Statement Example

Suppose that the Russell Corporation uses the LIFO inventory method. Prepare an absorption costing income statement for 2011.

Sales (# units sold @ $10)	$620,000
Cost of goods sold (# units sold @ $4.45)	275,900
Gross margin	344,100
Nonmfg costs ($70,000 + $55,800)	125,800
Operating income	$218,300

Note that cost of goods sold is based on the 2011 per-unit manufacturing costs because:

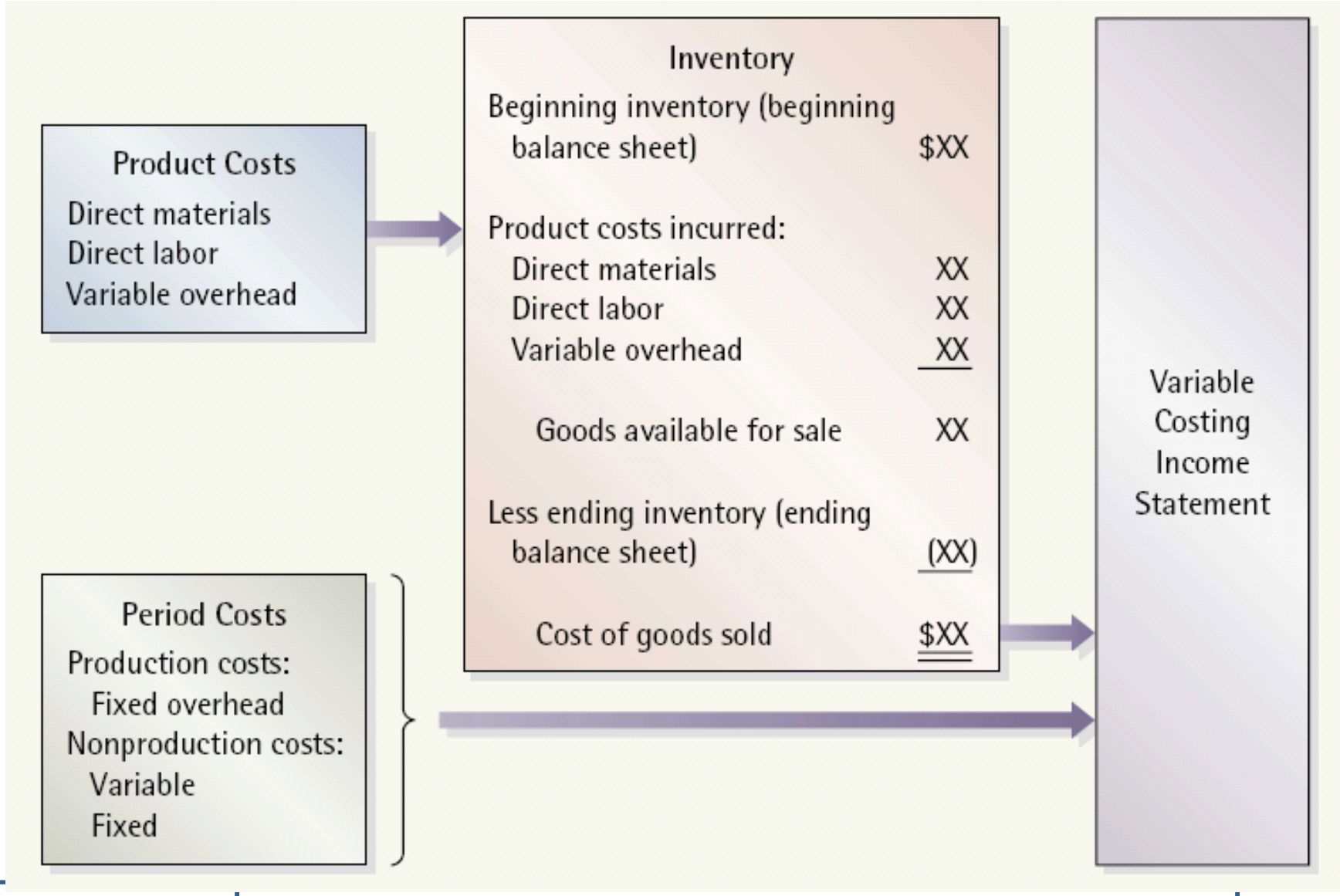
(1) Russell is using LIFO, and

(2) production exceeded sales in 2005.

Variable Costing Income Statements

- Under variable costing, fixed manufacturing overhead is a period cost.
- Variable costing income statements are used internally only.
- Variable costing income statements are prepared using the contribution format.
  - Expenses are grouped by cost behavior.
  - Variable costs deducted above the contribution margin subtotal.
  - Fixed costs deducted below the contribution margin subtotal.

Variable Costing Income Statements



Variable Costing Income Statements

Revenue	
(Units sold × Price per unit)	$XX
Variable costs:	
Production (Units sold × Variable production cost per unit)	(XX)
Nonproduction (Units sold × Variable nonproduction cost per unit, such as sales commissions)	(XX)
Contribution margin	XX
Fixed costs:	
Fixed production costs	(XX)
Fixed nonproduction costs	(XX)
Operating income	$XX

Variable Costing Income Statement Example

Russell Corporation produces a product that sells for $10. In 2011, there were 10,000 units in beginning finished goods inventory. The company expected to produce, and actually did produce, 80,000 units, and 62,000 units were sold. The costs incurred in 2011 are shown below. Compute the inventoriable costs per unit under variable costing.

	2011
Direct materials	$60,000
Direct labor	128,000
Variable factory overhead	68,000
Variable non-mfg costs	55,800
Fixed mfg overhead	100,000
Fixed non-mfg costs	70,000

Direct materials	$0.75
Direct labor	1.60
Variable mfg overhead	0.85
	$3.20

Variable Costing Income Statement Example

Suppose that the Russell Corporation uses the LIFO inventory method. Prepare a variable costing income statement for 2011.

Sales (# units sold @ $8)	$620,000
Variable costs:	
Cost of goods sold (# units sold @ $3.20)	198,400
Nonmfg variable costs	55,800
Contribution margin	365,800
Fixed costs:	
Fixed mfg overhead	100,000
Fixed nonmfg costs	70,000
Operating income	$195,800

Note that cost of goods sold is based on the 2011 per-unit manufacturing costs because Russell is using LIFO.

Variable Costing Income Statement Example

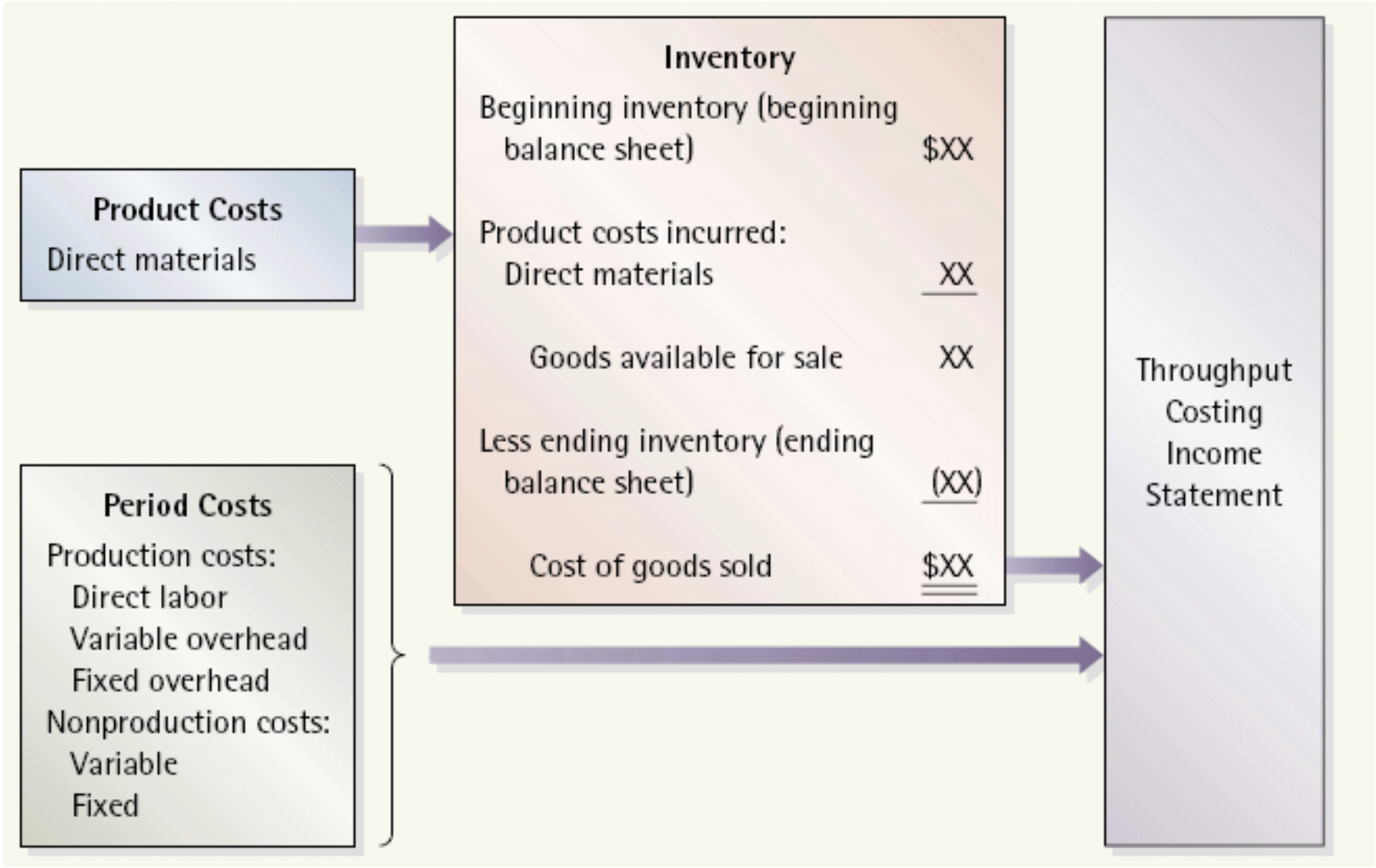
Suppose that the Russell Corporation uses the LIFO inventory method. Reconcile the income under variable costing you determined on the prior slide with the $218,300 income under absorption costing computed on slide #7.

Variable costing income	$195,800
Add: fixed overhead attached to the increase in inventory	
(18,000 units x $1.25/unit)	22,500
Absorption costing income	$218, 300

Throughput Costing Income Statements

- Under throughput costing, all manufacturing costs except direct materials are period costs.
- Throughput costing income statements are used internally only; useful when most manufacturing costs are not variable in the short run.
- Throughput costing income statements are prepared using a new format.
  - Sales – cost of goods sold (direct materials only) = throughput margin

Throughput Costing Income Statements



Throughput Costing Income Statements

Revenue	
(Units sold × Price per unit)	$XX
Direct material costs:	
Production (Units sold × Direct materials unit cost)	(XX)
Throughput contribution	XX
Other costs:	
Production (Direct labor + Fixed and variable overhead)	(XX)
Nonproduction costs (Fixed and variable selling and administration)	(XX)
Operating Income	$XX

Throughput Income Statement Example

Russell Corporation produces a product that sells for $10. In 2011, there were 10,000 units in beginning finished goods inventory. The company expected to produce, and actually did produce, 80,000 units, and 62,000 units were sold. The costs incurred in 2011 are shown below. Suppose that the Russell Corporation uses the LIFO inventory method. Prepare a throughput costing income statement for 2011.

	2011
Direct materials	$60,000
Direct labor	128,000
Variable factory overhead	68,000
Variable non-mfg costs	55,800
Fixed mfg overhead	100,000
Fixed non-mfg costs	70,000

Note that DL and VO costs expensed based on units produced, not units sold

Sales (# units sold @ $8)	$620,000
Cost of goods sold (# units sold @ $0.75)	46,500
Throughput margin	573,500
All other costs:	
Direct labor	128,000
Variable mfg overhead	68,000
Fixed mfg overhead	100,000
Variable nonmfg overhead costs	55,800
Fixed nonmfg costs	70,000
Operating income	$151,700

Throughput Costing Income Statement Example continued

Reconcile the income under throughput costing you computed on the prior slide to the income under variable costing computed on slide #18 and to the income under absorption costing computed on slide #7.

Throughput costing income	$151,700
Add: Costs attached to the increase in inventory:	
Direct labor (18,000 units x $1.60/unit)	28,800
Variable overhead (18,000 units x $0.85/unit)	15,300
Variable costing income	$195,800
Add: fixed overhead attached to the increase in inventory	
(18,000 units x $1.25/unit)	22,500
Absorption costing income	$218, 300

Actual versus Estimated Denominator Levels

- Normal costing uses an estimated, rather than an actual, denominator level for the overhead cost allocation base.

- If an actual denominator level is used, information is not timely.
- Using an estimated denominator level provides a smoothing effect, for two reasons:
  - Numerator reason
  - Denominator reason

Various Measures of Production

- Supply-based measures of capacity:
  - The maximum possible capacity, with no allowance for downtime, is known as theoretical capacity.
  - Theoretical capacity, reduced by an allowance for normal downtime, is known as practical capacity.
- Demand-based measures of capacity:
  - The average use of capacity of several years is known as normal capacity.
  - The anticipated use of capacity for the upcoming year is known as budgeted capacity or expected capacity.

Effect of Denominator Volume on the Income Statement

- When denominator volume is different than actual volume, there is a fixed overhead volume variance.
- The volume variance is the difference between budgeted fixed overhead and applied fixed overhead.
- If material, the volume variance is closed to work in process, finished goods, and cost of goods sold at year-end.

Absorption Costing Income Statement & Volume Variance Example

Russell Corporation produces a product that sells for $10. In 2005, there were 10,000 units in beginning finished goods inventory. The company expected to produce 100,000 units in 2011. However, it actually produced 80,000 units and sold 62,000 units. The costs incurred in 2005 are shown below. Compute the inventoriable costs per unit under absorption costing.

	2011
Direct materials	$60,000
Direct labor	128,000
Variable factory overhead	68,000
Variable non-mfg costs	55,800
Fixed mfg overhead	100,000
Fixed non-mfg costs	70,000

Direct materials	$0.75
Direct labor	$1.60
Variable mfg overhead	$0.85
Fixed mfg overhead	$1.00
	$4.20

Note that choice of denominator level affects only the fixed overhead cost per unit.

Absorption Costing Income Statement & Volume Variance Example

Suppose that the Russell Corporation uses the LIFO inventory method and that the volume variance is considered material. Assume that the balances in WIP, FG, and CGS, before any adjustment for the volume variance, were at a ratio of 1:2:7 at 12/31/11. There was no fixed overhead spending variance in 2011. Compute the volume variance and prepare the year-end entry to close the Fixed overhead control account.

Budgeted fixed overhead		$100,000
Fixed overhead applied (80,000 units x $1/unit)		80,000
Unfavorable fixed overhead volume variance		$20,000
Fixed overhead control	20,000	
Work in process [(1/10) x 20,000]		2,000
Finished goods [(2/10) x 20,000]		4,000
Cost of good sold [(7/10) x 20,000]		14,000

Note that the unfavorable volume variance equals the underapplied fixed overhead because there was no spending variance for fixed overhead.

Absorption Costing Income Statement & Volume Variance Example

Using the cost information on slide #8 and the volume variance you calculated on the prior slide, prepare an absorption costing income statement for 2011.

Sales (# units sold @ $10)		$620,000
Cost of goods sold:		
(# units sold @ $4.20)	$260,400	
Adjustment for volume variance	14,000	274,400
Gross margin		345,600
Nonmfg costs ($70,000 + $55,800)		125,800
Operating income		$219,800

Decision Making and Manager Incentives

- Absorption costing is used for external reporting but may not be best for performance evaluation purposes.
- Variable and throughput costing avoid incentives to build up inventory levels.
  - No income statement benefit to building up inventory since fixed costs are not inventoried.
- Throughput costing may be useful for some short-term decision making.
- Technology advances can help organizations utilize absorption costing for external purposes and another method for internal reporting

Role of costs in pricing strategies

Major factors that affect Pricing decisions

- How companies price a product or service ultimately depends on the demand and supply for it.
- Three influences on demand and supply are:
  1. Customers
  2. Competitors
  3. Costs

Influences on Demand and Supply

1. Customers—influence price through their effect on the demand for a product or service, based on factors such as product features and quality.
2. Competitors—influence price through their technologies, plant capacities and operating strategies which affect their costs.
3. Costs—influence prices because they affect supply (the lower the cost, the greater the quantity a firm is willing to supply).

The Product Life Cycle

Management methods discussed:

- Value Chain
- Target costing
- Theory of constraints (TOC)
- Life-cycle costing
- Strategic pricing

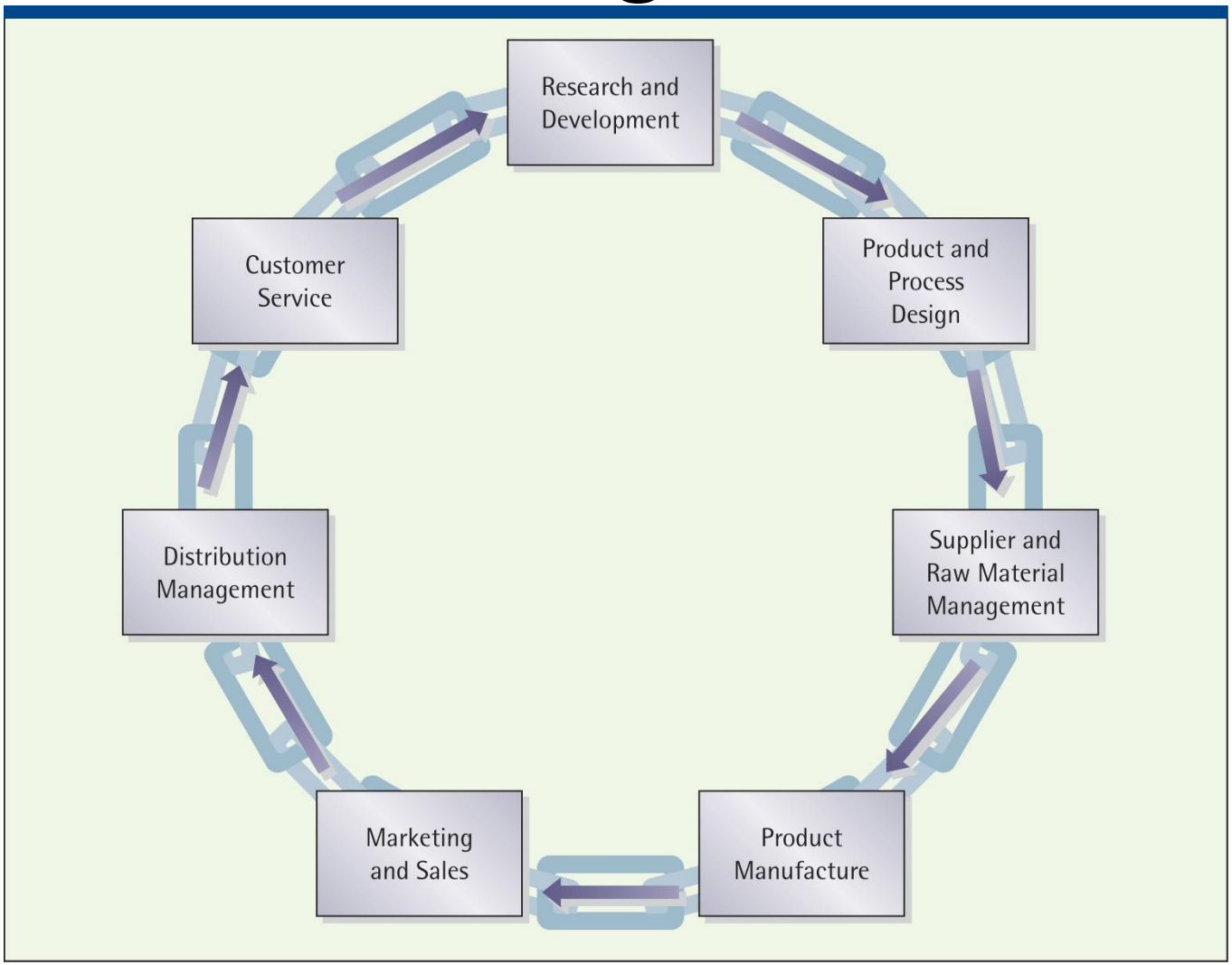
All involve the entire product life cycle:

- Managers now need to look at costs upstream (before manufacturing) and downstream (after manufacturing)

Value Chain Analysis

- The value chain is the series of sequential business processes an organization completes in order to deliver goods and services to customers.
- To manage costs, companies analyze the activities in the value chain.
  - Non-value-added activities are those that can be reduced or eliminated without affecting the value of the goods to the customer.
  - Value-added activities are necessary activities and support the value of the goods to the customer.

Manufacturing Value Chain



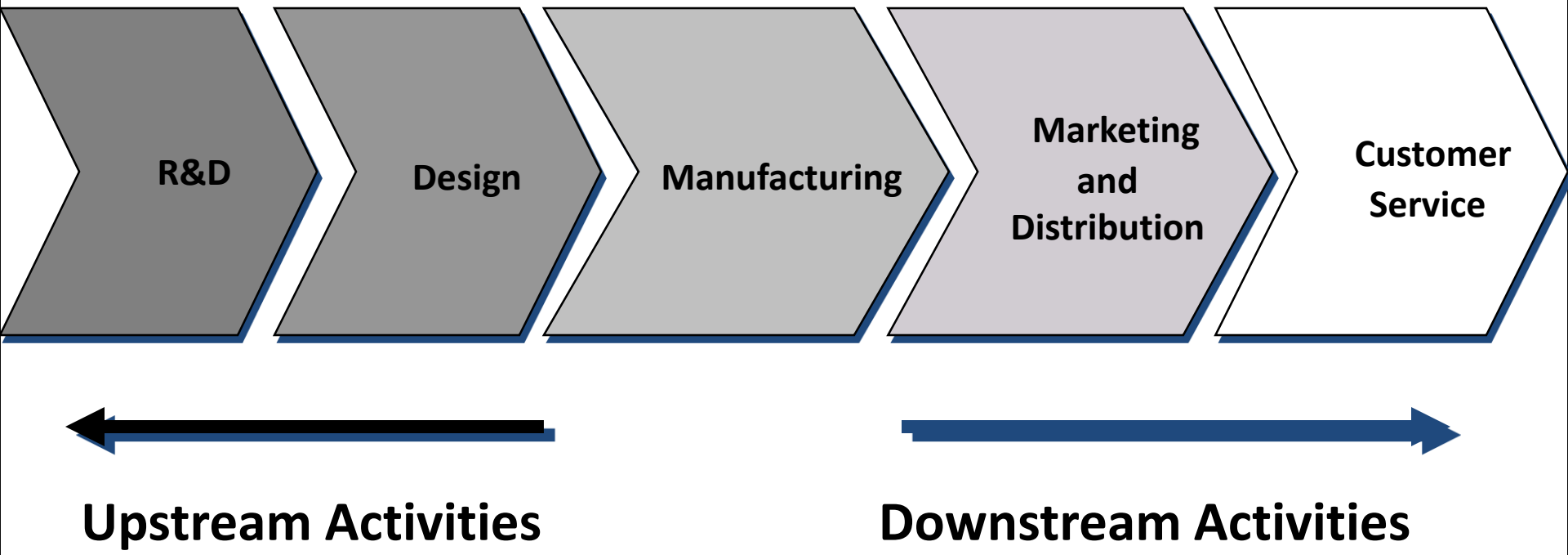
The Cost Life Cycle

"Cost life cycle" refers to the following sequence of activities:

- Research and Development (R&D)
- Design
- Manufacturing (or providing the service)
- Marketing/distribution
- Customer service

It is the life cycle of a product or service from the viewpoint of costs incurred

The Cost Life Cycle (continued)



Design decisions account for much of total life-cycle costs

Life Cycle Costing

- Life cycle costing takes the product's selling prices and costs over its entire life cycle into consideration.
- It is useful in industries with products that are expected to produce losses when first introduced, but rapid technological changes and increased volume are expected in future years.
- Initial production and process design costs will be viewed as costs to be matched against the revenues generated over the product's entire life.

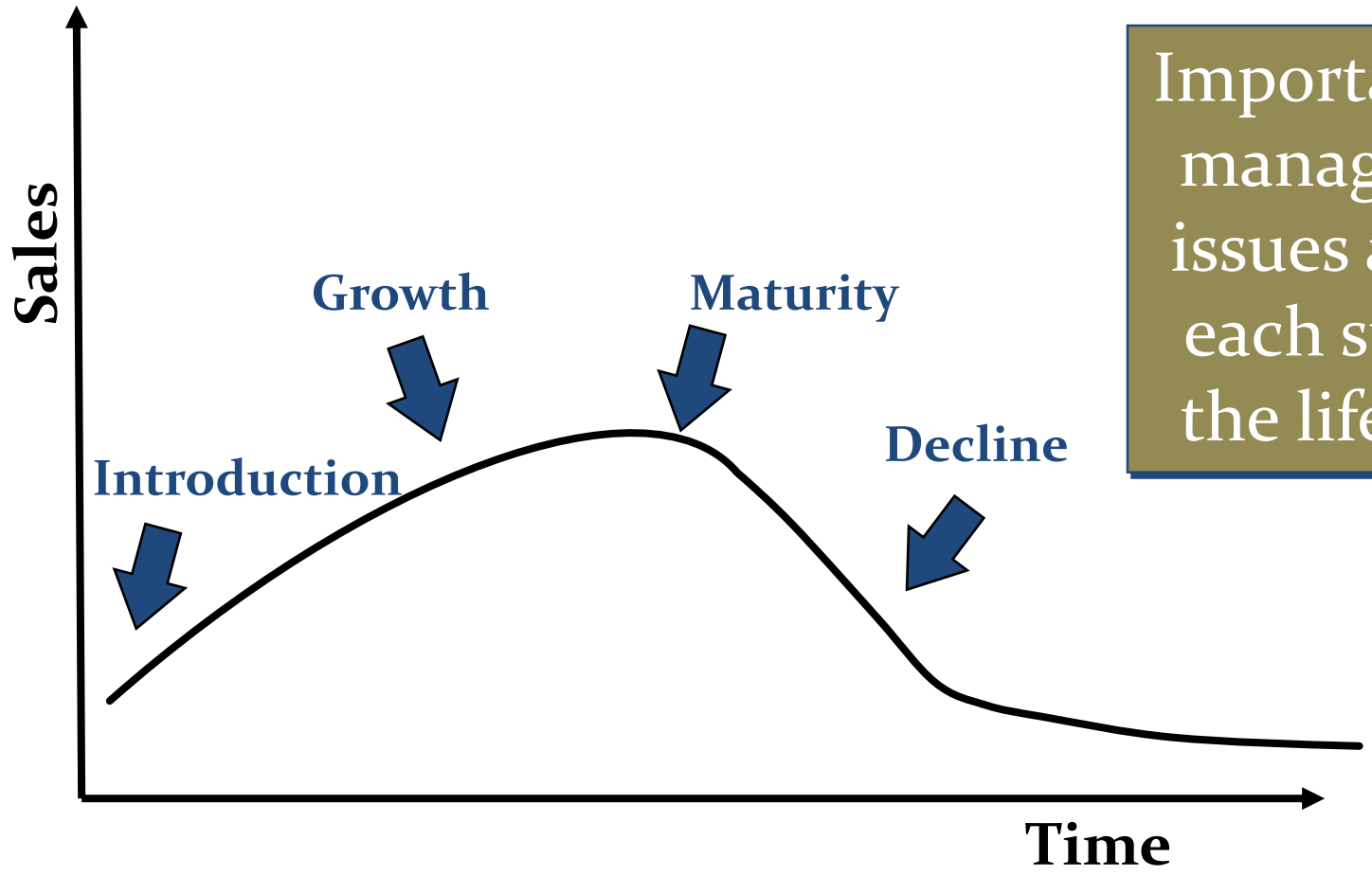
The Sales Life Cycle

The Sales life cycle is the sequence of phases in the product's or service's life:

- Introduction of the product or service to the market
- Growth in sales
- Maturity
- Decline
- Withdrawal from the market

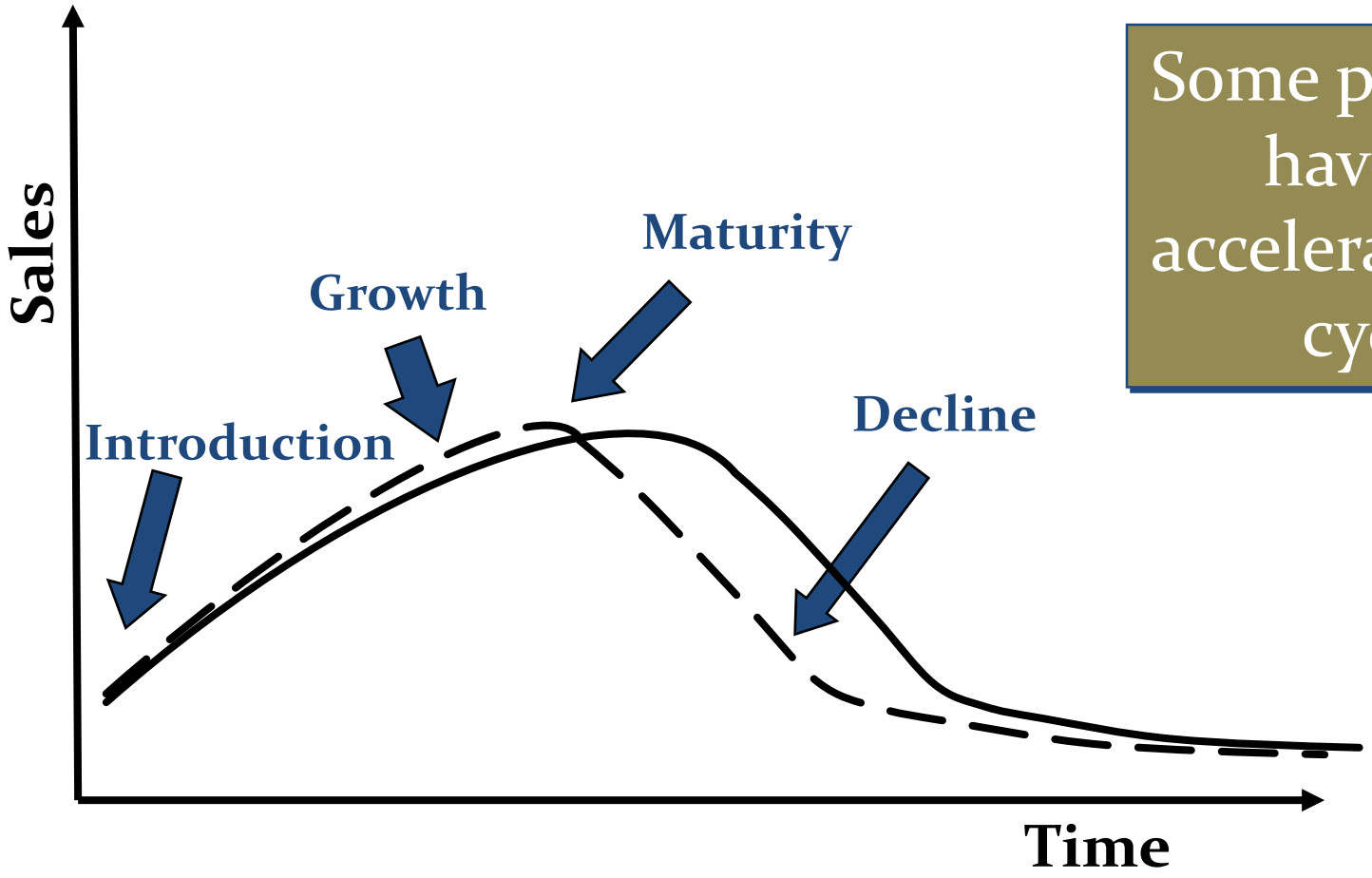
The sales life cycle is the life cycle of a product or service from the viewpoint of sales volume achieved

The Sales Life Cycle



Important cost management issues arise in each stage of the life cycle.

The Sales Life Cycle



Some products have an accelerated life cycle

Target Costing

- **Target costing: a costing method in which the firm determines the allowable (i.e., "target") cost for a product or service, given a competitive market price and a targeted profit**

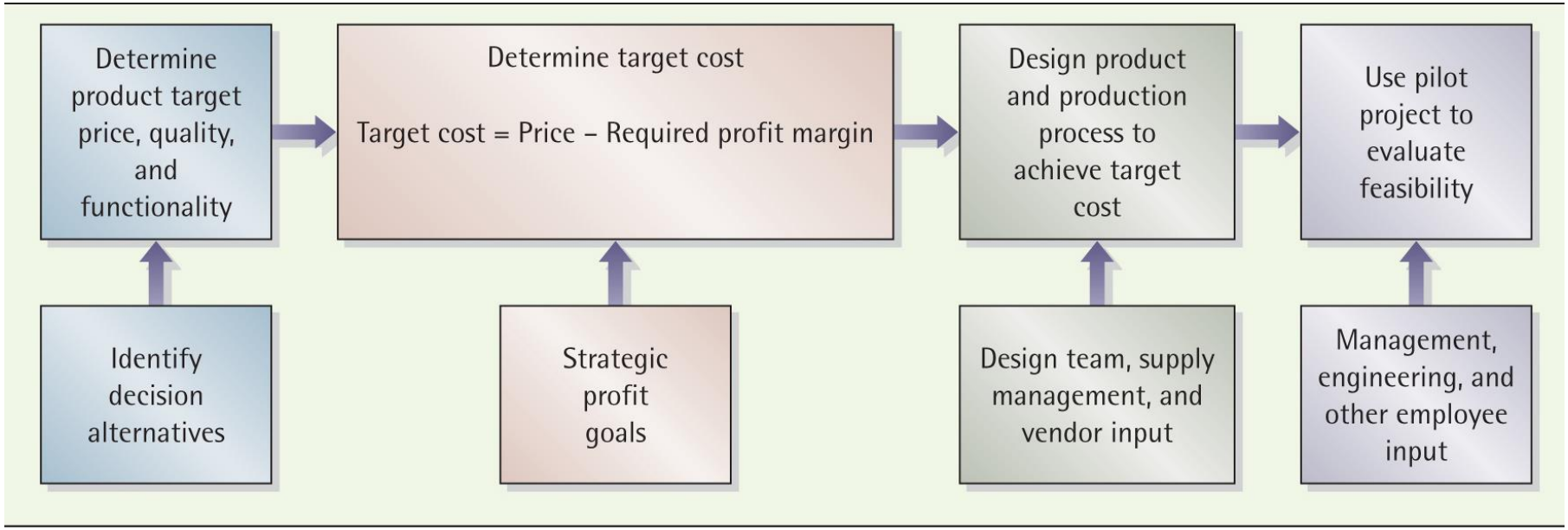
- **Two options for reducing costs to achieve the target-cost level:**
  - By integrating new manufacturing technology using advanced cost management techniques, (such as ABC), and seeking higher productivity
  - By redesigning the product or service

Target Costing

- In competitive markets, companies may have no control over selling prices.
- The company's only method to manage profits, then, is to manage costs.
- The selling price is used to back into the target cost of the product.

$$\text{Target cost} = \text{Selling price} - \text{Required profit margin}$$

Target Costing Design



Implementing Target Costing

1. Determine the market price
2. Determine the desired profit
   - Profit per unit
   - Profit as a % of revenue or cost
3. Calculate the target cost as market price less desired profit
4. Use “value engineering” to reduce cost
5. Use kaizen costing and operational control to further reduce costs

Target Costing

- Target costing takes place before the decision to produce the product is final.
- It is most likely to be successful when:
  - production and design processes are complex,
  - relationships with suppliers are flexible, and
  - potential customers may be willing to pay for product attributes that will differentiate the product from the competition.

Target Costing Example

Ted's Trailers is considering the design, production, and distribution of a new motorcycle trailer. The selling price of similar trailers is $1,200. Ted believes he can sell 10,000 trailers at this price, and he demands a margin of 25% of selling price on all products. Compute the target cost of the trailers.

Target cost = $1,200 – ($1,200 x 25%) = $900

Target Costing Example

The estimated production costs for the new trailer are shown below. Discuss the types of issues that Ted should investigate as he seeks to reduce these estimated costs to meet the target cost.

Direct materials	$500
Direct labor	210
Variable mfg overhead	50
Fixed mfg overhead	70
Variable selling expenses	40
Fixed selling & admin expenses	70
	$940

- Can the product be redesigned so that the quantity of materials and/or labor can be reduced?
- Can the purchase price of any of the materials be re-negotiated with the supplier(s)?
- Can the production process be redesigned so that the quantity of materials and/or labor can be reduced?
- Can the design of the product be changed to incorporate features that the customer would be willing to pay for?
- Can variable selling expenses, for example, commissions, be reduced on this new product?
- Can more than 10,000 units be produced and sold so that the allocation of fixed costs per unit decreases?

Value Engineering

Value engineering (step 4):

- Analyze trade-offs between product functionality (features) and total product cost
- Perform a consumer analysis during the design stage of the new or revised product to identify critical consumer preferences

Value Engineering

For firm's that can add and delete features easily, *functional analysis* (examining the performance and cost of each major function or feature of the product) can be used

- *Benchmarking* is often used in this step to determine which features give the firm a competitive advantage
- Goal: provide a desired level of performance without exceeding the target cost

Value Engineering

Design analysis:

- Useful when the **firm cannot add and delete features easily**
- The design team prepares several possible designs of the product, each having similar features with different levels of performance and different costs
- Accountants work with the design team to choose one design that best meets customer preferences while not exceeding the target cost

Value Engineering

Other cost-reduction methods:

- *Cost tables:* computer-based databases (costs and cost drivers)
  - Firms that manufacture parts of different size from the same design can estimate the difference in cost and material usage for increasing or decreasing size
- *Group technology* is a method of identifying similarities in the parts of products a firm manufactures so the same parts can be used in two or more products, thereby reducing costs

Value Engineering

- Value engineering is a systematic evaluation of all aspects of the value chain, with the objective of reducing costs and achieving a quality level that satisfies customers.
- Value engineering entails improvements in product designs, changes in materials specifications and modifications in process methods.
- To implement value engineering, managers must distinguish *value-added* activities and costs from *non-value-added* activities and costs.

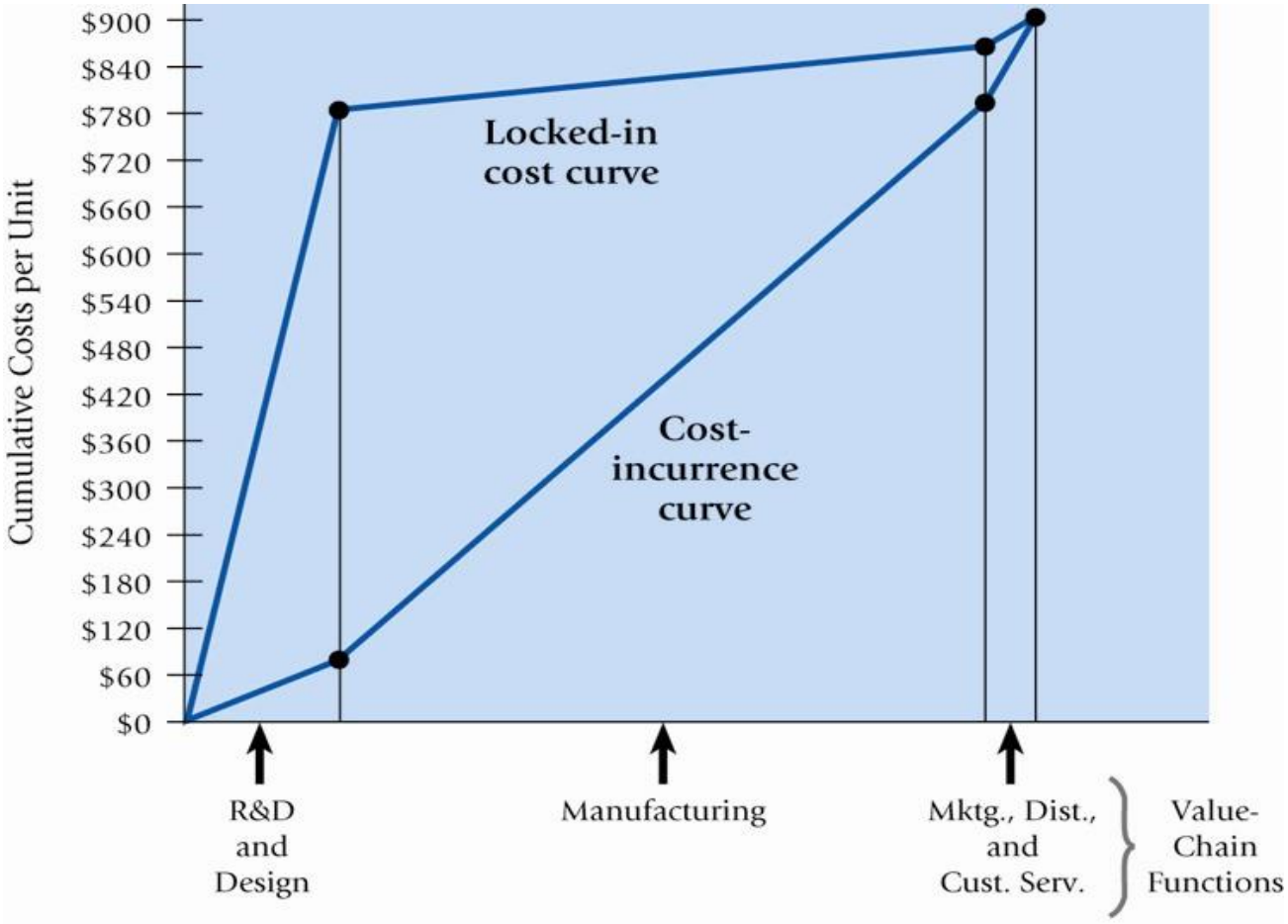
Value Engineering Terminology

- Value-added costs—a cost that, if eliminated, would reduce the actual or perceived value or utility (usefulness) customers experience from using the product or service.
- Non-value-added costs—a cost that, if eliminated, would *not* reduce the actual or perceived value or utility (usefulness) customers gain from using the product or service. It is a cost the customer is unwilling to pay for. (Examples include the cost of defective products and machine breakdowns.)

Value Engineering Terminology

- Cost incurrence—describes when a resource is consumed (or benefit foregone) to meet a specific objective.
- Locked-in costs (designed-in costs)—are costs that have not yet been incurred but will be incurred in the future based on decisions that have already been made.
- The best opportunity to manage costs is before they are locked in.

Cost Incurrence and Locked-In Costs Graph



Kaizen Costing

- In kaizen costing, explicit cost reductions are planned over time.
- Kaizen costing takes place after the production process has begun.
- Kaizen costing is a continuous improvement process that takes place over a longer planning horizon than target costing.

Kaizen

Kaizen (step five): using continuous improvement & operational control to reduce costs in the *manufacturing stage* of the product life cycle

- Achieved through:
  - Streamlining the supply chain
  - Lean manufacturing
  - Improving manufacturing methods and productivity programs
  - Employing new management techniques
- Used extensively in the time period between product redesigns

Lean Accounting

- Set of accounting principles and methods that support lean business practices
- Combines value chain analysis, cellular manufacturing, JIT inventory, activity based management, and target & kaizen costing
- Value stream analysis analyzes business processes to identify the cost of individual value-added activities
  - Establishes cellular manufacturing sytems
  - Utilizes kanban (demand-pull) systems
  - Allows for low inventory levels

Lean Accounting Performance Measurements

- Takt time – maximum time available to produce each unit
- Day-by-the-Hour – compares units demanded compared to units produced
- First Time Through (FTT) – percent of units which are produced correctly the first time (before rework)
- WIP to SWIP – measures actual level of WIP inventory relative to standard levels
- Operational Equipment Effectiveness (OEE) – measured primarily for bottleneck machines

Lean Accounting Measurements Example

Sigma Industries produces metal detection devices. Customer demand for the third quarter of 2011 (13 weeks) is expected to be 11,960 devices. Sigma produces metal detection devices five days a week in two manufacturing cells. Employees build devices 8 hours per day.

1. Calculate the takt time.

11,960 devices = 184 devices per day / 2 cells = 92 devices per cell per day

65 days or 11.5 devices per hour

(13 weeks * 5days/week)

2. After one hour, one cell produced 11 devices with 2 requiring rework. Calculate the Day-by-the-Hour variance and the FTT rate

Day-by-the-Hour results – negative variance of 0.5 devices

First Time Through – 11 devices less 2 rework devices = 9 good devices

then, 9 good devices / 11 devices = 81.2% FTT

3. If the FTT goal was 90%, what conclusions can you make about the manufacturing cell for the first hour of the day?

Uses of Lean Accounting Measurements

- Should not be used solely to evaluate manager or employee performance
- Instead lean accounting measurements should be used as
  - Diagnostic controls to identify & correct out-of-control situations
  - Interactive controls to drive continuous improvement
- Can be applied to manufacturing and non-manufacturing environments

Target Costing Example

HPI manufactures a hearing aid, HPI-2, that has 30% of the market. It has a cost of $650 and sells for $750. A competitor has just introduced a new model that incorporates a computer chip that improves quality. Its cost is $1,200. A consumer analysis indicates that cost-conscious consumers will remain loyal to HPI as long as price does not exceed $600. HPI wants to maintain the current rate of profit, $100 per hearing aid.

HPI must therefore reduce its cost to $500 ($600 price - $100 profit) to meet its profit goal

Target Costing Example

Design analysis options :

- Alternative A: reduce R&D, replace parts, and change inspection procedure – savings = $150
- Alternative B: replace parts and change inspection procedure – savings = $150
- Alternative C: increase R&D to develop a computer chip type hearing aid, replace parts, change inspection procedure, renegotiate new supplier contract – savings = $150

Target Costing Example

Management chooses alternative C because:

- The increase in R&D will improve the firm's competitive position in the future
- The move is strategically important: the new technology may be dominant in the future

Quality Function Deployment (QFD)

QFD: the integration of value engineering, marketing analysis, and target costing to assist in determining which components of the product should be targeted for redesign or cost reduction

Four steps in QFD:

1. Identify and rank customers' purchasing criteria for the product
2. Identify the components of the product and the cost of each component
3. Determine how the product's components contribute to customer satisfaction
4. Determine the importance index of each component

QFD Example: Step 1

First: Customer Criteria and Ranking

	Importance	Relative Importance	
Safety	95	46.3%	= 95÷205
Performance	60	29.3%	= 60÷205
Economy	50	24.4%	= 50÷205
Total	205	100.0%	

QFD Example: Step 2

Second: Identify Components and Cost of Each

	Cost	Percent of Total	
Motor	$40	53.3%	= 40÷75
Saw	20	26.7%	= 20÷75
Frame	15	20.0%	= 15÷75
Total	$75	100.0%	

QFD Example: Step 3

How Components Contribute to Customer Satisfaction

	Customer Criter		
	Safety	Performance	Economy
Motor	10%	10%	60%
Saw	30%	50%	10%
Frame	60%	40%	30%
Total	100%	100%	100%

QFD Example: Step 4

Fourth: Determine Importance Index for Each Component

	Safety	Perform.	Economy	Importance Index
Relative importance	46.3%	29.3%	24.4%	
% contribution:				
Motor	10%	10%	60%	22.2%*
Saw	30%	50%	10%	31.0%
Frame	60%	40%	30%	46.8%
Total	100%	100%	100%	100.00%

* (10% × 46.3%) + (10% × 29.3%) + (60% × 24.4%)

QFD Example: Conclusion

	Importance Index	Relative Cost
Motor	22.2%	53.3%
Saw	31.0%	26.7%
Frame	46.8%	20.0%
Total	100.0%	100.0%

The above analysis shows that too much is being spent on the motor component, relative to its value to the customer. In contrast, not enough is being spent on the frame component relative to its value to the customer.

Benefits of Target Costing

- Increases customer satisfaction (design is focused on customer value)
- Reduces costs (more effective and efficient design)
- Helps the firm achieve desired profitability on new and redesigned products
- Can decrease total time required for product development through improved coordination of design, manufacturing, and marketing
- Can increase communication and cooperation among departments
- Can improve overall product quality

Measuring and Improving Speed

- **Many strategic initiatives undertaken by firms today focus on improving the speed of operations**

- **Manufacturing *cycle time* (*lead time* or *throughput time*) is the amount of time between the receipt of a customer order and the shipment of that order**
  - Note that start and finish time of the cycle can be defined in several ways. Example: the start time could be defined as the time raw materials are ordered, and the finish time as the time production is completed

Measuring and Improving Speed (continued)

- ***Manufacturing cycle efficiency*** **(MCE) is defined as processing time divided by total cycle time**
  - MCE separates total cycle time into:
    - Processing time
    - Inspection time
    - Materials handling time
    - Waiting time, and so on
  - Most firms would like to see MCE close to one
- ***Constraints*** **are activities that slow a product's total cycle time**

The Theory of Constraints (TOC)

TOC focuses on improving speed at the constraints, to decrease overall cycle time

Five steps in TOC:

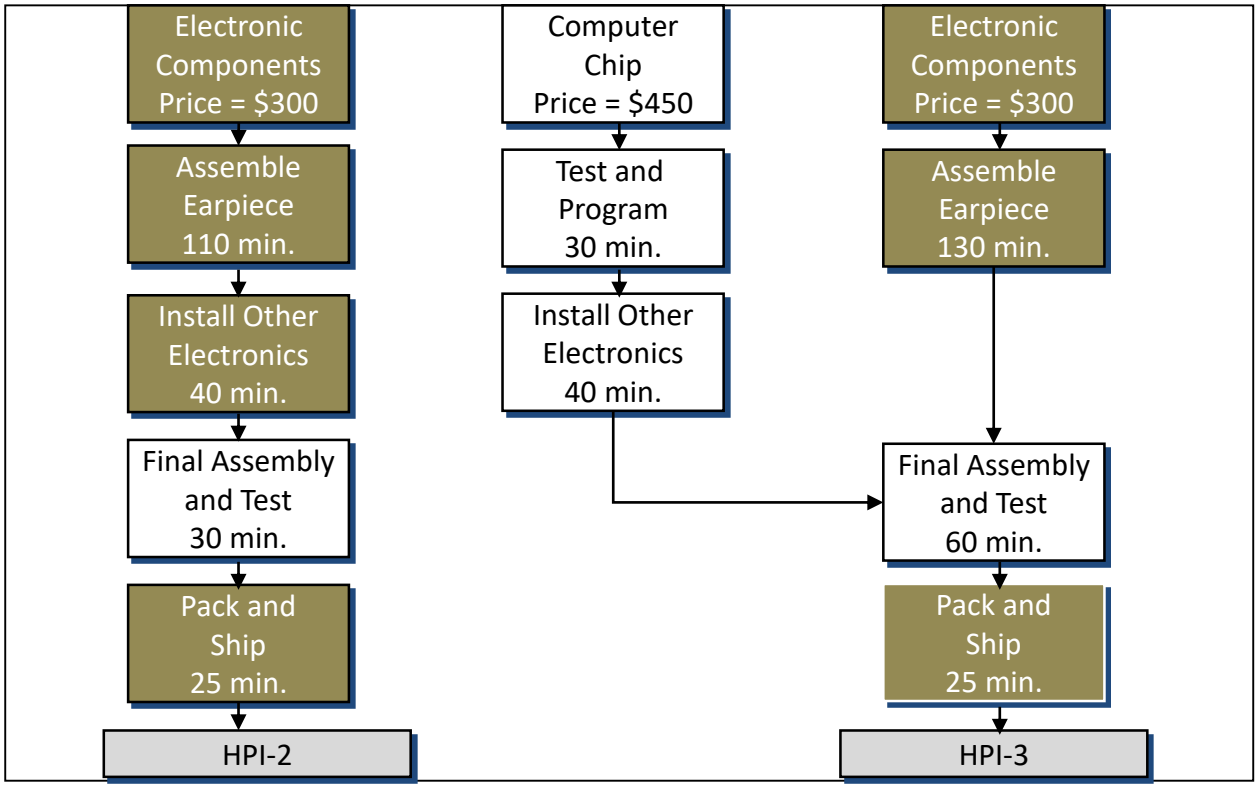
1. Identify the constraint
2. Determine the most profitable product mix given the constraint
3. Maximize the flow through the constraint
4. Add capacity to the constraint
5. Redesign the manufacturing process for flexibility and fast cycle time

TOC Example

HPI manufactures both the second generation (HPI-2) and the third generation (HPI-3) of hearing aids. Prices are competitive at $600 and $1,200, respectively, and are not expected to change. The monthly orders average 3,000 units for HPI-2 and 1,800 units for HPI-3. New customers are told they may have to wait at least three weeks for their orders, and management is concerned about the need to improve speed in the manufacturing process.

TOC Example Step 1: Identify the Constraint

Develop a *flow diagram*, which shows the sequence and time of each process



TOC Example Step 1: Identify the Constraint

Use the flow diagram and additional operational data to identify the constraint for HPI

- There is difficulty maintaining adequate staffing in all process areas except process 5
- Analysis of the process flow, staffing levels, and process time reveals the constraint occurs in process 4, perform final assembly and test; the other four processes have slack time

TOC Example Step 2: Determine the most profitable product mix given the constraint

The most profitable mix provides the maximum total profits for both products

- First, use throughput margin to determine the most profitable product given the constraint
- Throughput margin = selling price less materials cost

In the example, the relevant measure of profitability is *throughput margin per minute in final assembly and testing*

Step 2:

HPI-3 has a higher throughput margin per unit, but with the time constraint in process 4, HPI-2 is the more profitable product per constraint time minute.

	HPI-2	HPI-3
Price	$600.00	$1,200.00
Materials cost	300.00	750.00
Throughput margin	$300.00	$450.00
Constraint time (for Process 4)	30	60
Throughput per minute	$10.00	$7.50

Step 2:

HPI will produce all 3,000 units (total demand) for HPI-2 since it is the more profitable, and the remaining capacity will be used to produce HPI-3. HPI-2 will use 1,500 (3,000 units × 0.5 hour per unit) hours of the 2,400-hour capacity. The 900 hours remaining allow for production of 900 units of HPI-3.

	HPI-2	HPI-3
Total demand in units	3,000	1,800
Units of product in optimal mix	3,000	900
Unmet demand	-	900

TOC Example Step 3: Maximize the flow through the constraint

- Look for ways to speed the flow by simplifying the process, improving product design, reducing setup, and reducing other delays

- Objective is to balance the flow of production through the system (processes prior to and including the constraint) by carefully timing and scheduling those activities

Step 3:

- Another method to use is *Takt time* (total time available to meet expected customer demand)

- Example: after allowing for employee break time, a manufacturing plant operation has 400 minutes of manufacturing time available per day. If average customer demand is 800 units, the Takt time is 30 seconds per unit. The Takt time of 30 seconds is used to balance the flow of product through the processes.

400 minutes ÷ 800 units = 30 seconds per unit *takt time*

TOC Example Steps 4 & 5

Step 4: Add capacity to the constraint

- Adding new machines or additional labor is a long-term measure that can improve flow through the constraint

Step 5: Redesign the manufacturing process for flexibility and fast cycle time

- This step involves the most complete strategic response to the constraint because simply removing one or more minor features of a product might speed up the production process significantly

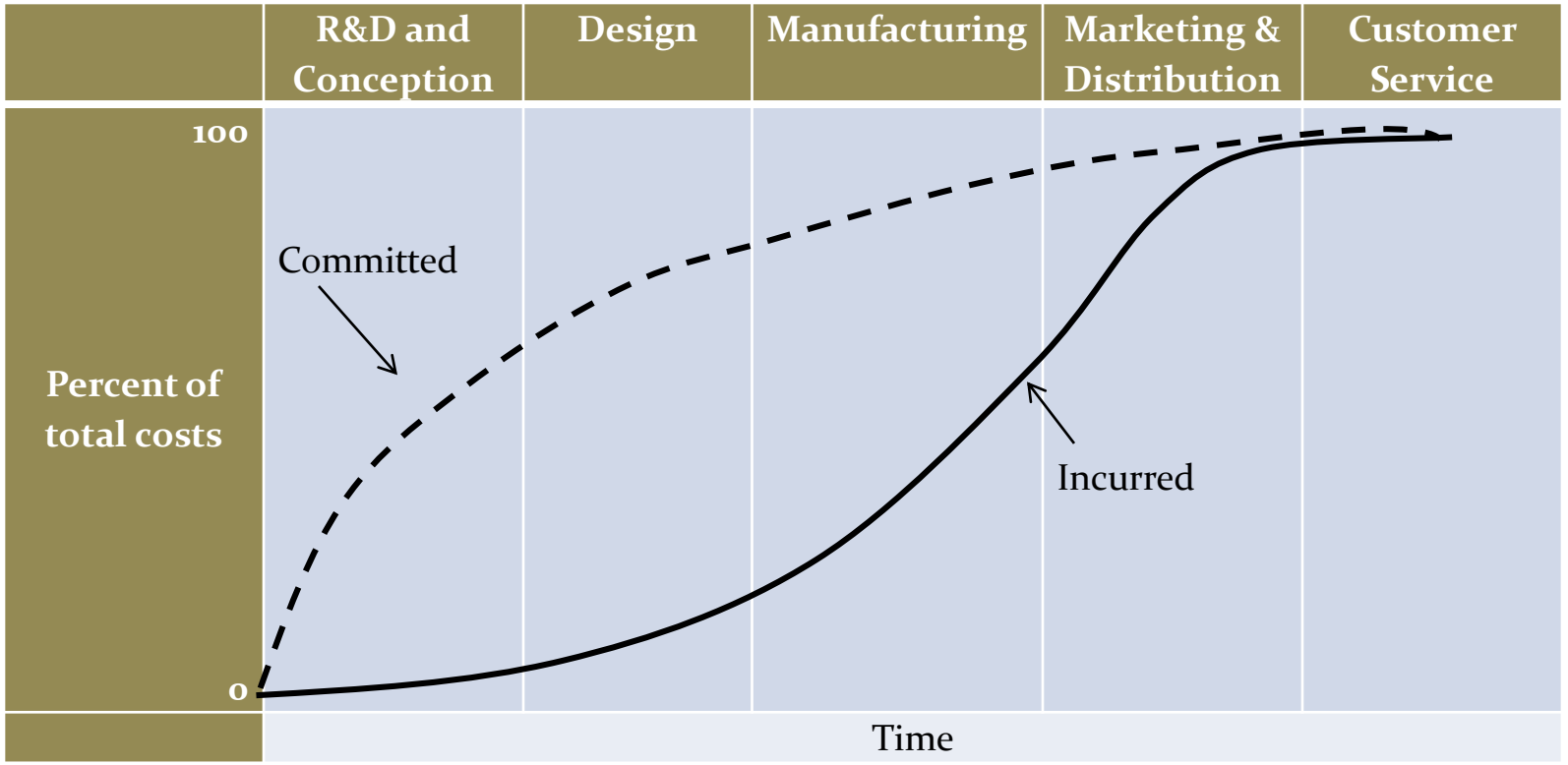
The Five Steps in Strategic Decision Making: Importance of Speed in the Fashion Industry: The Burberry Group PLC

1. **Determine the Strategic Issues Surrounding the Problem:** *Burberry competes on design and innovation in the fashion industry*
2. **Identify the Alternative Actions:** *focus on design or operations***?**
3. **Obtain Information and Conduct Analyses of the Alternatives:** *using an enterprise system, SAP, Burberry carefully determines product and process costs*
4. **Based on Strategy and Analysis, Choose and Implement the Desired Alternative:** *Burberry's CEO decides to simply the product line to "one brand…one image," and to focus on more efficient and less costly operations*
5. **Provide an On-going Evaluation of the Effectiveness of implementation in Step 4.**

TOC vs. ABC

	TOC	ABC
Main Objective	Short-term focus: through put margin analysis based on materials and materials-related costs	Long-term focus; analysis of all product costs
Resource constraints	Included explicitly, a principal focus of TOC	Not included explicitly
Cost drivers	No direct utilization of cost drivers	Develop an understanding of cost drivers at all levels
Major Use	Optimization of production flow and short-term product mix	Strategic pricing and profit planning

Committed vs. Incurred Costs



Life-Cycle Costing

Life-cycle costing provides a more complete perspective of product costs and profitability than pricing based on manufacturing costs alone

- Managers need to be concerned with costs outside the manufacturing process because upstream and downstream costs can account for a significant portion of total life-cycle costs.

- Decision-making at the design stage is critical because decisions at this point commit a firm to a given production, marketing, and service plan, and lock in most of the product's total life cycle costs. most crucial way to manage these costs is at the design stage of the product and the manufacturing process.

Life-Cycle Costing Example

According to the "traditional" product-line statements below, ADI-1 appears to be the more profitable product

Product Line Income Statements Analytical Decisions, Inc.			
	ADI-1	ADI-2	Total
Sales	$ 4,500,000	$ 2,500,000	$ 7,000,000
Cost of sales	1,240,000	1,005,000	2,245,000
Gross margin	$ 3,260,000	$ 1,495,000	$ 4,755,000
R & D			2,150,000
Selling and service			1,850,000
Income before taxes			$ 755,000

Life-Cycle Costing Example

However, when upstream and downstream costs are considered, ADI-2 is actually more profitable

Life-Cycle Costing Analytical Decisions, Inc.			
	ADI-1	ADI-2	Total
Sales	$ 4,500,000	$ 2,500,000	$ 7,000,000
Cost of sales	1,240,000	1,005,000	2,245,000
Gross margin	$ 3,260,000	$ 1,495,000	$ 4,755,000
R & D	1,550,000	600,000	2,150,000
Selling and service	1,450,000	400,000	1,850,000
Income before taxes	$ 260,000	$ 495,000	$ 755,000

Strategic Pricing

- **Strategic pricing decisions require information from:**
  - The cost life cycle
  - The sales life cycle
- **The cost information for pricing is commonly based on one of four methods:**
  - Full manufacturing cost plus markup
  - Life-cycle cost plus markup
  - Full cost and desired gross margin percent
  - Full cost plus desired return on assets

Strategic Pricing

Strategic pricing depends on the position of the product or service in the *sales life cycle*

Phase 1 Introduce	Pricing is set relatively high to recover development costs and take advantage of new-product demand
Phase 2 Growth	Pricing is likely to stay relatively high as the firm attempts to build profitability
Phase 3 Maturity	The firm becomes more of a price taker than a price setter and attempts to reduce upstream and downstream costs
Phase 4 Decline	Volume and prices decline and the firm increases emphasis on controlling upstream and downstream costs

Peak Load Pricing

- Designed to capitalize on or modify consumer behavior, examples include:
  - Charging different rates for peak and off-peak cell phone minutes used
  - Charging more per kilowatt of electricity in the afternoon than in the middle of the night

Cost-Based Pricing

- A selling price that is computed as the product's cost plus a markup is known as a cost-based price.
- The costs included in the base cost can be variable costs only or variable plus fixed costs.
- Some companies include only production costs in the cost base and others include production, selling, and administrative costs.

Market-Based Pricing

- A product's selling price depends on the degree of competition and the degree to which the company's product is differentiated from competitor's products.

- Market-based prices are based on customer demand for the product.

- The sensitivity of customer demand to changes in the selling price is called the price elasticity of demand.

Market-Based Pricing

- An increase in selling price should decrease customer demand for the product so that fewer units are sold.
  - When the decrease in units sales offsets the increased selling price, the price increase causes total revenue to decrease. This is known as elastic demand.
  - When the decrease in units sales does not offset the increased selling price, the price increase causes total revenue to increase. This is known as inelastic demand.

Market-Based Pricing

Elastic demand:



Inelastic demand:



Price Elasticitv of Demand

- The price elasticity of demand is calculated as follows:

$$\text{Price elasticity of demand} = \frac{\ln(1 + \%\text{ change in quantity sold})}{\ln(1 + \%\text{ change in price})}$$

- This elasticity can be used to compute the profit-maximizing price:

$$\text{Profit-maximizing price} = \left(\frac{\text{Elasticity}}{\text{Elasticity} + 1}\right) \times \text{Variable cost}$$

Market-Based Pricing Example

Ted's Trailers sells horse trailers in a competitive market. The variable costs of producing the one-horse trailer are $850 per unit. Information from prior years' indicates that a 10% increase in the trailer's selling price results in a 15% decrease in customer demand. Calculate the price elasticity of demand and the profit-maximizing price for the one-horse trailer.

$$\text{Price elasticity of demand} = \frac{\ln(1 - 0.15)}{\ln(1 + 0.10)} = \frac{-0.16252}{0.09531} = -1.70516$$

$$\text{Profit-maximizing price} = \left(\frac{-1.70516}{-0.70516} \right) \times \$850 = \$2{,}055$$

Uses & Limitations of Cost-Based Pricing

- Cost-based pricing is inappropriate in highly competitive markets.
  - If products are priced based on allocated fixed costs, and the price is too high for the market, the quantity sold will decrease.
  - This decrease in sales will cause an increase in the fixed costs allocated to each unit.
  - The increase in allocated fixed costs will cause even higher prices and unit sales will decline even further.
- This is known as the death spiral.

Uses & Limitations of Cost-Based Pricing

- Cost-based pricing is best used when a company produces highly customized products.

- However, there can still be problems in these instances.
  - If the determined price is too high the customer will not buy the customized product.
  - The determined price may be lower than the customer would have paid

Other Factors that Affect Pricing

- In peak-load pricing, companies charge higher prices when they are at higher capacities.
- When companies set high prices for newly-introduced products, and gradually lower prices to entice customers who would not have purchased at the higher price, this is known as price skimming.
- When prices are set unusually high to take advantage of specific situations, this is known as price gouging.

Other Factors that Affect Pricing

- Under penetration pricing, companies charge lower prices for newly introduced products.
- Companies set prices for the interdepart-mental transfer of goods and services known as transfer prices .
  - When this is done to decrease consumer uncertainty about the new product it is legal.
  - When this is done with the intent to eliminate all competition, it is illegal and is known as predatory pricing.

Other Factors that Affect Pricing

- When for-profit companies charge different prices to different customers and it is not based on differential costs, this is illegal and is known as price discrimination.
  - Not-for-profit companies can legally charge different prices to customers based on their ability to pay.
- Collusive pricing, where competitors get together to determine prices, is not legal.
- Foreign-based companies selling products at prices lower than in the home country is known as dumping.

Costing and Pricing for the long-run

- Short-run pricing decisions have a time horizon of less than one year and include decisions such as:
  - Pricing a one-time-only special order with no long-run implications
  - Adjusting product mix and output volume in a competitive market.
- Long-run pricing is a strategic decision designed to build long-run relationships with customers based on stable and predictable prices. Managers prefer a stable price.

Cost allocation

- Indirect costs of a particular cost object are costs that are related to that cost object but cannot be traced to it in an economically feasible (cost-effective) way.
- These costs often comprise a large percentage of the overall costs assigned to cost objects.
- Cost allocations influence managers' cost management decisions as well as the products that managers promote.

Purposes of cost allocation

Purpose	Examples
1. To provide information for economic decisions	To decide on the selling price for a product or service To decide whether to add a new product feature
2. To motivate managers and other employees	To encourage the design of products that are simpler to manufacture or less costly to service To encourage sales representatives to emphasize high-margin products or services
3. To justify costs or compute reimbursement amounts	To cost products at a "fair" price, often required by law and government defense contracts To compute reimbursement for a consulting firm based on a percentage of the cost savings resulting from the implementation of its recommendations
4. To measure income and assets	To cost inventories for reporting to external parties To cost inventories for reporting to tax authorities

Alternative Long-Run Pricing Approaches

How should managers use product cost information to price their products? There are two different approaches for pricing decisions:

- The MARKET-BASED APPROACH asks: Given what our customers want and how competitors will react to what we do, what price should we charge?
- The COST-BASED APPROACH asks: Given what it costs us to make this product, what price should we charge that will recoup our costs and achieve a target return on investment?

Markets and Pricing

Companies operate in different markets which affect the approach they'll use for pricing:

- Companies operating in COMPETITIVE MARKETS use the market-based approach. Companies in these markets must accept the prices set by the market (goods or services provided by competitors are very similar)

Markets and Pricing

Companies operate in different markets which affect the approach they'll use for pricing:

- Companies operating in LESS-COMPETITIVE MARKETS offer products or services that differ from each other and can use either the market-based or cost-based approach as the starting point for pricing decisions.
- Remember, both approaches consider customers, competitors and costs. Only the starting points differ.
- Managers should always keep in mind market forces regardless of which pricing approach they use.

Markets and Pricing

Companies operate in different markets which affect the approach they'll use for pricing:

- Companies operating in markets that are NOT COMPETITIVE favor cost-based approaches because these companies do not need to respond or react to competitors' prices.

Understanding the Market Environment

Before setting prices under any approach, managers need to understand customers and competitors for three reasons:

1. Lower-cost competitors continually restrain prices.
2. Products have shorter lives, which leaves companies less time and opportunity to recover from pricing mistakes, loss of market share and loss of profitability.
3. Customers are more knowledgeable because they have easy access to price and other information online and demand high-quality products at low prices.

Market-Based Approach: target costing for target pricing

- Starts with a target price which is the estimated price for a product or service that potential customers are willing to pay
- The target price is estimated based on

1. an understanding of customers' perceived value for a product or service, and
2. How competitors will price competing products or services.

Implementing Target Pricing and Target Costing: five steps

1. Develop a product that satisfies the needs of potential customers.
2. Choose a target price.
3. Derive a target cost per unit by subtracting target operating income per unit from the target price
4. Perform cost analysis.
5. Perform value engineering to achieve target cost.

Possible undesirable effects of Value Engineering and Target Costing

Unless managed properly, value engineering and target costing can have undesirable effects:

1. Employees may feel frustrated if they fail to attain targets.
2. The cross-functional team may add too many features just to accommodate the different wishes of team members.
3. A product may be in development for a long time as the team repeatedly evaluates alternative designs.
4. Organizational conflicts may develop as the burden of cutting costs falls unequally on different business functions in the company's value chain.

Avoiding possible undesirable effects

To avoid those possible undesirable effects, target-costing efforts should always:

1. Encourage employee participation and celebrate small improvements toward achieving the target cost.
2. Focus on the customer.
3. Pay attention to schedules.
4. Set cost-cutting targets for all value-chain functions to encourage a culture of teamwork and cooperation.

Target pricing approach and five-step decision-making process

The target pricing approach is another illustration of the five-step decision-making process:

1. Identify the problem and uncertainties.
2. Obtain information.
3. Make predictions about the future.
4. Make decisions by choosing among alternatives
5. Implement the decision, evaluate performance and learn.

Cost-plus Pricing

Instead of using the market-based approach for long-run pricing decisions, managers sometimes use a cost-based approach

- The general formula for setting a cost-based selling price adds a markup component to the cost base.
- Usually, it is only a starting point in the price-setting process.
- Markup is somewhat flexible, based partially on customers and competitors.
- Because a markup is added, cost-based pricing is often called cost-plus pricing, where the plus refers to the markup component.

Forms of Cost-Plus Pricing

Cost-plus pricing can be determined several ways:

- Choose a markup to earn a target rate of return on investment, which is the target annual operating income divided by invested capital
- Computing the specific amount of capital invested in a product is challenging because it requires difficult and arbitrary allocations of investments in equipment and buildings to individual products.

Forms of Cost-Plus Pricing, concluded

- Because computing the specific amount of capital invested in a product is challenging, sometimes managers use alternate cost bases to set prospective selling prices:
  - Variable manufacturing cost
  - Variable cost
  - Manufacturing cost
  - Full cost

Common Business Practice

- Most firms use full cost for their cost-based pricing decisions, because:
  - It allows for full recovery of all costs of the product.
  - It allows for price stability.
  - It is a simple approach.

Cost-plus pricing and target pricing

- The selling prices computed under Cost-plus pricing are prospective prices.
- The Target-pricing approach reduces the need to go back and forth among prospective cost-plus prices, customer reactions and design modifications.
- Target-pricing first determines product characteristics and target price on the basis of customer preferences and expected competitor responses and then computes a target cost.

Life-Cycle Product Budgeting and Costing

- Managers sometimes need to consider target prices and target costs over a multiple-year product life cycle.
- Product life-cycle spans the time from initial R&D on a product to when customer service and support are no longer offered on that product (orphaned).
- In Life-cycle budgeting, managers estimate the revenues and business function costs across the entire value-chain from its initial R&D to its final customer service and support.
- Life-cycle costing tracks and accumulates business function costs across the entire value chain from a product's initial R&D to its final customer service and support.
- Life-cycle budgeting and life-cycle costing span several years.

Life-Cycle Budgeting and pricing decisions

Budgeted life-cycle costs provide useful information for strategically evaluating pricing decisions. These two features of costs make life-cycle budgeting particularly important.

- The development period for R&D and design is long and costly.
- Many costs are locked in at the R&D and design stages, even if R&D and design costs are themselves small.

Noncost factors in Pricing Decisions

- Price discrimination—the practice of charging different customers different prices for the same product or service.
  - Legal implications
- Peak-load pricing—the practice of charging a higher price for the same product or service when demand approaches the physical limit of the capacity to produce that product or service
- International pricing-prices charged in different countries vary much more than the costs of delivering the product to each country.

Antitrust laws and pricing decisions

- Price discrimination is illegal if the intent is to lessen or prevent competition.
- Predatory pricing occurs when a company deliberately prices below its costs in an effort to drive competitors out of the market and restrict supply, then raise prices rather than enlarge demand.

Antitrust laws and pricing decisions, concluded

- Dumping—occurs when a non-U.S. company sells a product in the United States at a price below the market value in the country where it is produced, and this lower price materially injures or threatens to materially injure an industry in the United States.
- Collusive pricing—occurs when companies in an industry conspire in their pricing and production decisions to achieve a price above the competitive price and so restrain trade.

Summary

- *Target costing* determines the allowable (i.e., "target") cost for a product or service, given a competitive market price and a target profit
- The target costing approach involves five steps:
  - Determine the market price
  - Determine the desired profit
  - Calculate the *target cost* (market price less desired profit)
  - Use *value engineering* to reduce cost
  - Use *kaizen costing* and *operational control* to further reduce costs

Summary

- The theory of constraints (TOC) focuses on improving speed at the constraints, which causes a decrease in overall cycle time

- Five steps in TOC:
  - Identify the constraint
  - Determine the most profitable product mix given the constraint
  - Maximize the flow through the constraint
  - Add capacity to “relax” the constraint
  - Redesign the manufacturing process for flexibility and faster cycle time

Summary

- Life-cycle costing provides a more complete perspective of product costs and product or service profitability because it considers the entire cost life cycle of the product or service

- Management accountants prepare information from both the perspective of the cost life cycle and the sales life cycle to help management make strategic pricing decisions

Activity Based Costing (ABC)

Background

- Recall that plant overhead is applied to production in a rational systematic manner, using some type of averaging. There are a variety of methods to accomplish this goal.
- These methods often involve trade-offs between simplicity and realism.



Simple Methods	Complex Methods
Can be inaccurate	Usually more accurate

Plantwide & Department OVERHEAD CALCULATIONS

- Plantwide Overhead Rate:
- Total Estimated Overhead* /Total Estimated Base**

  *Obtain total of all overhead costs to be allocated.

  ** Determine best "base" – direct labor hours, machine hours, etc.

  This rate is used to allocate overhead costs to all products.

- Dept Overhead Rate: Similar concept except overhead cost pools and selected base are obtained by department.

Example of plantwide & department overhead calculations

For our example, let's say we have Department A and Department B with overhead costs of $300,000 and $450,000, respectively. We might also use different bases for each department. In our example, we will use DLH for Department A and Machine Hours for Dept B.

Example, cont'd

	Dept A	Dept B
O/H	$300,000	$450,000
DLH	8000	7000
MH	750	1200

- Overhead allocation in Department A would be $300,000 / 8000 (DLH) or $37.50 per DLH
- Overhead allocation in Department B would be $450,000 / 1200 (MH) or $375.00 per MH

Example, cont'd

- Contrast this with a single Plantwide Rate which would be calculated as follows:

Based on DLH: $750,000 / 15,000 or $50.00/DLH

Based on MH: $750,000 / 1,950 or $384.62/MH

- From this simple comparison we see that a product using more Dept A resources would be severely overcosted, especially if we were basing the single rate on Machine Hours and a product using more Dept B resources would be severely undercosted if we used DLH as the base for the single rate.

Broad Averaging

- Historically, firms produced a limited variety of goods and at the same time, their indirect costs were relatively small.
- Allocating overhead costs was simple: use broad averages to allocate costs uniformly regardless of how they are actually incurred.
  - Generally known as “Peanut-butter costing” (perhaps because it is spread evenly??)
- The end-result:
  - Products using fewer resources are overcosted and products using more resources are undercosted.

Over and Undercosting-defined

- Overcosting—a product consumes a low level of resources but is allocated high costs per unit.
- Undercosting—a product consumes a high level of resources but is allocated low costs per unit.

Cross-subsidization

- If one product is undercosted then at least one other product must be overcosted.
- The overcosted product absorbs too much cost, making it seem less profitable than it really is.
- The undercosted product is left with too little cost, making it seem more profitable than it really is.

Cross-subsidization, cont'd

CONSIDER THIS:

- If you were using cost to determine price, what affect would this have?
- If you were looking at product profitability to determine marketing focus, what result?

Let's take a closer look using our previous example.

Cross-subsidization, example

You recall that in our previous plantwide vs. departmental example, Dept A had a rate of $37.50/DLH; Dept B had a rate of $375/MH and the plantwide rate would be $50.00/DLH or $384.62/MH.

Job 457 incurs 1,000 DLH in each department, 40 MH in Dept A and 75 MH in Dept B.

Let's compare the costs of the job based on different allocation methods.

Cross-subsidization, example, Allocating to Job 457

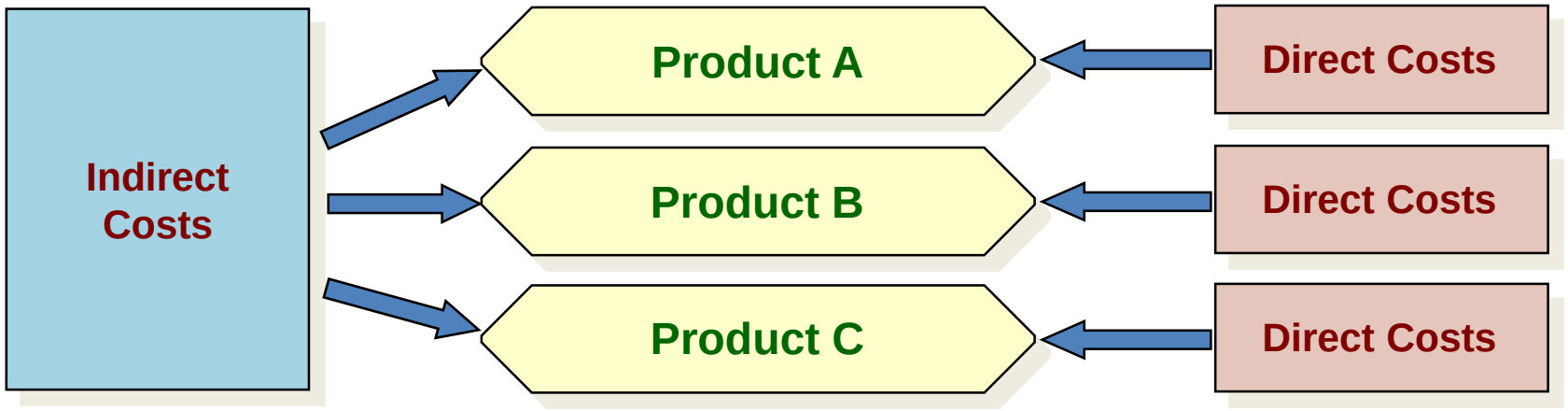
Explanation	Dept A/DLH	Dept B/MH	Total	Single Rate
1000*37.50	$37,500			
75*375		$28,125		
Total by Dept			**$65,625**	
PW/DLH				
2000*$50				**$100,000**
PW/MH				
125*$384.62				**$48,077.50**

Activity-Based Costing (ABC)

- ABC is a method of cost system refinement.
- Indirect costs are divided into “sub-pools” of costs of activities.
- Activity costs are then allocated to the final cost objects using a cost allocation base (more commonly called cost drivers in ABC).
- Activities are measurable, making it more likely that cost drivers can be found so that a final cost object will absorb indirect costs in proportion to its use of the activity.

Traditional Costing vs. ABC

Traditional costing systems:

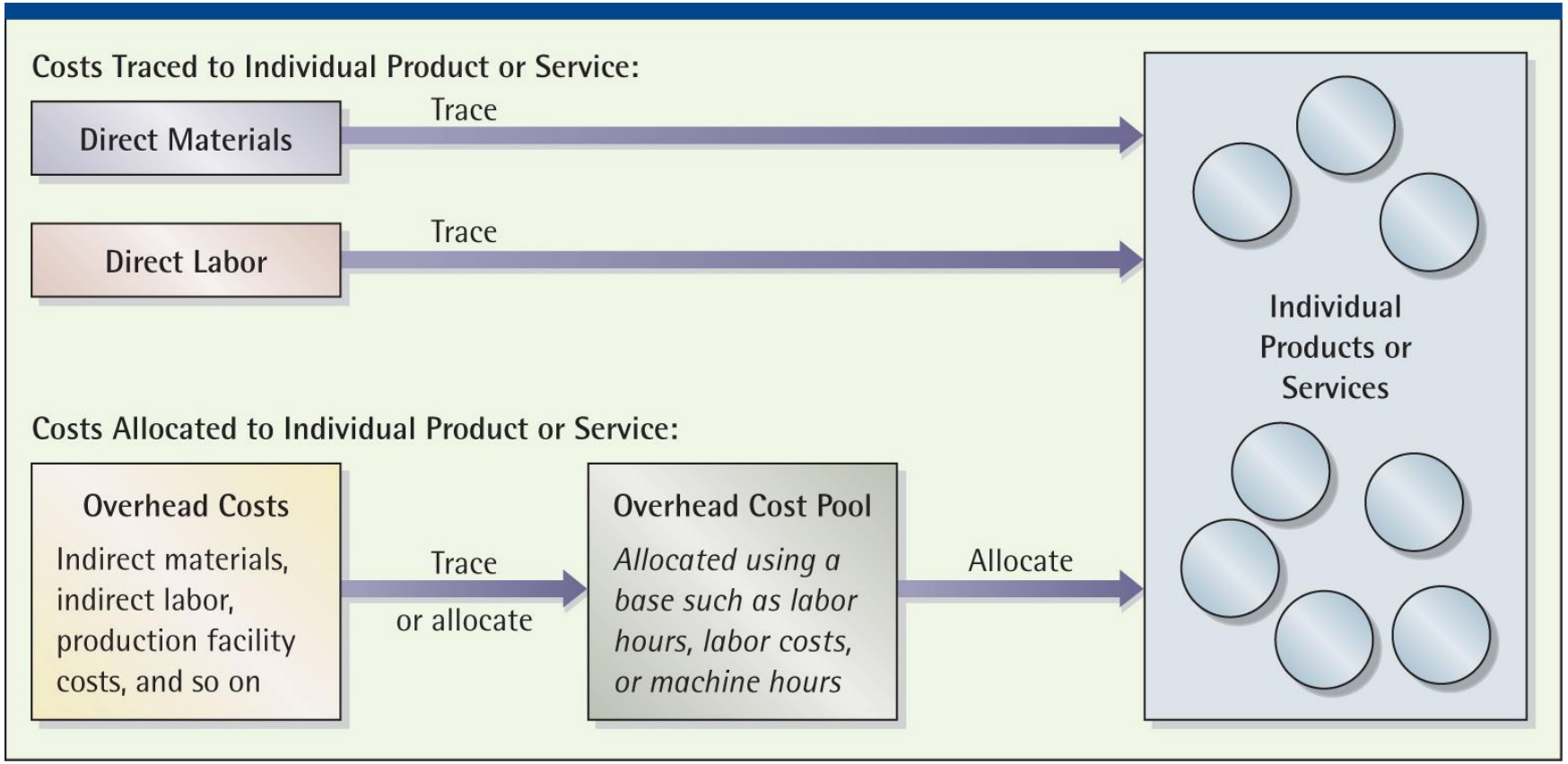


Indirect costs are grouped into one (or a small number) of cost pools; a cost allocation base assigns costs to the individual products

The individual products are the final cost objects.

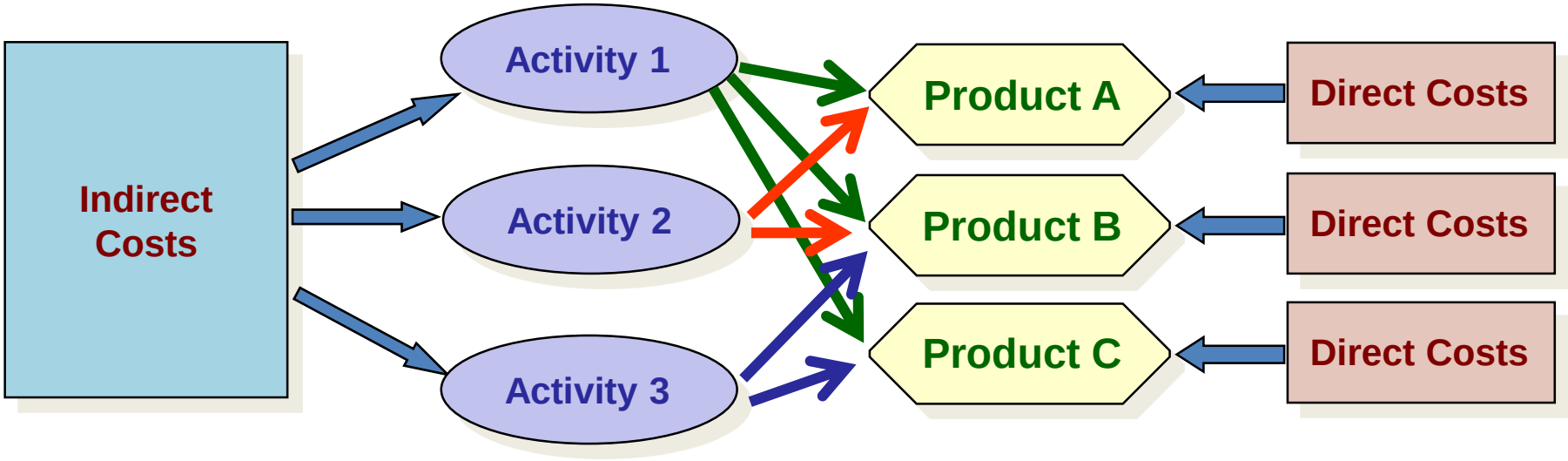
Direct costs are traced to the individual products.

Traditional Costing Systems



Traditional Costing vs. ABC

Activity-based costing systems:

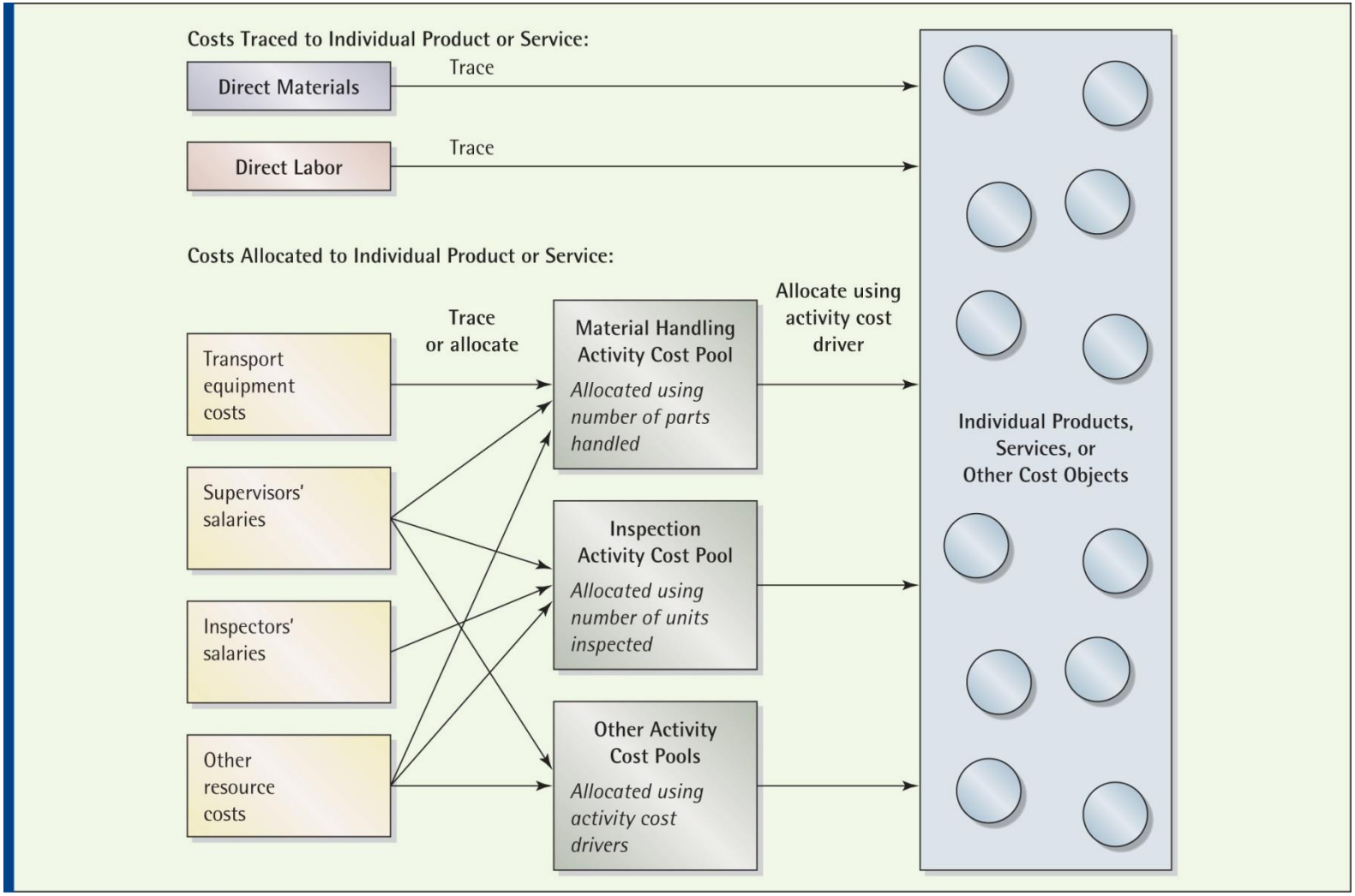


Indirect costs are assigned (traced & allocated) to various pools of activity costs.

Activity costs are allocated to products

The individual products are the final cost objects & direct costs are traced to the individual products.

ABC Costing Systems



What are Activities and How are They Identified?

The ABC cost hierarchy includes the following activities:

- organization-sustaining – associated with overall organization
- facility-sustaining – associated with single manufacturing plant or service facility
- customer-sustaining – associated with a single customer
- product-sustaining – associated with product lien or single product
- batch-level – associated with each batch of product
- unit-level – associated with each unit produced

ABC Cost Hierarchy Example

Some of the costs incurred by the Dewey Chargem law firm are listed below. This firm specializes in immigration issues and family law. For each cost, identify whether the cost most likely relates to a(n) (1) organiz-ation-sustaining, (2) facility-sustaining, (3) customer-sustaining, (4) product-sustaining, (5) batch-level, or (6) unit-level activity and explain your choice.

Cost	Cost Hierarchy Level
Bookkeeping software	
Salary for partner in charge of family law	
Office supplies	
Subscription to family law update journal	
Telephone charges for local calls	
Long distance telephone charges	
Window washing service	
Salary of receptionist	

What Process is Used to Assign Costs in an ABC system?

1. Identify the relevant cost object.
2. Identify activities and group *homogeneous activities*.
3. Assign costs to the activity cost pools.
4. Choose a cost driver for each activity cost pool.
5. Calculate an allocation rate for each activity cost pool.
6. Allocate activity costs to the final cost object.

How Are Cost Drivers Selected for Activities?

- For each activity, determine its place in the ABC cost hierarchy.
- Look for drivers that have a good cause-and-effect relationship with the activities' costs.
- Use a reasonable driver when there is no cause-and-effect relationship.

ABC in Manufacturing Example

Alphabet Co. makes products A & B. Product A is a low-volume specialty item and B is a high-volume item. Estimated factory- wide overhead is $800,000, and the number of DL hours for the year is estimated to be 50,000 hours. DL costs are $10/hour. Each product uses 2 DL hours. Compute the traditional cost of each product if Products A & B use $25 and $10 in direct materials, respectively.

First, compute the estimated overhead rate:

Estimated overhead rate = $800,000/50,000 hours = $16/hour.

	Product A	Product B
Direct materials	$25	$10
Direct labor (2hrs @ $10)	20	20
Overhead (2 hrs @ $16)	32	32
	$77	$62

ABC in Manufacturing Example

Alphabet Co. is implementing an ABC system. It estimated the costs and activity levels for the upcoming year shown below.

	Estimated Costs	Estimated Activity Levels			
		Prod. A	Prod. B	Total	Cost Driver
Machine set-ups	$200,000	3,000	2,000	5,000	# set-ups
Inspections	140,000	500	300	800	# inspections
Materials handling	80,000	400	400	800	# mat'l requistions
Machining dep't	320,000	12,000	28,000	40,000	# machine hours
Quality control dep't	60,000	600	150	750	# tests
	$800,000				

First, compute the estimated overhead rate for each activity:



ABC in Manufacturing Example

	Estimated Costs	Estimated Activity		Overhead Rate
Machine set-ups	$200,000	5,000	set-ups	$40 /setup
Inspections	140,000	800	inspections	$175 /inspection
Materials handling	80,000	800	mat'l requistions	$100 /requisition
Machining dep't	320,000	40,000	machine hours	$8 /mach hr
Quality control dep't	60,000	750	tests	$80 /test
	$800,000			

ABC in Manufacturing Example

Alphabet recently completed a batch of 100 As and a batch of 100 Bs. Direct material and labor costs were as budgeted. Information about each batch's use of the cost drivers is given below. Compute the overhead allocated to each unit of A and B.

	100 As	100 Bs
Machine set-ups	60	10
Inspections	10	2
Materials handling	4	2
Machining dep't	240	120
Quality control dep't	3	1

Overhead allocated:	100 As	100 Bs
Machine set-ups	$2,400	$400
Inspections	1,750	350
Materials handling	400	200
Machining dep't	1,920	960
Quality control dep't	240	80
Overhead for batch	$6,710	$1,990
Overhead per unit	$67.10	$19.90

ABC in Manufacturing Example

Compute the total cost of each product and compare it to the costs computed under traditional costing.

	Prod A	Prod B
Direct material	$25.00	$10.00
Direct labor	20.00	20.00
Overhead	67.10	19.90
Total	$112.10	$49.90

Traditional costing assigned $77 to a unit of Product A and $62 to a unit of Product B.

- The only difference between the two costing systems is that Product A is assigned more overhead costs under ABC.
- The additional overhead assigned to Product A reflects Product A's consumption of resources.

Activity-Based Management (ABM)

- ABM is the process of using ABC information to evaluate opportunities for improvements in an organization.
- Examples include managing & monitoring
  - customer profitability
  - product and process design
  - environmental costs
  - quality
  - constrained resources

ABM & Customer Profitability

- Activities can be defined so that different costs of servicing customers are accumulated.
- Examples include
  - analyzing the types of bank transactions used by various categories of customers
  - comparing the costs of servicing insurance contracts sold to married versus single individuals
  - comparing the costs of different distribution channels

ABM & Product/Process Improvements

- Activities can be defined so that the costs of stages of production or of a business process are accumulated.
- Examples include
  - determining the costs of non-value-added activities so the most costly can be reduced or eliminated
  - changing the steps in the accounts payable function to reduce the number of personnel
  - determining the most costly stages of product development so that the time to market is reduced

ABM & Environmental Costs

- Activities can be defined so that types of environmental costs are accumulated.
- Examples include
  - capturing the costs of contingent liabilities for waste disposal site remediation
  - comparing the cost of recycling packaging to the cost of disposal
  - computing the costs of treating different kinds of emissions

ABM & Quality Costs

- Activities can be defined so that categories of costs of managing quality are accumulated.
- Common categories of quality costs are
  - costs of prevention activities
  - costs of appraisal activities
  - costs of production activities
  - costs of postsales activities

What are GPK and RCA?

- Costing approaches similar to ABC because they involve multiple pools and multiple drivers
- GPK can be described as marginal planning and cost accounting
  - Each cost is traced to a cost center (smaller than a department) which performs a single repetitive activity, and is the responsibility of one manager)
  - Output measures tracks the volume of resource use
  - Costs are segregated into proportional (change with volume in resource use) and fixed
  - *Practical* capacity is used for estimated allocation rate volumes

Capacity Definitions

- Theoretical capacity – maximum assuming continuous, uninterrupted operations 365 days/year
- Practical capacity – typical operating conditions
- Budgeted capacity – expected volume for the upcoming time period
- Idle/excess capacity – difference between activity capacity used and one of the above measures of capacity

What are GPK and RCA?

- Resource Consumption Accounting (RCA)
- Builds on GPK and ABC principles
- Each cost is assigned to a resource cost pool
  - Labor and machinery are often placed in different cost pools since they are different types of resources
  - RCA involves a significantly larger number of cost pools than traditional accounting
  - Like GPK, segregates proportional and fixed costs
  - Utilizes *theoretical* rather than practical capacity for allocating fixed costs
    - More likely to focus manager attention on reducing idle and non-productive resource time

Benefits/Drawbacks to GPK/RCA

- Benefits
  - Generates multi-level internal income statements useful for short terms decisions because it focuses on marginal cost
  - Increases cause & effect awareness among managers
  - Categorizes costs (and generates profit margin) at the product, product group, division, and company level
  - Avoids arbitrary allocations of fixed costs
- Drawbacks
  - Can be costly to implement
  - Can result in a large number of variances to analyze

Comparison of ABC, GPK, and RCA

	ABC	GPK	RCA
Character of cost accounting system	Full costing	Marginal costing	Full and marginal costing
Location of data	Database separate from general ledger	Comprehensive accounting system	Comprehensive accounting system
Primary decision relevance	Mid- to long-term	Short-term	Short-, Mid-, and Long term
Allocation of overhead based on	Activities	Cost Centers	Resources and/or activities
Cost Drivers	Activity –Based	Resource Output related	Resource output or activity related
Fixed cost allocation rate denominator	Actual, budgeted, or practical capacity	Budgeted or practical capacity	Theoretical capacity

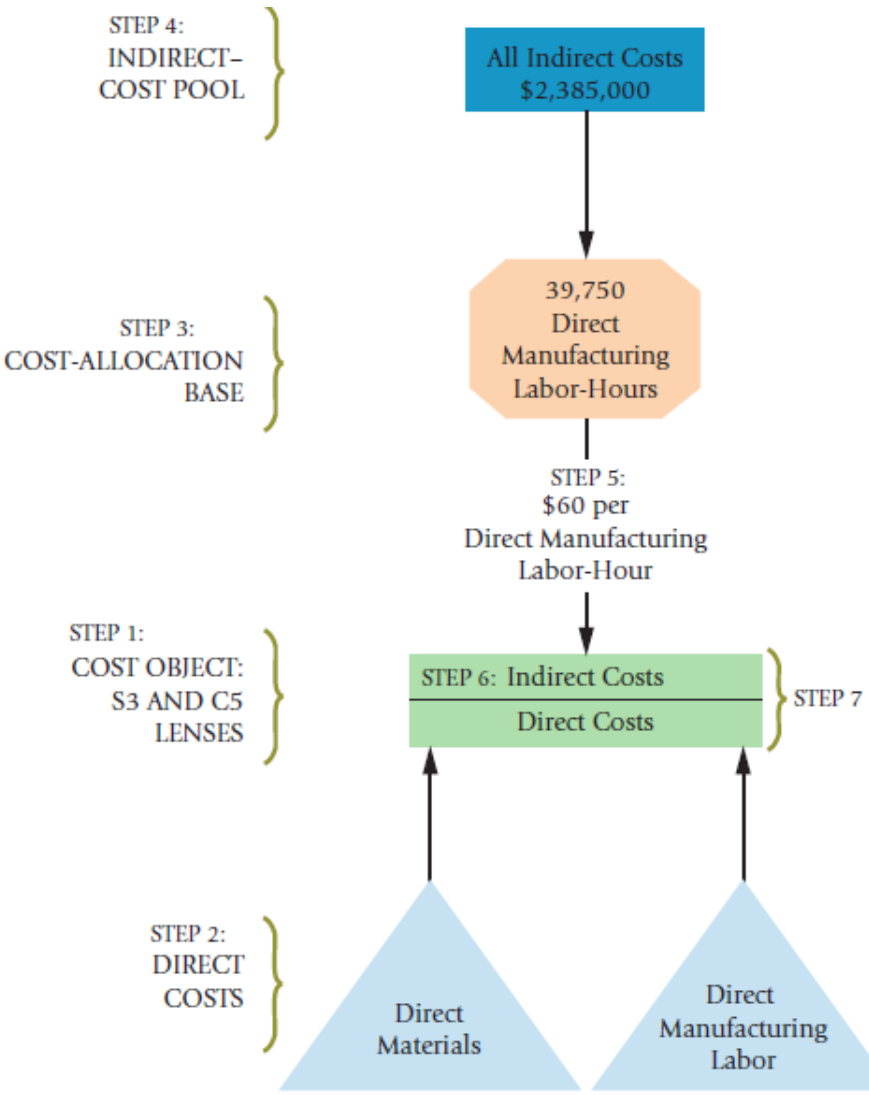
Decision Making with ABC, GPK, and RCA

- Benefits
  - more accurate and relevant product cost information
  - employees focus attention on activities
  - measurement of the costs of activities and business processes
  - identify non-value-added activities and reduce costs
- Costs
  - systems can be difficult to design and maintain
  - more information must be captured
  - decision makers may not use the information appropriately

Uncertainties in ABC and ABM Implementation

- Judgment is required when determining activities.
- Judgment is required when selecting cost drivers.
- Denominator levels for cost drivers are estimates.
- ABC information includes unitized fixed costs, so decision makers must use ABC information correctly.

An Example: Plastim



Plastim and Simple Costing

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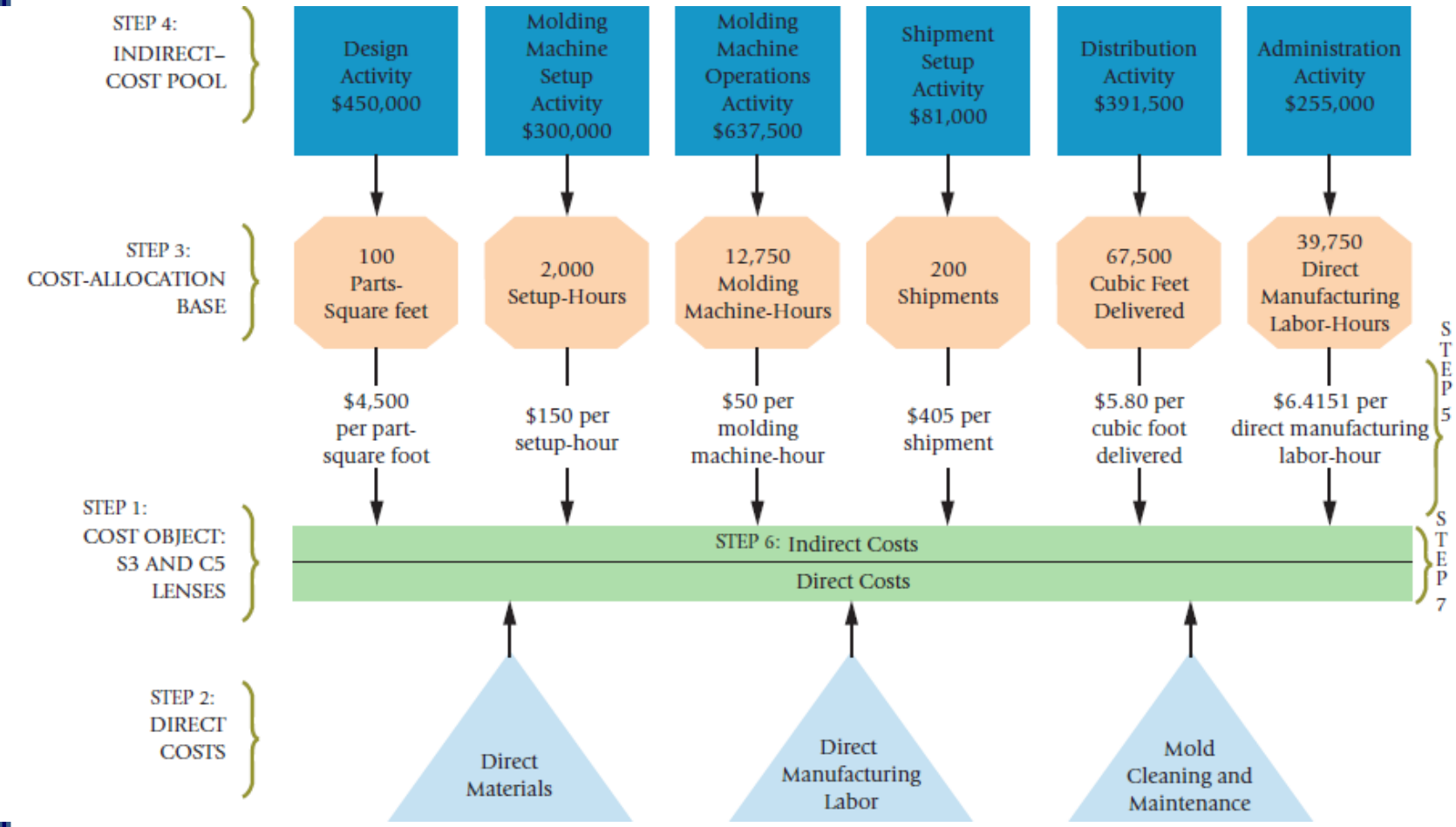
	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4		(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) + (3)
5	Direct materials	$1,125,000	$18.75		$ 675,000	$45.00	$1,800,000
6	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
7	Total direct costs (Step 2)	1,725,000	28.75		870,000	58.00	2,595,000
8	Indirect costs allocated (Step 6)	1,800,000	30.00		585,000	39.00	2,385,000
9	Total costs (Step 7)	$3,525,000	$58.75		$1,455,000	$97.00	$4,980,000
10							

Using the 5-Step Decision Making Process

1. Identify the Problems & Uncertainties. (Possible loss of Giovanni business)
2. Obtain Information.(Analyze and evaluate the design, manufacture, and distribution operations for the S3 lens.)
3. Make Predictions about the future. (obtain a better cost estimate for the S3)
4. Make Decisions by Choosing among alternatives.

   (should they bid and if yes, at what price)
5. Implement the Decision, Evaluate Performance and Learn.

Plastim and ABC Illustrated



Plastim and ABC Rate Calculation

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	A	B	C	D	E	F	G	H
1			(Step 4)	(Step 3)		(Step 5)		
2	Activity	Cost Hierarchy Category	Total Budgeted Indirect Costs	Budgeted Quantity of Cost-Allocation Base		Budgeted Indirect Cost Rate		Cause-and-Effect Relationship Between Allocation Base and Activity Cost
3	(1)	(2)	(3)	(4)		(5) = (3) ÷ (4)		(6)
4	Design	Product-sustaining	$450,000	100	parts-square feet	$ 4,500	per part-square foot	Design Department indirect costs increase with more complex molds (more parts, larger surface area).
5	Setup molding machines	Batch-level	$300,000	2,000	setup-hours	$ 150	per setup-hour	Indirect setup costs increase with setup-hours.
6	Machine operations	Output unit-level	$637,500	12,750	molding machine-hours	$ 50	per molding machine-hour	Indirect costs of operating molding machines increases with molding machine-hours.
7	Shipment setup	Batch-level	$ 81,000	200	shipments	$ 405	per shipment	Shipping costs incurred to prepare batches for shipment increase with the number of shipments.
8	Distribution	Output-unit-level	$391,500	67,500	cubic feet delivered	$ 5.80	per cubic foot delivered	Distribution costs increase with the cubic feet of packages delivered.
9	Administration	Facility sustaining	$255,000	39,750	direct manuf. labor-hours	$6.4151	per direct manuf. labor-hour	The demand for Administrative resources increases with direct manufacturing labor-hours.

Plastim and ABC Product Costs

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	A	B	C	D	E	F	G
1		60,000			15,000		
2		Simple Lenses (S3)			Complex Lenses (CL5)		
3		Total	per Unit		Total	per Unit	Total
4	**Cost Description**	(1)	(2) = (1) ÷ 60,000		(3)	(4) = (3) ÷ 15,000	(5) = (1) + (3)
5	Direct costs						
6	Direct materials	$1,125,000	$18.75		$ 675,000	$ 45.00	$1,800,000
7	Direct manufacturing labor	600,000	10.00		195,000	13.00	795,000
8	Direct mold cleaning and maintenance costs	120,000	2.00		150,000	10.00	270,000
9	Total direct costs (Step 2)	1,845,000	30.75		1,020,000	68.00	2,865,000
10	Indirect Costs of Activities						
11	Design						
12	S3, 30 parts-sq.ft. x $4,500	135,000	2.25				} 450,000
13	CL5, 70 parts-sq.ft. x $4,500				315,000	21.00	
14	Setup of molding machines						
15	S3, 500 setup-hours x $150	75,000	1.25				} 300,000
16	CL5, 1,500 setup-hours x $150				225,000	15.00	
17	Machine operations						
18	S3, 9,000 molding machine-hours x $50	450,000	7.50				} 637,500
19	CL5, 3,750 molding machine-hours x $50				187,500	12.50	
20	Shipment setup						
21	S3, 100 shipments x $405	40,500	0.67				} 81,000
22	CL5, 100 shipments x $405				40,500	2.70	
23	Distribution						
24	S3, 45,000 cubic feet delivered x $5.80	261,000	4.35				} 391,500
25	CL5, 22,500 cubic feet delivered x $5.80				130,500	8.70	
26	Administration						
27	S3, 30,000 dir. manuf. labor-hours x $6.4151	192,453	3.21				} 255,000
28	CL5, 9,750 dir. manuf. labor-hours x $6.4151				62,547	4.17	
29	Total indirect costs allocated (Step 6)	1,153,953	19.23		961,047	64.07	2,115,000
30	Total Costs (Step 7)	$2,998,953	$49.98		$1,981,047	$132.07	$4,980,000
31							

Plastim: Simple and ABC Compared

	Simple Costing System Using a Single Indirect-Cost Pool (1)	ABC System (2)	Difference (3) = (2) − (1)
Direct-cost categories	2 Direct materials Direct manufacturing labor	3 Direct materials Direct manufacturing labor Direct mold cleaning and maintenance labor	1
Total direct costs	$2,595,000	$2,865,000	$270,000
Indirect-cost pools	1 Single indirect-cost pool allocated using direct manufacturing labor-hours	6 Design (parts-square feet)[1] Molding machine setup (setup-hours) Machine operations (molding machine-hours) Shipment setup (number of shipments) Distribution (cubic feet delivered) Administration (direct manufacturing labor-hours)	5
Total indirect costs	$2,385,000	$2,115,000	($270,000)
Total costs assigned to simple (S3) lens	$3,525,000	$2,998,953	($526,047)
Cost per unit of simple (S3) lens	$58.75	$49.98	($8.77)
Total costs assigned to complex (CL5) lens	$1,455,000	$1,981,047	$526,047
Cost per unit of complex (CL5) lens	$97.00	$132.07	$35.07

[1]Cost drivers for the various indirect-cost pools are shown in parentheses.

Conclusions

- Each method is mathematically correct.
- Each method is acceptable.
- Each method yields a different cost figure, which will lead to different gross margin calculations which may lead to differences in other decisions such as pricing.
- Only overhead is involved. Total costs for the entire firm remain the same—they are just allocated differently to the cost objects within the firm.
- Selection of the appropriate method and drivers should be based on experience, industry practices, as well as a cost-benefit analysis of each option under consideration.

ABC vs. Simple Costing Schemes

- ABC is generally perceived to produce superior costing figures due to the use of multiple drivers across multiple levels.
- ABC is only as good as the drivers selected, and their actual relationship to costs. Poorly chosen drivers will produce inaccurate costs, even with ABC.
- Using ABC does not guarantee more accurate costs!

Signals that Suggest that ABC Implementation Could Help a Firm:

- Significant amounts of indirect costs are allocated using only one or two cost pools.
- All or most indirect costs are identified as output unit-level costs.
- Products make diverse demands on resources because of volume, process steps, batch size or complexity.
- Products that a company is well-suited to make show small profits whereas products that a company is less suited to make show large profits.

Behavioral Issues in Implementing ABC

- Gain the support of top management and create a sense of urgency.
- Create a guiding coalition of managers throughout the value chain for the ABC effort.
- Educate and train employees in ABC as a basis for employee empowermen.t
- Seek small short-run success as proof that the ABC implementation is yielding results.
- Recognize that ABC is not perfect. (better costs but complex system)

ABC and Service/Merchandising Firms

- ABC implementation is widespread in a variety of applications outside manufacturing, including:
  - Health Care
  - Banking
  - Telecommunications
  - Retailing
  - Transportation

Food for Thought!

You are the owner/manager of a dance studio and are considering offering a beginner's jazz dance class for a reduced rate. You believe that once your students start "jazz-dancing", they'll be hooked and will continue with the classes at your regular prices. You aren't sure how to price the discounted beginner's class and have gathered the following information:

Direct cost per class:	$95.00
Indirect studio costs/annual:	$140,000
Anticipated # of classes (all):	20/week; 50 weeks
Anticipated # of jazz intro classes:	5/week; 50 weeks
Anticipated # of students for jazz class:	20

Food for Thought, cont'd

- You were able to determine that the indirect costs ($140,000) consisted of the following:
  - Studio Rental $70,000
  - Your salary $40,000
  - Utilities $ 5,000
  - Office Staff $12,000
  - Instructor Benefits $ 6,000
  - Cleaning services $ 6,000
  - Refreshments $ 1,000

From traditional budgeting to Activity-based budgeting (ABB)

From traditional budgeting to Activity-based budgeting (ABB)

- Activity Based Budgeting (ABB): Budgeting approach that focuses on the budgeted cost of the activities necessary to produce and sell products and services.

- For some industries ABC will give accurate information and results which are clearer than traditional budgeting.

Activity-based management

Activity-Based Management

- A method of management that uses ABC as an integral part in critical decision-making situations, including:
  - Pricing and product-mix decisions
  - Cost reduction and process improvement decisions
  - Design decisions
  - Planning and managing activities

Activity-Based Management (ABM)

ABM manages activities to improve the value of products or services to customers and increase the firm's competitiveness and profitability:

- Focuses on the efficiency and effectiveness of key business processes and activities
- Improves management's focus on the firm's critical success factors thereby enhancing the firm's competitive advantage
- ABC is its major source of information

Activity-Based Management (ABM)

ABM applications can be classified into two categories:

- ***Operational ABM*** enhances operational efficiency and asset utilization and lowers costs; it focuses on doing things right and performing activities more efficiently
- ***Strategic ABM*** attempts to alter the demand for activities and increases profitability through improved activity efficiency

ABC/M Tools

Some key ABC/M tools:

- In *activity analysis* an organization assesses each of its activities based on its need by the product or the customer, its efficiency, and its value content

- *Value-added analyses* are performed in an effort to eliminate activities that add little or no value to the customer; resource consumption can be reduced and the firm can focus on activities that increase customer satisfaction

ABC/M Tools

High-value-added activities:

- Increase significantly the value of the product or service
- Are necessary to meet customer requirements
- Enhance purchased materials or components
- Contribute to customer satisfaction
- Are critical steps in a business process

In short, removal would reduce the value of the product or service

ABC/M Tools

Low-value-added activities:

- Consume time, resources, or space but add little or nothing to satisfying customer needs
- *C*an be eliminated without affecting the form/fit/function of the product or service

Customer Profitability Analysis

ABC/M can be used to estimate customer-related costs and in therefore in assessing the profitability of a specific customer or group of customers

- *Customer profitability analysis* identifies customer service activities and cost drivers and determines profitability for each customer or group; this process allows the firm to chose its customer mix, determine an appropriate offering of after-sale services, decide what discounts to offer, etc.

- *Customer cost analysis* is the first step in a customer profitability analysis; it identifies activities and cost drivers to service customers before and after sales

Customer Profitability Analysis

Customer-related costs can be classified into the following categories:

- Customer unit-level costs - resources consumed for each unit sold to a customer, such as sales commissions and shipping costs based on units sold or shipped
- Customer batch-level costs - resources consumed for each sales transaction, such as order-processing costs or invoicing costs
- Customer-sustaining costs -resources consumed to service a customer regardless of the number of units or batches sold, such as monthly statement processing costs and collection costs for late payments

Customer Profitability Analysis

Customer costs can be classified into the following categories (continued):

- Distribution-channel costs are resources consumed in each distribution channel the firm uses to service customers, such as the cost of operating a regional warehouse or centralized distribution center

- Sales-sustaining costs are resources consumed to sustain sales and service activities that cannot be traced to an individual unit, batch, customer, or distribution channel, such as general corporate marketing expenditures

Customer Profitability Analysis

- **Customer Profitability Analysis** combines customer revenues and customer costs to assess customer profitability and helps identify actions to improve customer profitability
- Some companies quantify customer value in what is called **Customer Lifetime Value** (CLV), which is equal to the net present value (NPV) of all estimated future profits from the customer for a specified period of time

Customer Profitability Analysis

Customer profitability analysis helps to assess a customer's value to the company:

- What is the growth potential of the customer and the customer's industry?
- What is its "cross-selling" potential?
- What are the possible reactions of the customer to changes in sales terms or services?
- How important is this customer as a future sales reference?

ABC/M Implementation Issues

- A successful ABC/M implementation requires close cooperation among management accountants, engineers, and manufacturing and operating managers

- There are three important issues to consider in ABC/M implementation:
  - Multiple-Stage ABC
  - Time-Driven ABC (TDABC)
  - Resource Consumption Accounting

ABC/M Implementation Issues

- **Multiple-stage ABC** takes into account that some activities are cost objects for other activities

- **Time-driven ABC (TDABC)** simplifies some of the complexity involved in large ABC systems

ABC/M Implementation Issues

- Time-driven ABC (TDABC)
- Is based on the idea that the common element in the utilization of many activities is the unit of time
- Assigns resource costs directly to cost objects using the cost per time unit of supplying the resource
- Requires the total activity cost be divided by the number of minutes available to that activity to provide a cost per unit of time

Resource Consumption Accounting

- Emphasis is on being able to attribute costs, both fixed and proportional, to cost objects for decision support
- Three foundational concepts for RCA:
  - The view of resources – resources are the suppliers of capacity, meaning that capacity is a function of the resources available.
  - The quantity-based model – an operational view of the organization based on the concept that there is a causal relationship that can be expressed in terms of input and output units.
  - Cost behavior – the characteristics of the cost are inherent to the underlying resource and the consumption of those resources by value creating operations.

TDABC Example

- Assume 2 clerical workers paid $45,000 annually perform a certain activity that is expected to require 17 minutes. TDABC calculates the total cost as $45,000 × 2 = $90,000; TDABC then calculates the total time available for the activity as 180,000 minutes (assuming 30 hours per week with two weeks vacation: 2 workers × 50 weeks × 30 hours × 60 minutes per hour = 180,000 minutes per year).

- The TDAC rate for the activity is $0.50 per minute ($90,000 ÷ 180,000). The cost of a unit of activity is $0.50 × 17 min = $8.50.

Strategic Role of ABC

Activity-based costing (ABC) vs. volume-based costing:

- Volume-based costing results may be distorted because indirect costs do not always occur in proportion to output volume
- Volume-based costing generally causes cross-subsidization of outputs (i.e., some products will be overcosted and others undercosted)
- Activity-based costing uses detailed information about the activities that make up indirect costs so that outputs are charged only for resources consumed by the activities needed to perform them

Volume-Based Costing

- **May be a good strategic choice for some firms**
  - When the costs to be allocated are relatively small versus the directly traceable costs
  - When the activities supporting production are relatively homogeneous across different product/service lines
- **Volume-based costing is often used by paper product manufacturers, producers of agricultural products, other commodity firms, and professional service firms**

ABC Terms

- ***Activity*** **- a specific task or action of work done, such as production set-up**
- ***Resource*** **- an economic element needed or consumed in performing activities, such as salaries and supplies**
- **Cost driver - either a *resource consumption cost driver* or an *activity consumption cost driver***

ABC Terms

- **Resource consumption cost drivers** measure the amount of resources consumed by an activity, such as the number of items in a purchase or sales order
- **Activity consumption cost drivers** measure the amount of activity performed for an object, such as the number of batches used to manufacture a product

Cost Assignment

- ***The two-stage cost assignment* approach for indirect (support) costs: resource costs such as factory overhead are assigned to activity cost pools and then to cost objects (jobs, clients, products, patients, etc.)**
  - Volume-based systems assign factory overhead to a single plant or departmental cost pool first and then to products or services using a volume-based rate
  - ABC systems assign factory overhead costs to activities or activity cost pools using resource consumption cost drivers and then assign these costs to cost objects using activity consumption cost drivers

Summary: ABC vs. volume-based costing

ABC systems differ from volume-based costing systems in two ways:

- ABC system defines cost pools as activities rather than production plant or department cost centers
- Cost drivers
  - ABC systems use drivers based on an activity or activities performed for the cost object
  - Volume-based approaches use a volume-based cost driver that often bears little or no relationship to the consumption of resources by the cost objects

Activity Analysis

Through activity analysis, a firm identifies the work it performs to carry out its operations by

- Gathering data from existing documents and records
- Collecting additional data using questionnaires, observations, or interviews of key personnel
- Sample questions include:
  - What work or activities do you do?
  - How much time do you spend performing these activities?
  - What resources are required to perform these activities?
  - What value does the activity have for the product, service, customer, or organization?

Activity Analysis

To identify resource costs for various activities, a firm classifies all activities according to the way in which the activities consume resources

- A *unit-level* activity is performed on each individual unit of product or service of the firm (e.g., direct materials)
- A *batch-level* activity is performed for each batch or group of units of products or services (e.g., setting up machines or placing purchase orders)
- A *product-level* activity supports the production of a specific product or service (e.g., engineering changes to modify parts for a product)
- A f*acility-level* activity supports overall operations (e.g., property taxes and insurance)

Unit Level Costs

Performed for each unit of product or service

Examples include:

- Units of production related depreciation of factory machinery
- Energy costs for machinery used for individual units of production (e.g., A drill press that drills holes in pieces of metal)

Batch Level Costs

Performed for each batch of product or service produced

Examples include:

- Machine setup costs
- Quality control costs
- Wages for works that move products within the factory
- Energy costs for machinery that is used for multiple units of product at the same time (e.g., an oven that bakes a batch of cookies for a commercial baker)

Product Level Costs

Support production of a specific product or service line

Examples include:

- Salaries for product line purchasing managers
- Quality control costs
- Product development costs
- Depreciation and maintenance for specialized machinery dedicated to the production od a single product or service line

Facility Level Costs

Support overall operations

Examples include:

- Factory depreciation
- Security costs for the factory
- Insurance and property taxes for a factory
- Salary of a plant manager

Developing an ABC System

There are three steps in the development of an ABC system:

1. Identify resource costs and activities
   - An activity analysis is performed to identify key activities and the way in which the activities consume resources
2. Assign resource costs to activities
   - Use resource consumption cost drivers based on cause-and-effect relationships, such as the number of labor hours, setups, moves, machine-hours, employees, or square feet to assign resource costs
3. Assign activity costs to cost objects
   - Use activity consumption cost drivers, such as purchase orders, receiving reports, parts stored, direct labor-hours, or manufacturing cycle time to assign activity costs

Benefits of ABC Systems

1. Better profitability measures due to more accurate costs
2. Better decision making: identification of value-added vs. non-value-added activities and associated costs
3. Information for process improvement
4. Improved cost planning
5. Helps identify and control the cost of unused capacity

Volume-Based vs. ABC Example

Haymarket BioTech, Inc. (HBT) produces and sells two secure communication systems, AW (Anywhere) and SZ (SecureZone). HBT has the following operating data for the two products:

	AW	SZ
Production volume	5,000	20,000
Selling price	$400.00	$200.00
Unit direct materials and labor	$200.00	$80.00
Direct labor-hours	25,000	75,000
Direct labor-hours per unit	5	3.75

Volume-Based vs. ABC

The **traditional volume-based costing system** assigns factory overhead (OH) based on direct labor-hours (DLH). The firm has a total budgeted overhead of $2,000,000. Since the firm budgeted 100,000 DLHs for the year, the overhead rate per DLH is $20 ($2,000,000÷100,000 DLH).

Therefore……

Volume-Based vs. ABC

The factory overhead assigned to AW is $500,000 (25,000 DLH × $20) in total and $100 ($500,000÷5,000 units) per unit, since the firm used 25,000 direct labor hours to manufacture 5,000 units of AW

and

The factory overhead assigned to SZ is $1,500,000 (75,000 DLH × $20) in total and $75 ($1,500,000÷20,000 units) per unit, since the firm used 75,000 direct labor hours to manufacture 20,000 units of SZ

Volume-Based vs. ABC

Product profitability analysis per unit using volume-based costing:

	AW		SZ	
Unit selling price		$400.00		$200.00
Unit-level manufacturing costs				
Direct materials and labor	$200.00		$80.00	
Factory overhead	100.00		75.00	
Cost per unit		300.00		155.00
Profit margin		100.00		45.00

Volume-Based vs. ABC

In an attempt to use an ABC system, HBT has identified the following activities, budgeted costs, and activity consumption cost drivers:

Activity	Budgeted Cost	Activity Consumption Cost Driver
Engineering	$ 125,000	Engineering hours
Setups	300,000	Number of setups
Machine operations	1,500,000	Machine hours
Packing	75,000	Number of packing orders
Total	$ 2,000,000	

Volume-Based vs. ABC

HBT also has gathered the following operating data pertaining to each of its products:

	AW	SZ	Total
Engineering hours	5,000	7,500	12,500
Number of setups	200	100	300
Machine hours	50,000	100,000	150,000
Number of packing orders	5,000	10,000	15,000

Volume-Based vs. ABC

Using the operating data, the activity rate for each activity consumption cost driver is calculated as follows:

(1)	(2)	(3)	(4) = (2) ÷ (3)
Consumption Cost Driver	Budgeted Cost	Budgeted Activity Consumption	Activity Consumption Rate
Engineering hours	$ 125,000	12,500	$ 10 per hour
Number of setups	300,000	300	1,000 per setup
Machine hours	1,500,000	150,000	10 per hour
Number of packing orders	75,000	15,000	5 per order

Volume-Based vs. ABC

Factory overhead costs for AW at 5,000 units of production:

(1)	(2)	(3)	(4) = (2) × (3)	(5)
Consumption Cost Driver	Activity Consumption Rate	Activity Consumption	Total Overhead	Overhead per Unit
			$	
Engineering hours	$ 10	5,000	50,000	$ 10
Number of setups	1,000	200	200,000	40
Machine hours	10	50,000	500,000	100
Number of packing orders	5	5,000	25,000	5
Total			$ 775,000	$ 155

Volume-Based vs. ABC

Factory overhead costs for SZ at 20,000 units of production:

(1)	(2)	(3)	(4)=(2)×(3)	(5)
Consumption Cost Driver	Activity Consumption Rate	Activity Consumption	Total Overhead	Overhead per Unit
Engineering hours	$ 10	7,500	$ 75,000	$ 3.75
Number of setups	1,000	100	100,000	5.00
Machine hours	10	100,000	1,000,000	50.00
Number of packing orders	5	10,000	50,000	2.50
Total			$ 1,225,000	$ 61.25

Volume-Based vs. ABC Example

Product profitability analysis per unit using ABC:

		AW			SZ	
Unit selling price			$ 400			$200.00
Unit-level manufacturing costs						
Direct materials and labor		$ 200			$ 80.00	
Engineering	$ 10			3.75		
Setups	40			5.00		
Machine running	100			50.00		
Packing	5			2.50		
Factory overhead		155.00			61.25	
Cost per unit			355.00			141.25
Profit margin			$ 45			$ 58.75

Volume-Based vs. ABC

The following chart compares the results of the two costing systems:

	AW	SZ
Unit overhead cost		
Volume-based	$ 100	$ 75.00
Ativity-based	155	61.25
Difference	$ 55	$ 13.75
Profit margin		
Volume-based	$ 100	$ 45.00
Ativity-based	45	58.75
Difference	$ 55	$ 13.75

Can you guess which is the high-volume and which is the low-volume product?

Keep in mind that volume-based costing tends to undercost low-volume products and overcost high-volume products, a situation often referred to as product cost cross-subsidization

Cost of Capacity for the HBT Example

- Suppose that instead of a budgeted activity consumption of 12,500 hours, HBT were to use the practical capacity of the engineering staff, which is 15,625 hours.
- Using practical capacity, the activity consumption rate would be $8 per engineering hour (=$125,000÷15,625). If only 12,500 hours were used, as shown in the HBT example, then the overhead cost charged to AW and SZ would be reduced because of the lower rate ($8 instead of the original rate of $10).
- AW overhead would be reduced by $10,000 (5,000 hours × $2) and SZ overhead would be reduced by $15,000 (7,500 hours × $2).
- The total reduction for the two products, $25,000 (=$10,000 + $15,000) is the **cost of unused capacity.**

Five Steps of Strategic Decision Making in the HBT Example

1. **Determine the Strategic Issues Surrounding the Problem:** ***HBT competes on differentiation***
2. **Identify the Alternative Actions:** ***focus on AW or SZ?***
3. **Obtain Information and Conduct Analyses of the Alternatives:** ***cost analysis based on ABC costing***
4. **Based on Strategy and Analysis, Choose and Implement the Desired Alternative:** ***do not promote AW over SZ, but instead focus on SZ to improve overall profitability***
5. **Provide an On-going Evaluation of the Effectiveness of implementation in Step 4.**

Summary

- Activity-based costing (ABC) is a costing approach that assigns resource costs to cost objects such as products, services, or customers based on activities performed for the cost objects

- Volume-based costing is often inadequate because indirect costs do not always occur in proportion to output volume; the use of volume-based costing can cause costing inaccuracies and product cost cross-subsidization

Summary

- Among other benefits, ABC yields information that can be used by management to guide strategic decision-making; the use of ABC data for decision-making purposes is referred to as ABM

- ABM manages activities to improve the value of products or services to customers and increase the firm's competitiveness and profitability

Summary

- ABC/M can be applied to customer-related costs and therefore for conducting customer profitability analysis; as such, ABC data become a powerful tool for increasing customer profitability
- A successful ABC/M implementation requires close cooperation among management accountants, engineers, and manufacturing and operating managers
- Implementation of ABC sometimes includes recent advances such as Multiple-Stage ABC, Time-Driven ABC, and Resource Consumption Accounting

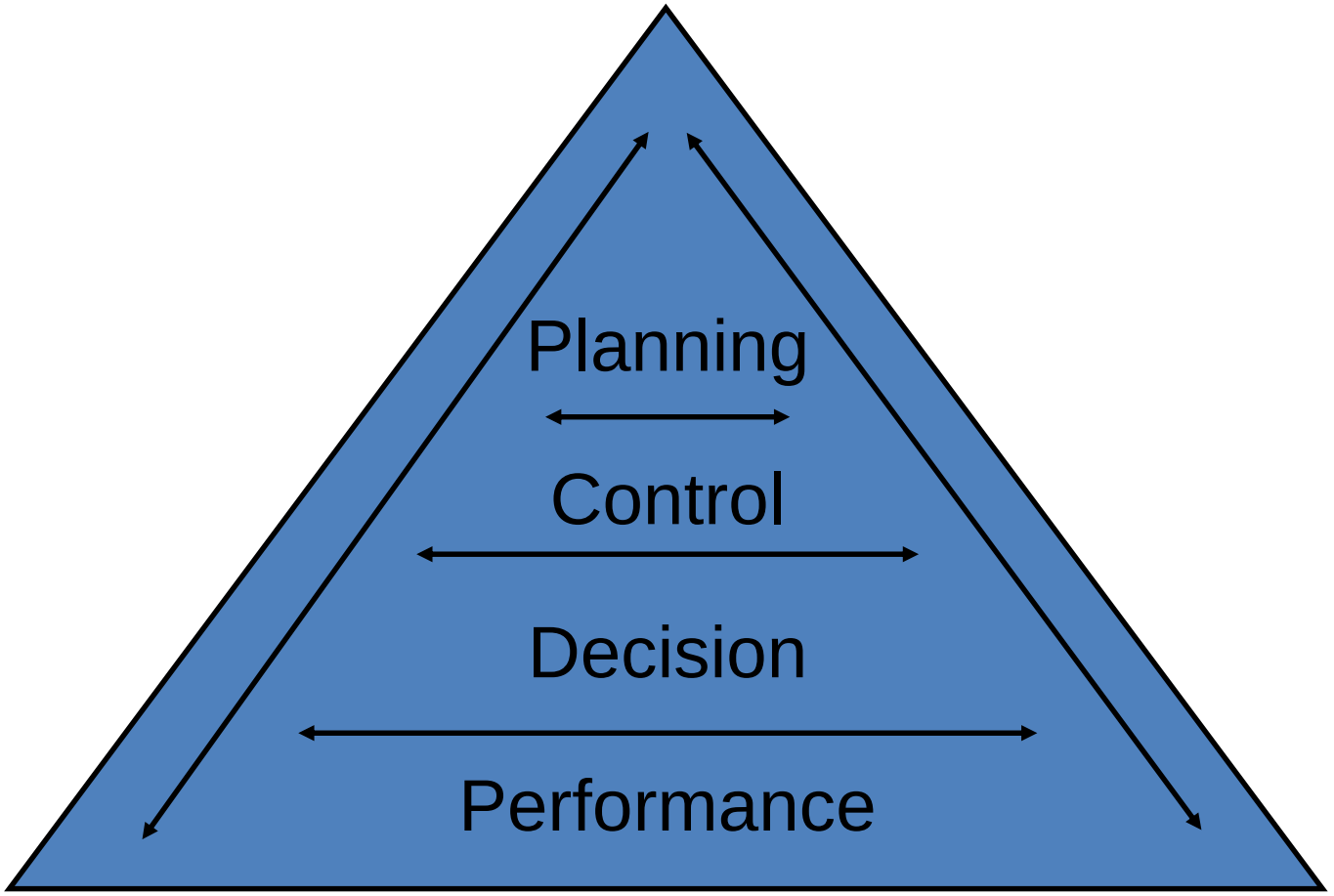
Managing cost control

Management Information System

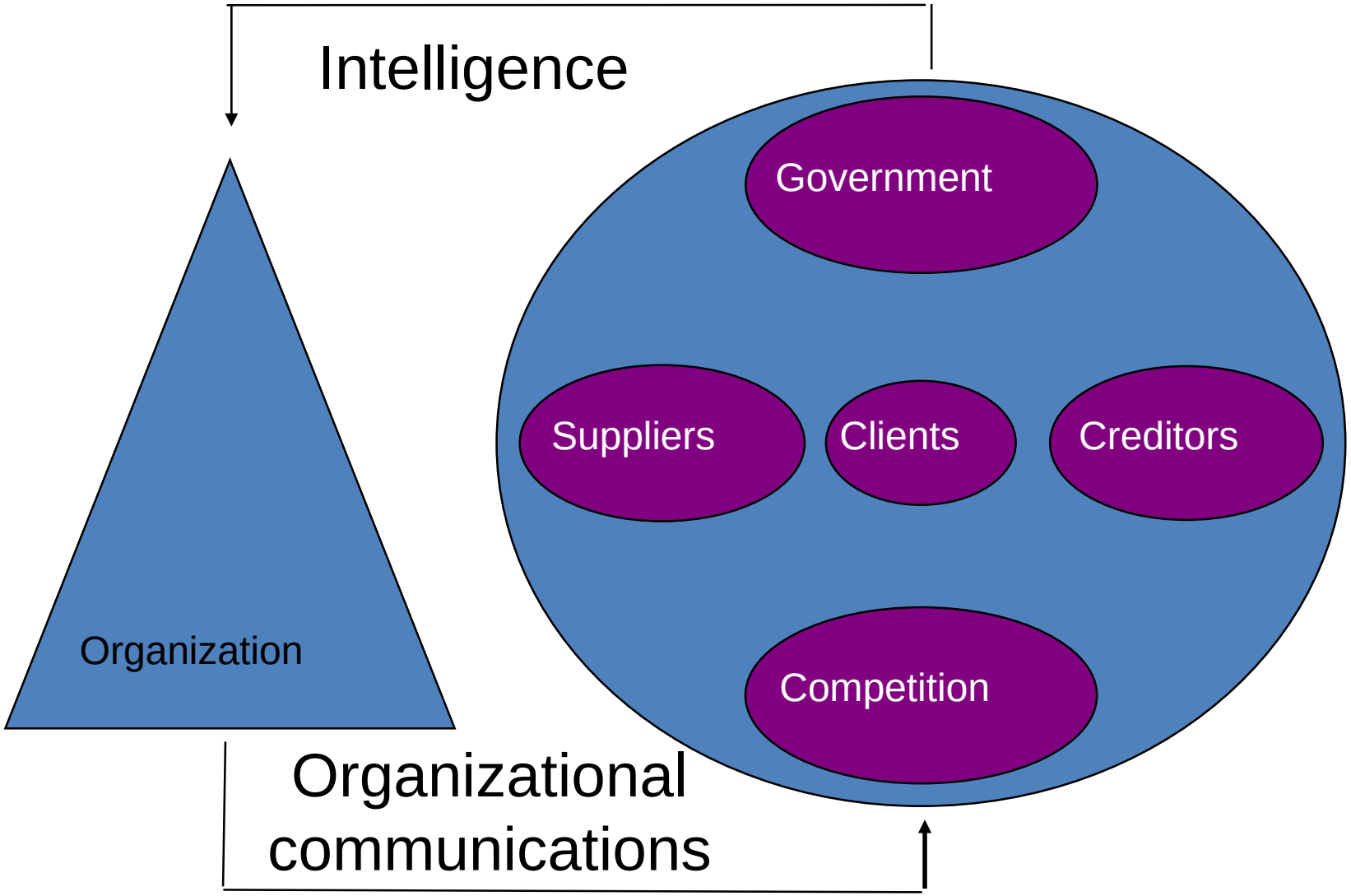
- A structure of interrelated elements that
  - collects, organizes, and communicates data so managers may
  - plan, control, evaluate performance, and make decisions

- Emphasizes satisfying internal demands for information rather than external demands

Internal Information Flows



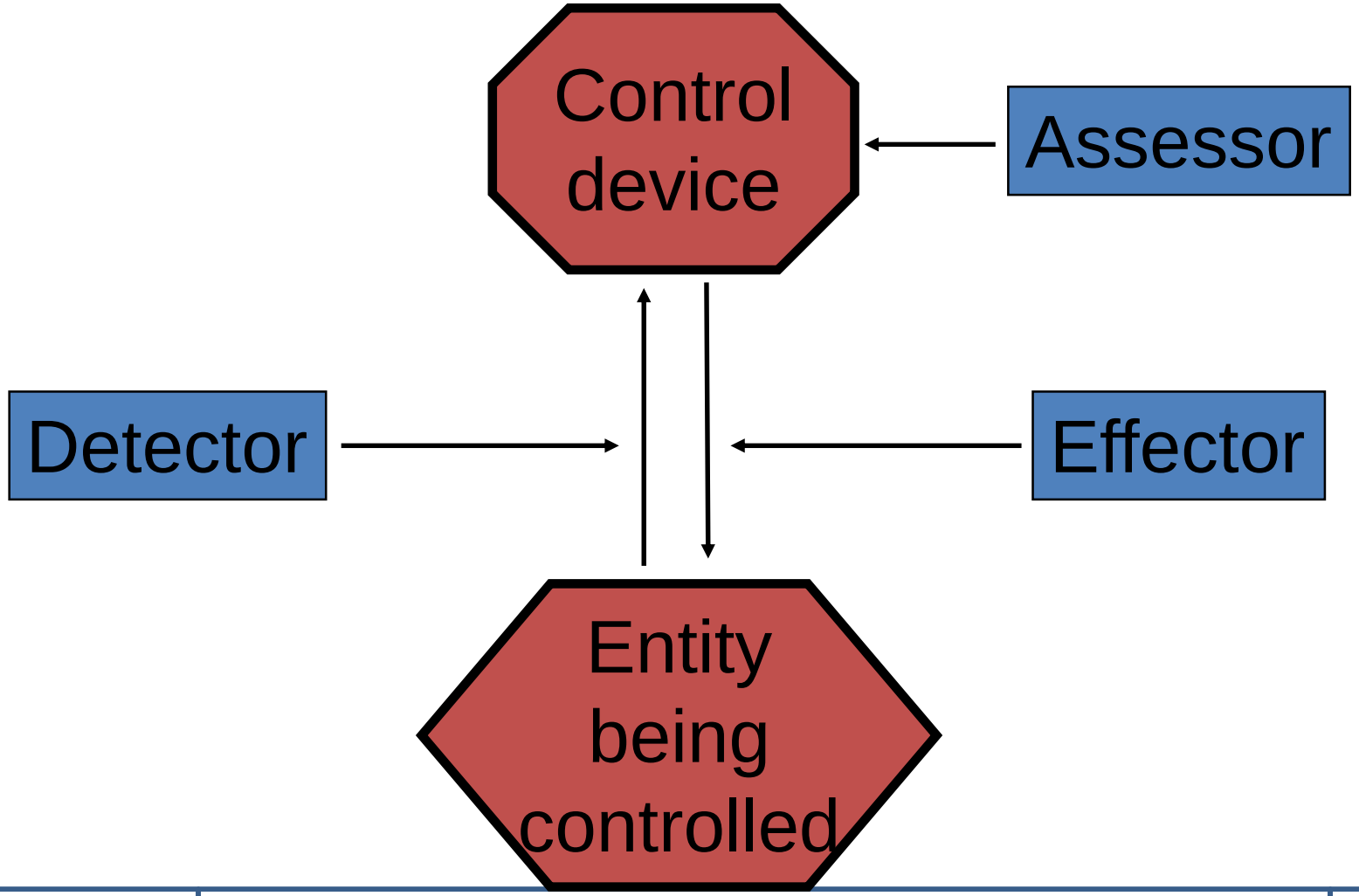
External Information Flows



Control System Components

- Detector or sensor
- Assessor
- Effector
- Communications network

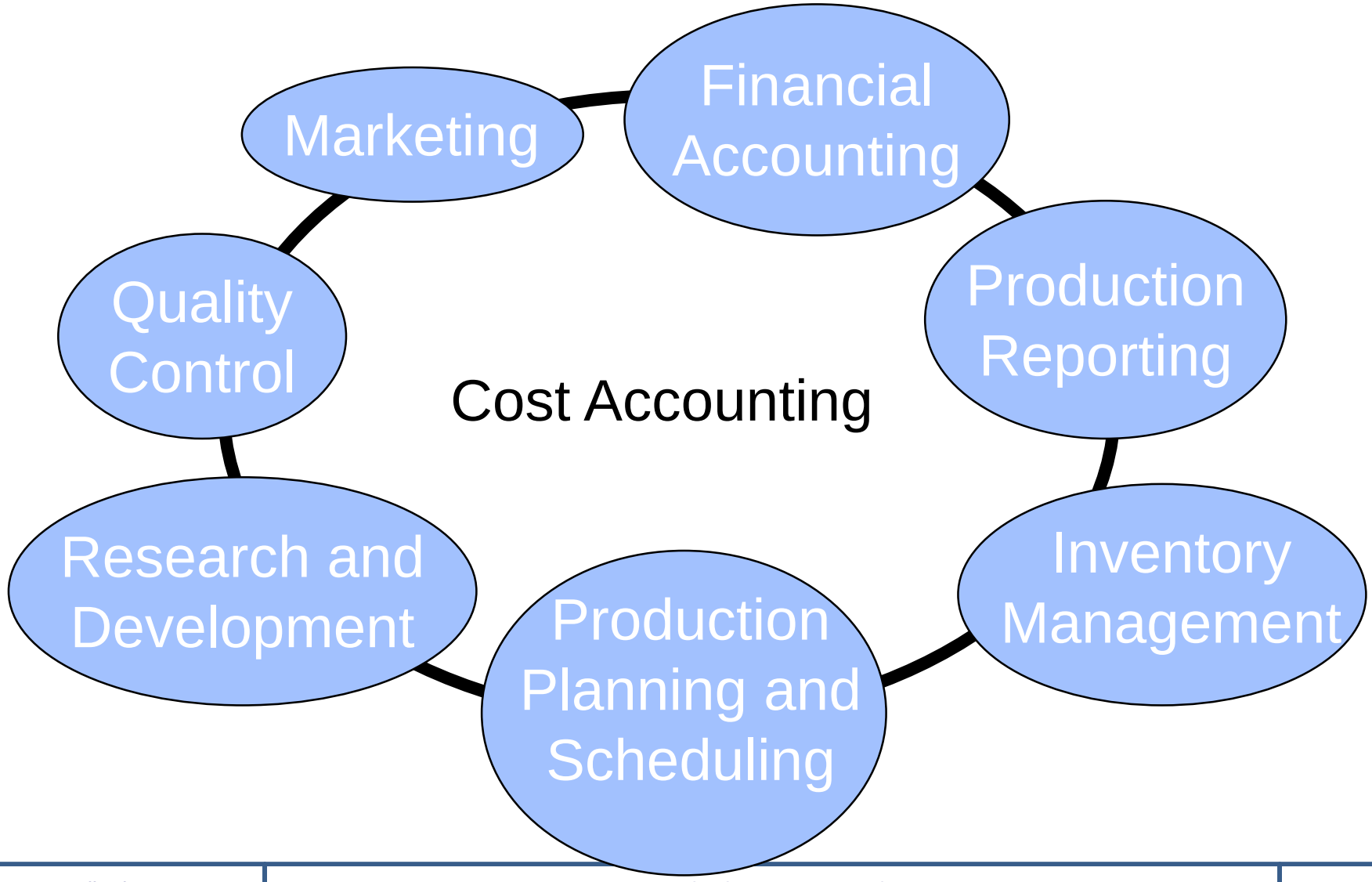
Management Control System



Cost Management System (CMS)

- Formal methods to plan and control an organization's cost-generating activities with major challenges of:
  - Achieving profitability in the short run
  - Maintaining a competitive position in the long run

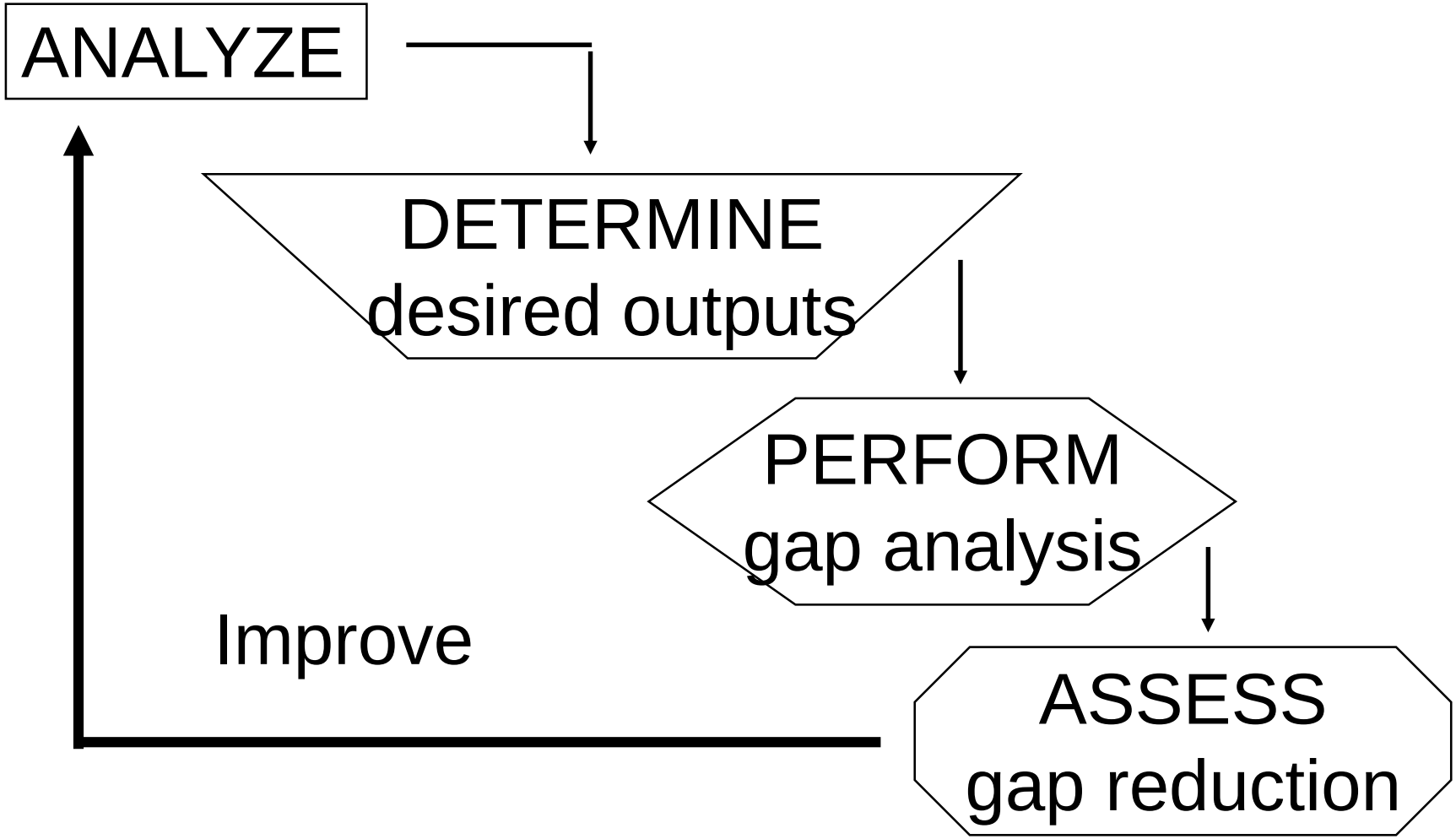
Integrated Cost Management System



Cost Management System Goals

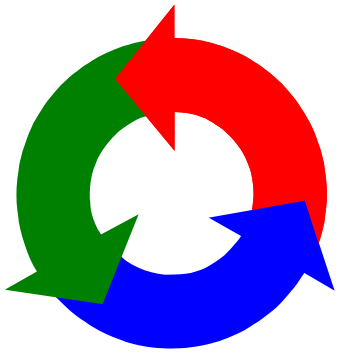
- Develop product costs
- Assess product/service life-cycle performance
- Improve understanding of processes and activities
- Control costs
- Measure performance
- Allow pursuit of organizational strategies

Designing a Cost Management System



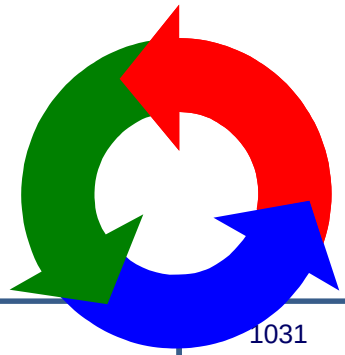
CMS Information

- Enables managers to perform analyses on:
  - determining core competencies and organizational constraints
  - positive and negative financial and non-financial factors of strategic and operational plans



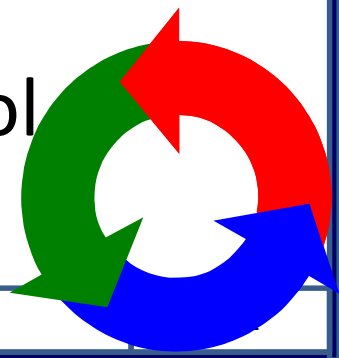
Organizational Form, Structure, Culture

- Choice of form affects
  - Cost of raising capital
  - Cost of operating business
  - Cost of litigating
  - Statutory authority to make decisions
- Forms of business include
  - Corporations, Partnerships, LLPs, LLCs



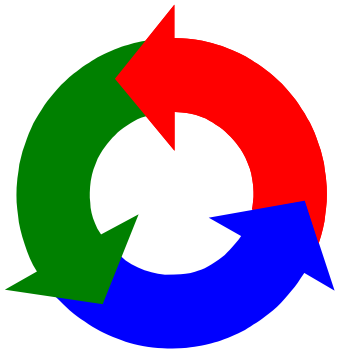
Organizational Form, Structure, Culture

- Distribute authority and responsibility
  - Centralized, decentralized decision making
- Group subunits
  - geographically
  - by similar missions
  - by natural product clusters
- Determine accountability for cost management and organizational control



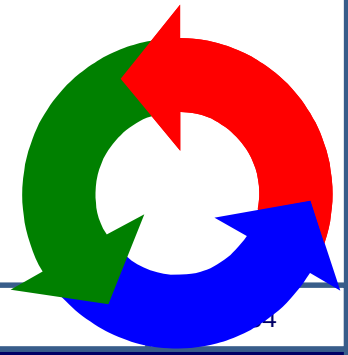
Organizational Form, Structure, Culture

Underlying set of assumptions about entity and goals, processes, practices, and values that are shared by its members



Organizational Mission and Core Competencies

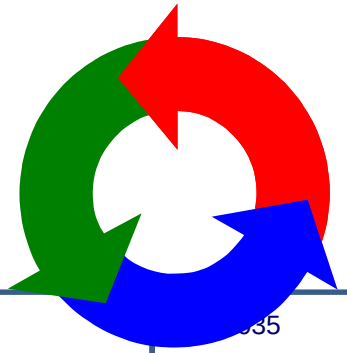
- Business mission regarding competition
  - Avoid competition
    - Differentiation
    - Cost Leadership
  - Confront competition
- Business mission in relation to product life cycle



Organizational Mission and Core Competencies

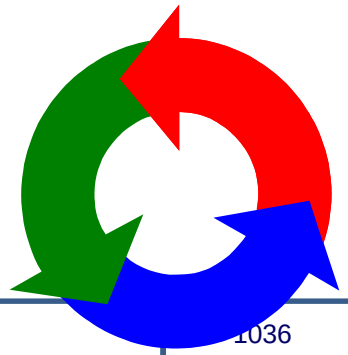
- Timeliness
- Quality
- Customer service
- Efficiency and cost control
- Responsiveness to change

Cost management system gathers data and reports about core competencies



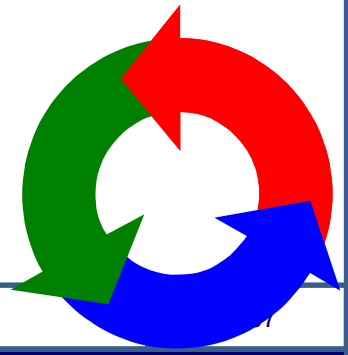
Operating and Competitive Environment and Strategies

- Fewer costs susceptible to short-run control
- Cost management efforts targeted toward
  - the longer term
  - capacity management
- Decreased flexibility when responding to a change in short-term conditions



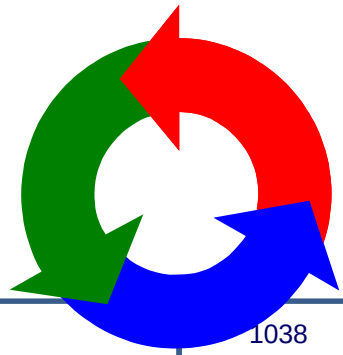
Operating and Competitive Environment and Strategies

- Being first to market - pricing flexibility
  increase market share or large per-unit profit
- Reduce product cost substantially
  - develop new production processes
  - capture learning curve effects
  - increase capacity utilization
  - create a focused factory arrangement
  - design for manufacturability, logistical support, reliability, maintainability



Operating and Competitive Environment and Strategies

- Supplier relations
  - link electronically
- Integration of entire information system
  - payroll
  - inventory
  - budgeting
  - costing

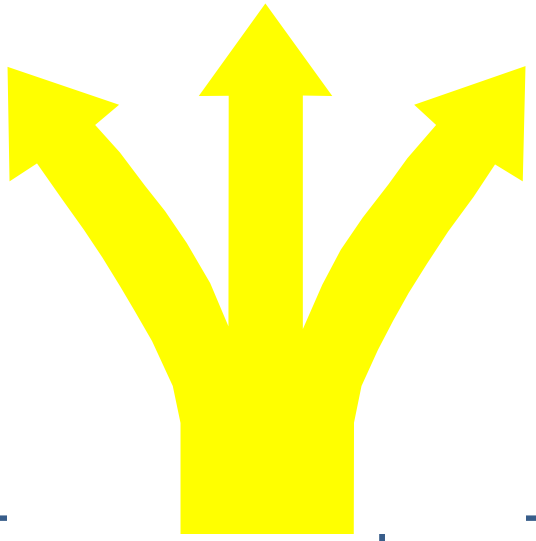


CMS Elements

- Motivational elements
- Informational elements
- Reporting elements

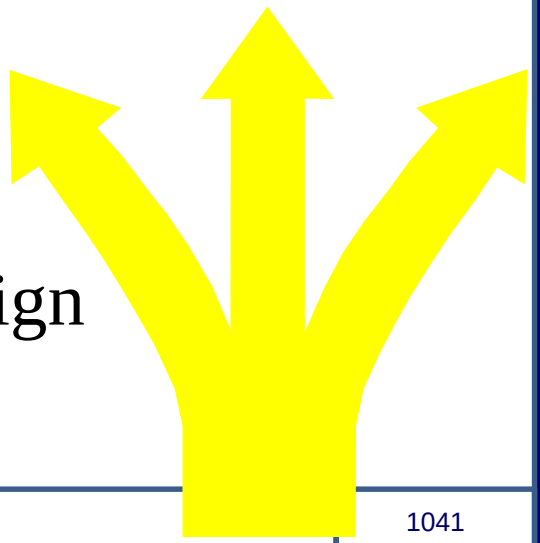
CMS Elements

- Motivational elements
  - Performance measurements
  - Reward structure
  - Support of organizational mission and competitive strategy



CMS Elements

- Motivational elements
- Informational elements
  - Support budgeting process
  - Identify cost drivers
  - Reduce/eliminate non-value-added activities
  - Emphasize product life cycle
  - Adapt to changing competitive conditions
  - Relate cost to product/process design
  - Focus on capital spending
  - Minimize cost distortions



CMS Elements

- Motivational elements
- Informational elements
- Reporting elements
  - Prepare financial statements
  - Implement responsibility accounting system

Implement CMS

Perform GAP analysis



Information Needs

<Information Available>

Gap to Overcome

Implement CMS

- Gap Analysis
  - Identify gap to overcome
  - Prioritize differences
  - Develop and deploy improvements

Enterprise Resource Planning

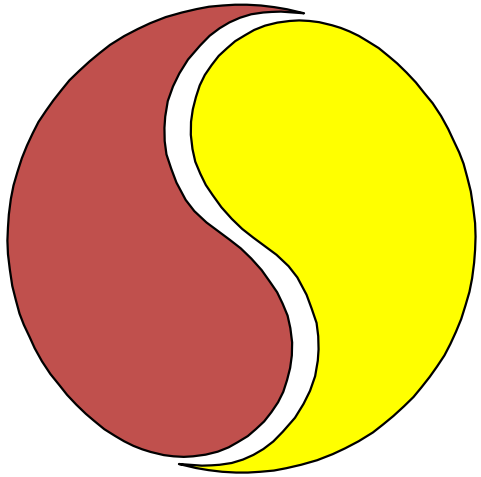
For a truly integrated CMS

- Automate and integrate business processes
- Share common data and practices
- Produce and access information in real-time

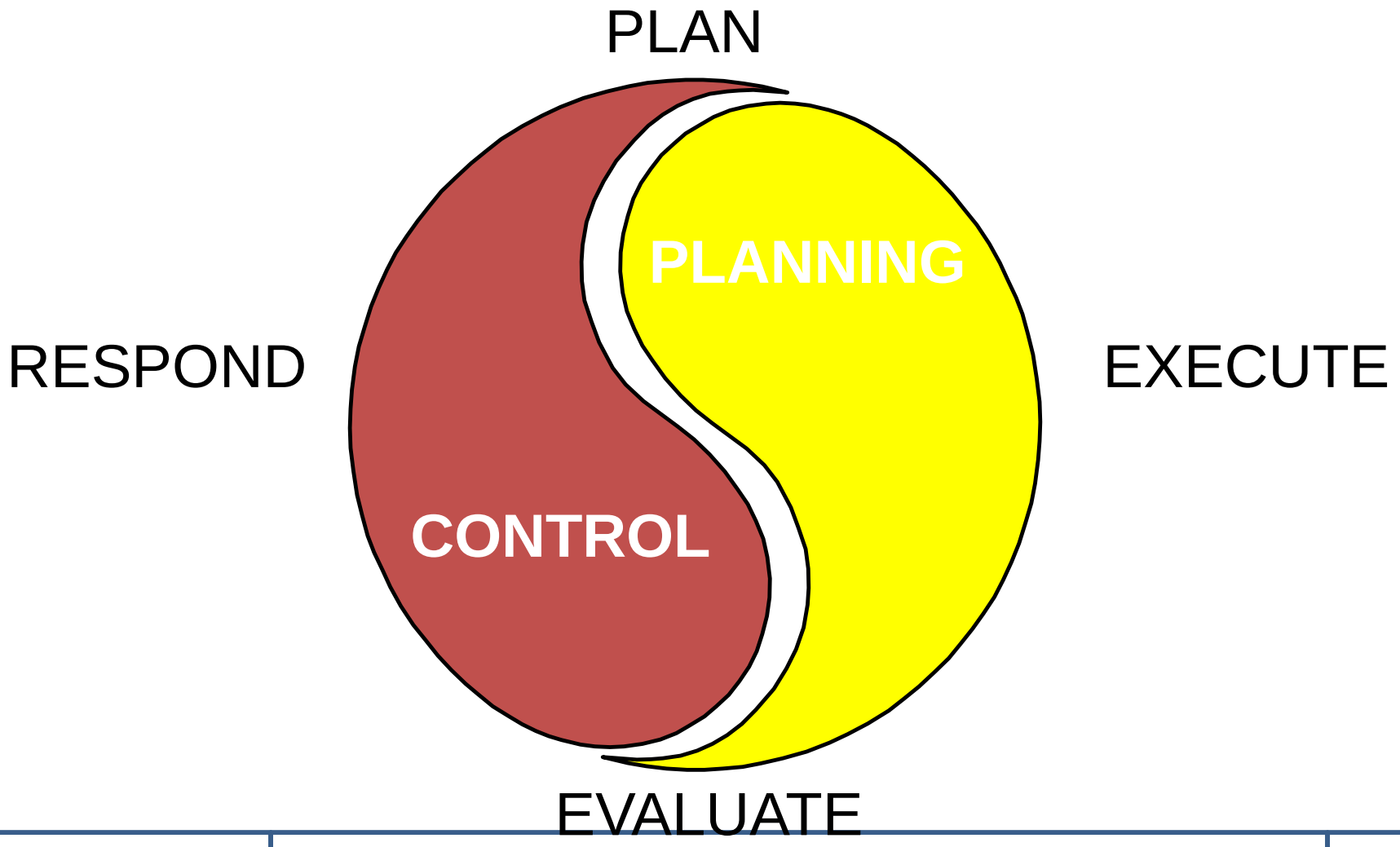


Cost Control Systems

Provide information for planning and for determining the efficiency of activities while they are being planned and after they are performed



Planning and Control Model



ACTIVITY

Before

During

After

Budgeting, Standard setting

Monitoring, Correcting

Providing feedback

Cost understanding

Cost containment, Cost avoidance

Cost reduction

COST CONSCIOUSNESS ATTITUDE

Why Costs Change

- Cost Behavior
  - Reaction of variable and mixed costs to changes in activity level
- Inflation/Deflation
- Supply/Supplier Cost Adjustments
  - Supply/demand adjustments
- Taxes
- Regulatory Requirements
- Quantity Purchased

Cost Containment

Cannot contain

- inflation
- tax
- regulatory changes
- supply and demand adjustments

Use cost containment for

- reduced competition
- seasonality
- quantities purchased

Interorganizational arrangements

Long-term or single-source contracts

Cost Avoidance and Reduction

- Avoidance - finding acceptable alternatives
- Reduction - lowering current costs
  - Benchmarks
  - Outsourcing
  - Consultants
  - Redesign operations

Implement Cost Control System

- Investigate/understand types of costs
- Communicate need for cost containment
- Motivate employees (education/incentives)
- Review results and consider improvements
- View as long-run process

Fixed Costs

- Committed Costs plant assets and personnel structure
  - depreciation
  - lease rentals
  - property taxes

Cannot be reduced easily

- Discretionary Costs important but optional activities
  - employee travel
  - repairs and maintenance
  - advertising
  - research and development
  - employee training and development

Controlling Committed Costs

- Compare expected benefits to expected costs
- Analyze operating leverage
- Perform postinvestment audit; compare actual to expected results

Discretionary Costs

- Vary in type and magnitude
- Vary in quality of performance
- Not easy to measure benefits in terms of money



Budgeting Discretionary Costs

- Perceived significance to the achievement of objectives and goals
- Expected level of operations
- Managerial negotiations

- Spend all of the appropriation, or
- Spend less than the appropriation

Measuring Benefits from Discretionary Costs

- Use surrogate measures
  - Reduction in unplanned downtime
  - Number of coupons clipped from ads
  - Reduction in number of customer complaints
- Compare discretionary costs to benefits to measure efficiency and effectiveness

Discretionary Cost Measures

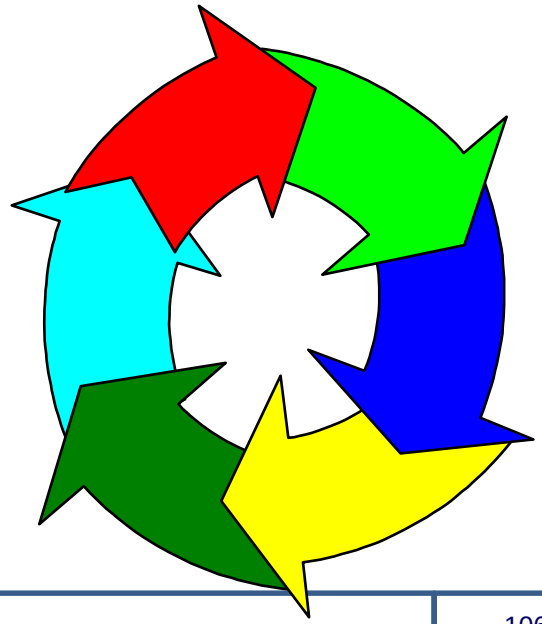
	Actual Result	Compared to	Desired Result
Efficiency =	Actual Output / Actual Input		Planned Output / Planned Input
OR			
Efficiency =	Actual Input / Actual Output		Planned Input / Planned Output
Effectiveness =	Actual Output / Planned Output		Preestablished Standard

Controlling Discretionary Costs

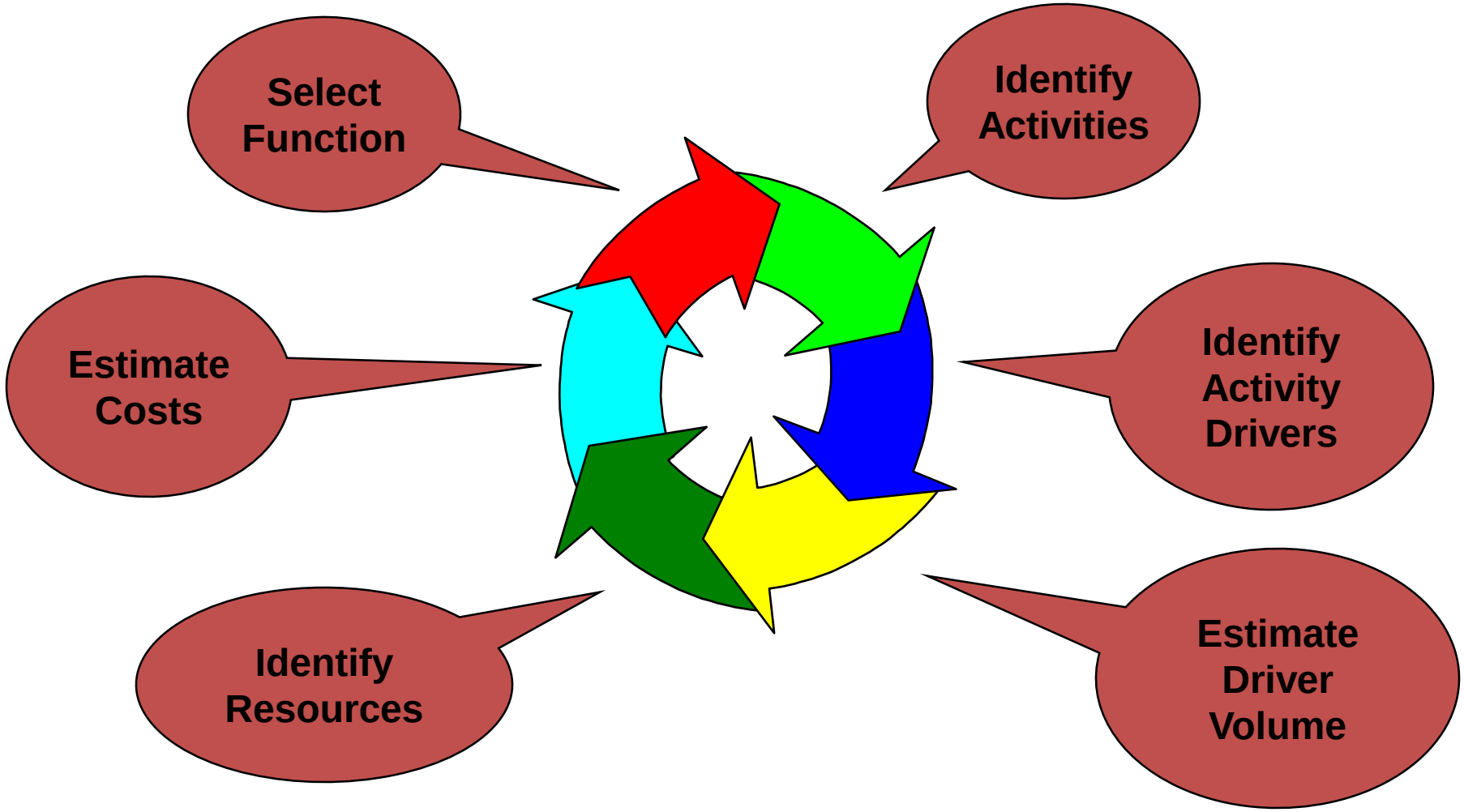
- To determine variances, compare actual to standards or budgeted amounts
- Use engineered costs
  - Costs that bear observable and known relationship to a quantifiable activity base
  - Compute fixed or variable variances

Activity-Based Budgeting

Apply activity drivers to estimate the levels and costs of activities necessary to provide the budgeted quantity and quality of production



Activity-Based Budgeting Steps



Cash Management Issues

- Cash level
  - sufficient to cover all needs
  - low enough to allow for alternative uses of cash
- What variables influence the optimal level of cash?
- What are the sources of cash?
- What variables influence the cost of carrying cash?

Cash Management Issues

What variables influence the optimal level of cash?

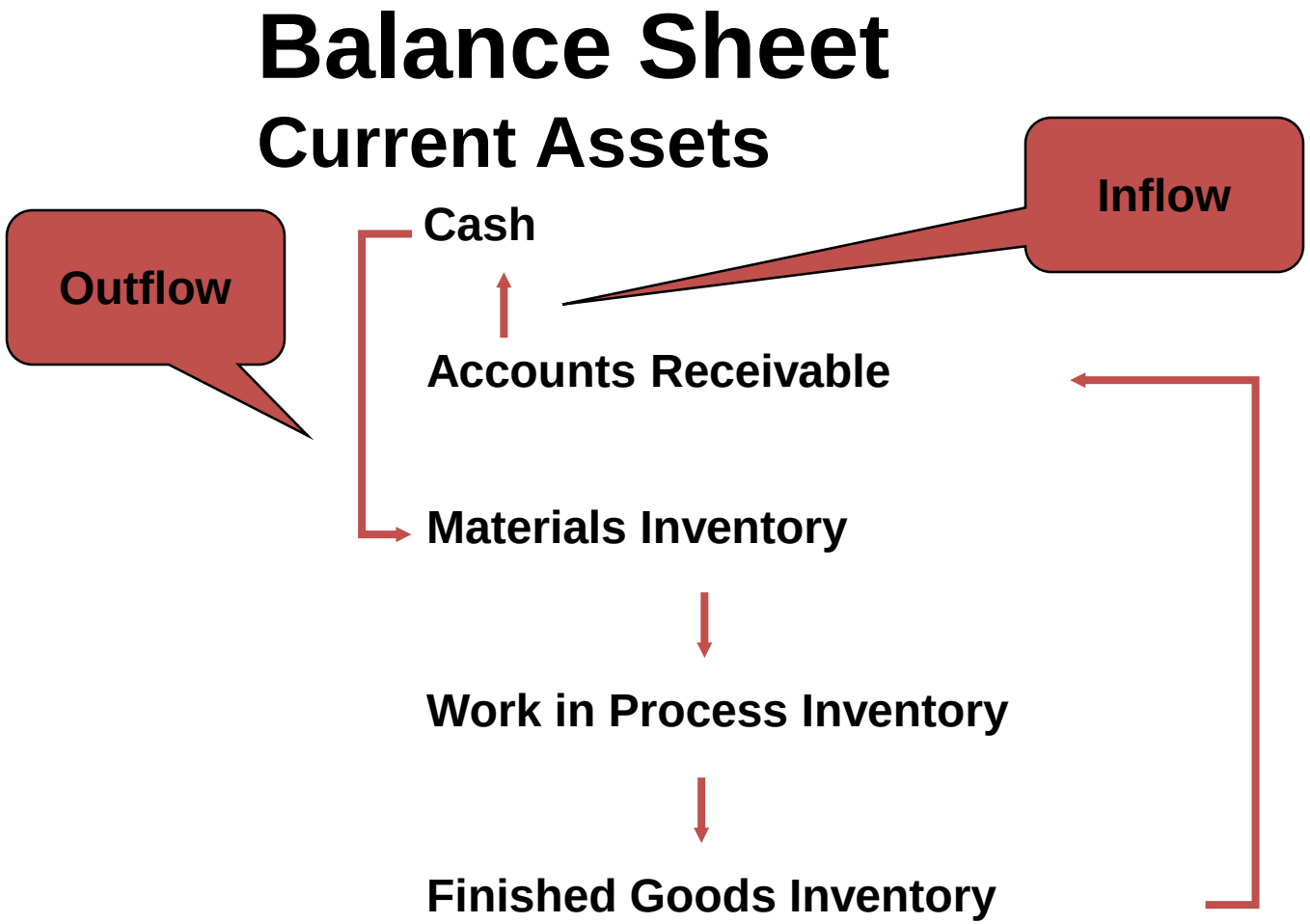
- Uncertainty of timing of cash inflows and outflows
- Variability in cash requirements throughout the year
- Ability to arrange short-term financing
- Bond and loan covenants

Cash Management Issues

What are the sources of cash?

- Sale of equity or debt instruments
- Sale of unneeded or unproductive assets
- Normal operations
  - Reduce inventory
  - Increase A/R turnover
  - Decelerate payments

Cash Collection Cycle



Cash Management Issues

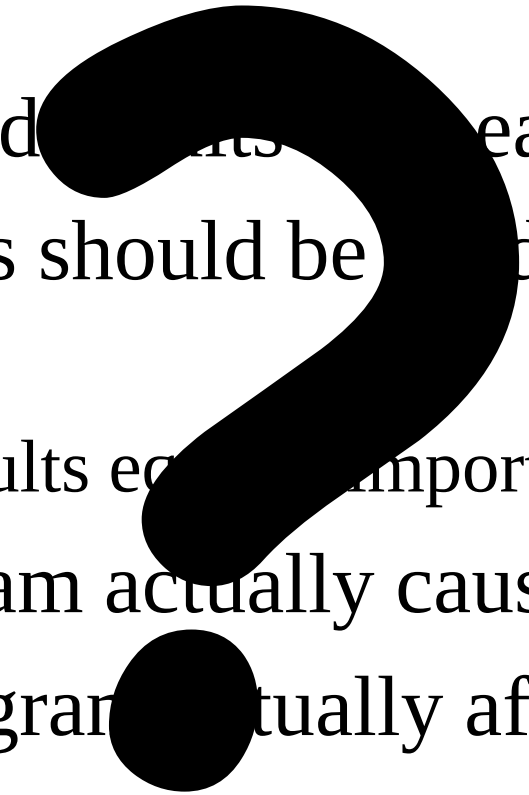
What variables influence the cost of carrying cash?

- Cost of borrowing and cost of issuing equity capital
- Opportunity costs of holding cash

Program Budgeting

- Use in government, not-for-profits, and service activities in for-profits
- Relates resource inputs to service outputs
- Define objectives in terms of output results, not quantity of input activities
- Analyze alternative activities that may achieve the objectives
- Use surrogate measures of output

Program Budgeting Questions



- When should [illegible] easured?
- What results should be [illegible]d as output measures?
  - Are all results eq[illegible]mportant?
- What program actually caused the result?
- Did the progra[illegible]tually affect the target population?

Zero-Base Budgeting

- Considers the priorities and alternatives for current and proposed activities in relation to organizational objectives
- Reevaluates activities
  - continue
  - eliminate
  - adjust funding

Day 5

BUDGET CONSTRUCTION AND CONTROL

BUDGET CONSTRUCTION AND CONTROL

- Nature and purpose of budgets for planning and control
- Types of budgets and budgeting
- Creating Key Performance Indicators for financial and non-financial performance
- Building a budget
- Budgetary control and variance analysis
- Budgeting for non-financial measures -introducing the Balanced Scorecard

Nature and purpose of budgets for planning and control

Budgeting

- What is a budget?
  - A plan expressed in money
  - Prepared and agreed prior to the budget period
  - The budget may show
    - Income
    - Expenditure
    - Capital to be employed

Chartered Institute of Management Accountants

Budgeting

- What is a budget?
  - The budget is part of the strategic planning process
  - Organisation gains from the budget process itself
  - And gains from the budget once it is prepared

What is Budgeting About?



PEOPLE



PLANNING



MEASURING



CONTROLLING

What is Budgeting About?



PEOPLE



PLANNING

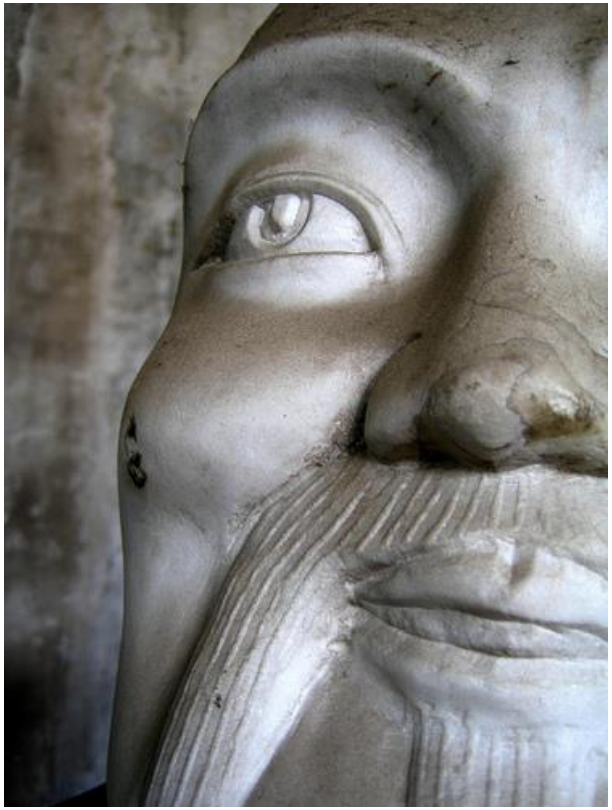


MEASURING



CONTROLLING

Planning



"With careful and detailed planning one can win;

with careless less detailed planning one cannot win.

How much more certain is defeat if one does not plan at all"

Sun Tzu:
"The Art of War" written in 400BC

In other words:

Failing to plan is planning to fail

Planning

- What is planning about?
  - Looking at where we are now
  - Deciding what we want to achieve
  - Taking stock of resources available or needed
  - Anticipating problems
  - Deciding what will need to be done

Planning

- Types of business planning
  - Operational planning
    - Detailed planning
    - Day to day

Planning

- Types of business planning
  - Operational planning
  - Tactical planning
    - Short term annual planning

Planning

- Types of business planning
  - Operational planning
  - Tactical planning
  - Strategic planning
    - Long term planning
    - Three to five years

Planning

THE PLANNING PROCESS

STRATEGIC / CORPORATE / LONG RANGE PLANNING

Covers periods of longer than one year
Involves setting long term objectives of the organisation
Formulation, evaluation and selection of strategies designed to achieve the objectives
Strategies are the basis of long-term plan of action

BUDGETARY / SHORT TERM TACTICAL PLANNING

Covers period of one year
Involves preparing detailed plans for an organisation's functions
Works within framework set by strategic plans
Converts strategic plans in to actions

OPERATIONAL PLANNING

Covers very short term day-to-day activities
Concerned with how the organisation's resources will be used
Work within the framework set by the budget
Converts budgetary plans in to detailed plan of action

Planning

- Types of business planning
  - Operational planning
  - Tactical planning = **Budgeting**
  - Strategic planning

Planning

- Budgeting
  - Uses the strategic plan
  - To identify short term goals and objectives
  - To produce an annual operating plan

What is Budgeting About?



PEOPLE



PLANNING



MEASURING



CONTROLLING

People

- Budgeting and People
  - Responsibility
    - Objectives should be set at departmental level
    - Department manager is made responsible for delivery

People

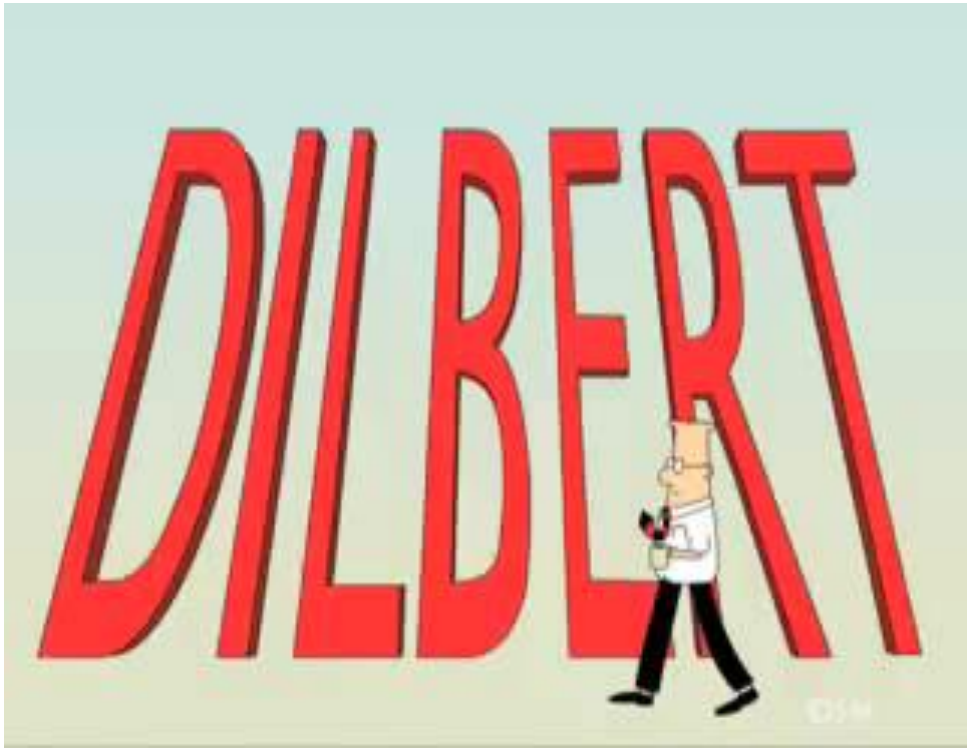
- Budgeting and People
  - Responsibility
  - Integration
    - Individual efforts focussed on common goals
    - Managers and staff “pull in the same direction”
    - Avoids managers following their ‘own agenda’

People

- Budgeting and People
  - **R**esponsibility
  - **I**ntegration
  - **M**otivation
    - Budgeting can be a good way of motivating people

People

- Motivation
  - Budgetary systems can provide good motivation
  - But it's also easy to produce negative reactions
  - Style of budgeting is a major factor
    - Top down – imposed budget
    - Bottom up – participatory budget
    - Negotiated – between budget holders and managers



Style of budgeting is a major factor

People

- Motivation
  - Budgetary systems can provide good motivation
  - But it's also easy to produce negative reactions
  - Style of budgeting is a major factor
  - Style affects attitude and can cause demotivation
  - Attitudes to setting; implementing; controlling budgets

People

- Motivation
  - Most successful budgetary control systems:
    - Set realistic and achievable budgets
    - Are prepared in consultation with the whole team
    - This approach provides the best basis for motivation

People

- Budgeting and People
  - **R**esponsibility
  - **I**ntegration
  - **M**otivation
  - **E**valuation
    - Performance of budget holders can be measured
    - Both by attitude and results

What is Budgeting About?



PEOPLE



PLANNING



MEASURING



CONTROLLING

Measuring

- Actual performance must be measured
  - Income and spending must be recorded and monitored
  - Accounted for in sufficient detail
  - Monthly and year to date report at department level
  - Other non-financial KPI's also calculated monthly

What is Budgeting About?



PEOPLE



PLANNING



MEASURING



CONTROLLING

Controlling

- One of the main purposes of budgeting
  - Actual monthly performance must be measured
  - And compared to monthly phased budget
  - Feedback reporting to budget holder is key

Controlling

- The key to good feedback reporting
  - Clear and comprehensive
  - Timely to allow prompt action to be taken
  - Accurate but without superfluous detail
  - Directed to the responsible manager with authority to act

Controlling

- One of the main purposes of budgeting
  - Actual monthly performance must be measured
  - And compared to monthly phased budget
  - Feedback reporting to budget holder is key
  - Actual results should be compared to budget
  - Variances shown for investigation
  - Appropriate action taken promptly to deal with variance

Controlling

Morgan Brown Gillespie Limited	BUDGET REPORT : JUNE 2009

	June					June year to date				
	Actual		Budget		Variance	Actual		Budget		Variance
	£000's	%	£000's	%	£000's	£000's	%	£000's	%	£000's
Sales	420	100.0	400	100.0	20	2,000	100.0	2200	100.0	(200)
Direct costs	215	51.2	200	50.0	(15)	1,050	52.5	1100	50.0	50
Gross profit	205	48.8	200	50.0	5	950	47.5	1100	50.0	(150)
Administration costs	136	32.4	130	32.5	(6)	730	36.5	700	31.8	(30)
Operating profit	69	16.4	70	17.5	(1)	220	11.0	400	18.2	(180)

Comments

Action

Controlling

- Appropriate action taken promptly
  - No action if results in line with budget
  - Remedial action if results indicate problem

What is Budgeting About?



PEOPLE



PLANNING



MEASURING



CONTROLLING

Budgeting

- Alternative approaches to budgeting
  - Incremental budgeting is traditional approach
    - Current period budget is base for next period
    - Sales and costs subject to incremental increase
    - Inappropriate for some kinds of costs
    - Inefficient form of budgeting which encourages waste

Budgeting

- Alternative approaches to budgeting
  - Incremental budgeting is traditional approach
  - Zero based budgeting

Budgeting

- Zero based budgeting
  - Each cost element specifically justified
    - In principle budgeted from zero base
    - In practice works back from current cost level
    - Every aspect of budget subject to cost benefit review
    - Encourages managers to develop questioning attitude

Budgeting

- Zero based budgeting
  - Each cost element specifically justified
  - Advantages of ZBB
    - Identifies inefficient operations and processes
    - Avoids wasteful expenditure
    - Can improve motivation

Budgeting

- Zero based budgeting
  - Each cost element specifically justified
  - Advantages of ZBB
  - Disadvantages of ZBB
    - Requires a great deal of management time
    - Depends on large amounts of paperwork

Budgeting

- Alternative approaches to budgeting
  - Incremental budgeting is traditional approach
  - Zero based budgeting
  - Activity based budgeting

Budgeting

- Activity based budgeting
  - Traditional approach
    - Assumes resources consumed evenly
    - Makes managers responsible for activities beyond their control

Budgeting

- Activity based budgeting
  - Traditional approach
  - Activity based approach
    - Identifies specific cost drivers
    - Assigns responsibility for costs on this basis
    - Allows activity related increases in budgeted
    - Allows more efficient allocation of resources

Criticisms of Budgeting

Is Budgeting the Corporate Curse?

In a recent survey by the CBI senior executives reported that up to 30% of their time was spent in preparing for and carrying out the budget process

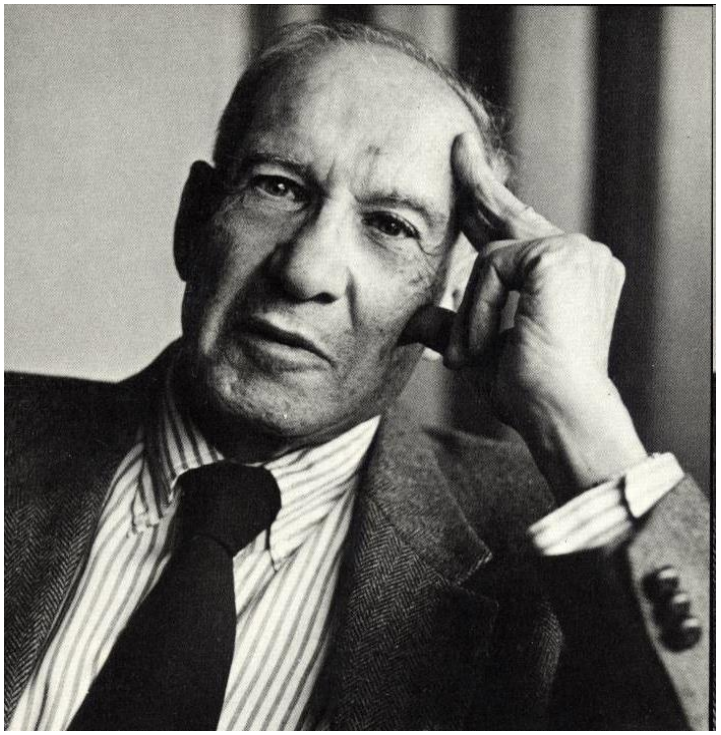
Criticisms of Budgeting



Lord Browne : ex-CEO of BP

"The process of management is not about administering fixed budgets, it is about the dynamic allocation of resources'

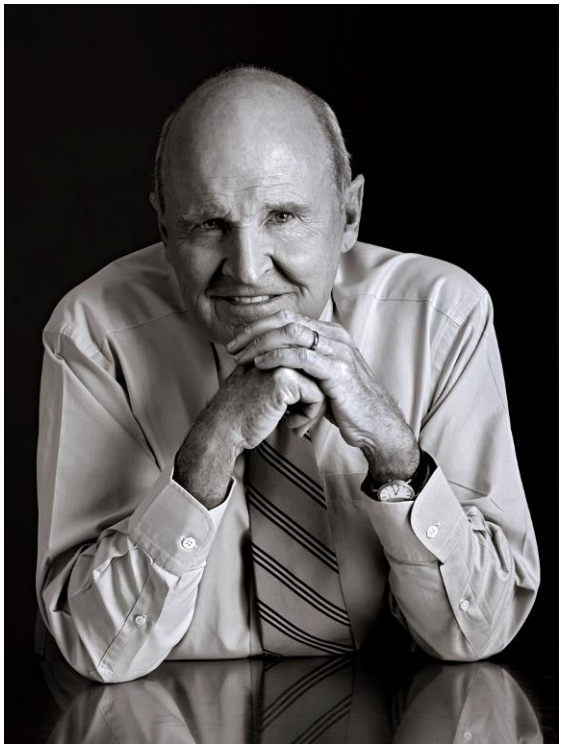
Criticisms of Budgeting



Peter Drucker

"Uncertainty…has become so great as to render futile, if not counterproductive, the kind of planning most companies still practice; forecasting based on probabilities'

Criticisms of Budgeting



Jack Welch : ex-CEO of General Electric

"Budgeting is the bane of corporate America"

Criticisms of Budgeting

- Time consuming and expensive
- Encourages short term thinking
- Discourages risk taking
- Focus on sales rather than customer satisfaction
- Budgets divorced from long term strategy

Budgeting

- To Summarise
  - The budget is part of the strategic planning process
  - Organisation gains from the budget process itself
  - Used correctly they can be a good management tool
  - The most successful budgetary control systems
    - Set realistic and achievable budgets
    - Are prepared in consultation with the whole team
    - Provide the best basis for motivation

Types of budgets and budgeting

Management

Planning is the cornerstone of effective management



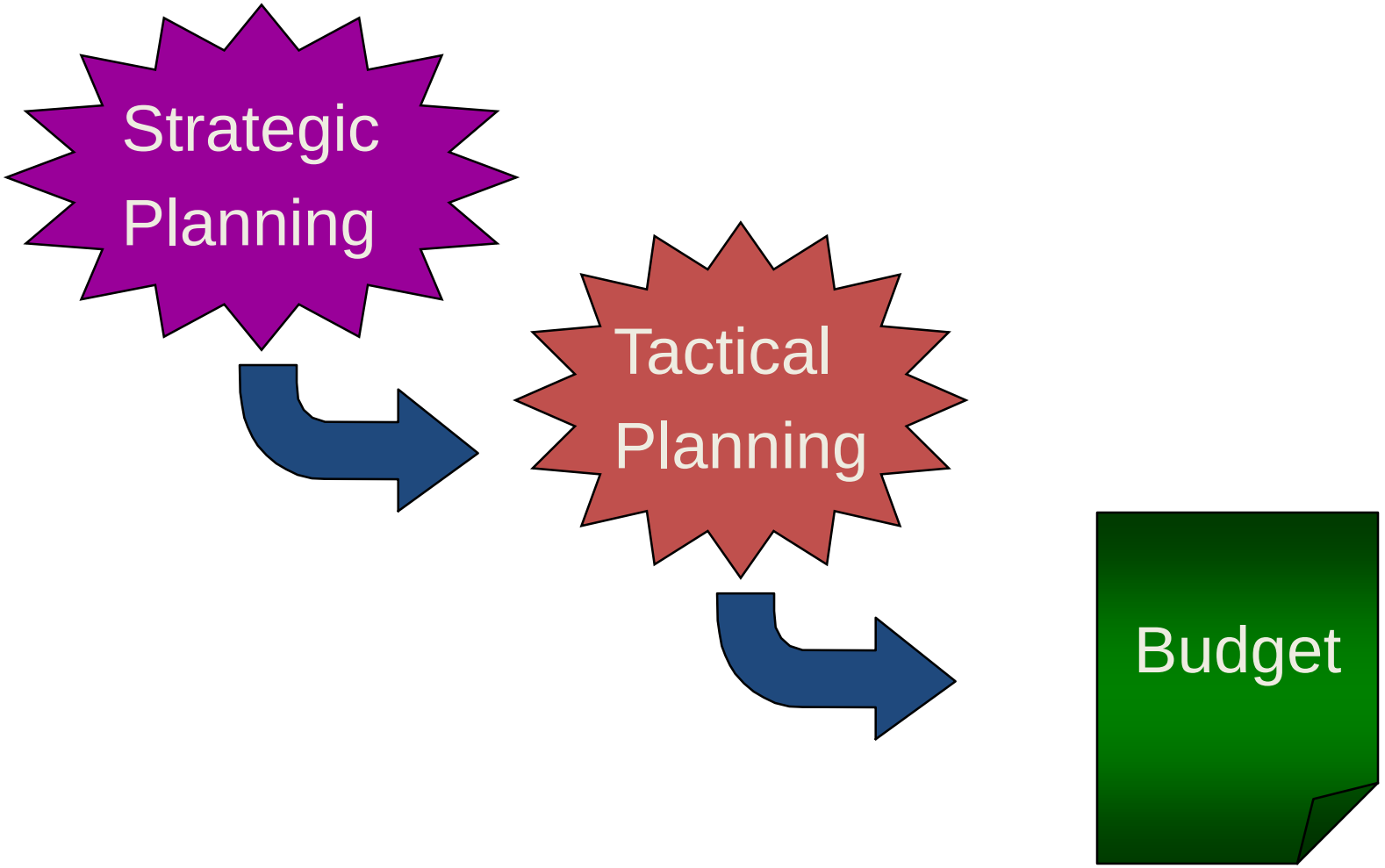
Terms

- Budgeting - Formalizes plans and translates qualitative narratives into a documented, quantitative format
- Budget - Expresses a commitment to planned activities and resource acquisition and use

Budgets

- Communicate objectives, constraints, and expectations
- Provide financial predictions
- Identify potential problems
- Determine resource allocation and constraints
- Permit control through budget-to-actual comparisons

The Planning Process



Strategic Planning

- Long-term (5 to 10 years)
- Top-level management
- Long-range goals, strategies, and policies
- Foundation for short-term planning
- Identify and gather information on key variables, both internal and external

External Key Variables

- Competitor actions
- U.S. market conditions
- U.S. political/regulatory climate
- Emerging technology issues
- Consumer trends and attitudes
- International market conditions
- Demographics
- International political/regulatory climate

Tactical Plans

- Short-term (1 to 18 months)
- Top and mid-management
- Specific objectives and means to achieve strategic plans
- Basis against which results can be measured

Budgeting

- Short-term
- Top, mid, and operational management
- Usable guidelines to implement strategic and tactical plans
- Allocates resources
- Standard against which performance can be measured

The Control Phase

- Actual-to-budget comparisons
- Determining and investigating variances
- Corrective action
- Feedback to operating managers



The Balanced Scorecard

- Financial performance
- Customer satisfaction
- Innovation and learning
- Key performance indicators

- Measures
  - Short-term performance
  - Indicators of future success

The Master Budget

Operating Budget

- Sales Budget
- Production Budget
- Purchases Budget
- Direct Labor Budget
- Overhead Budget
- Selling & Administrative Budget

Financial Budget

- Cash Budget
- Capital Expenditures Budget
- Balance Sheet
- Income Statement
- Statement of Cash Flows
- Statement of Retained Earnings

The Operating Budget

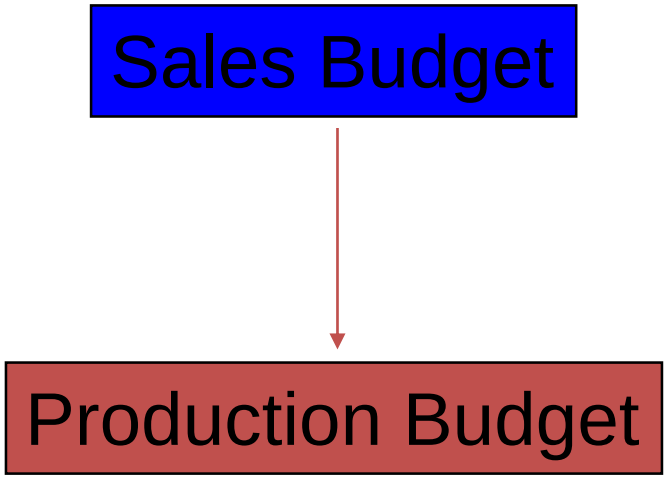
Sales Budget

Sales Forecast

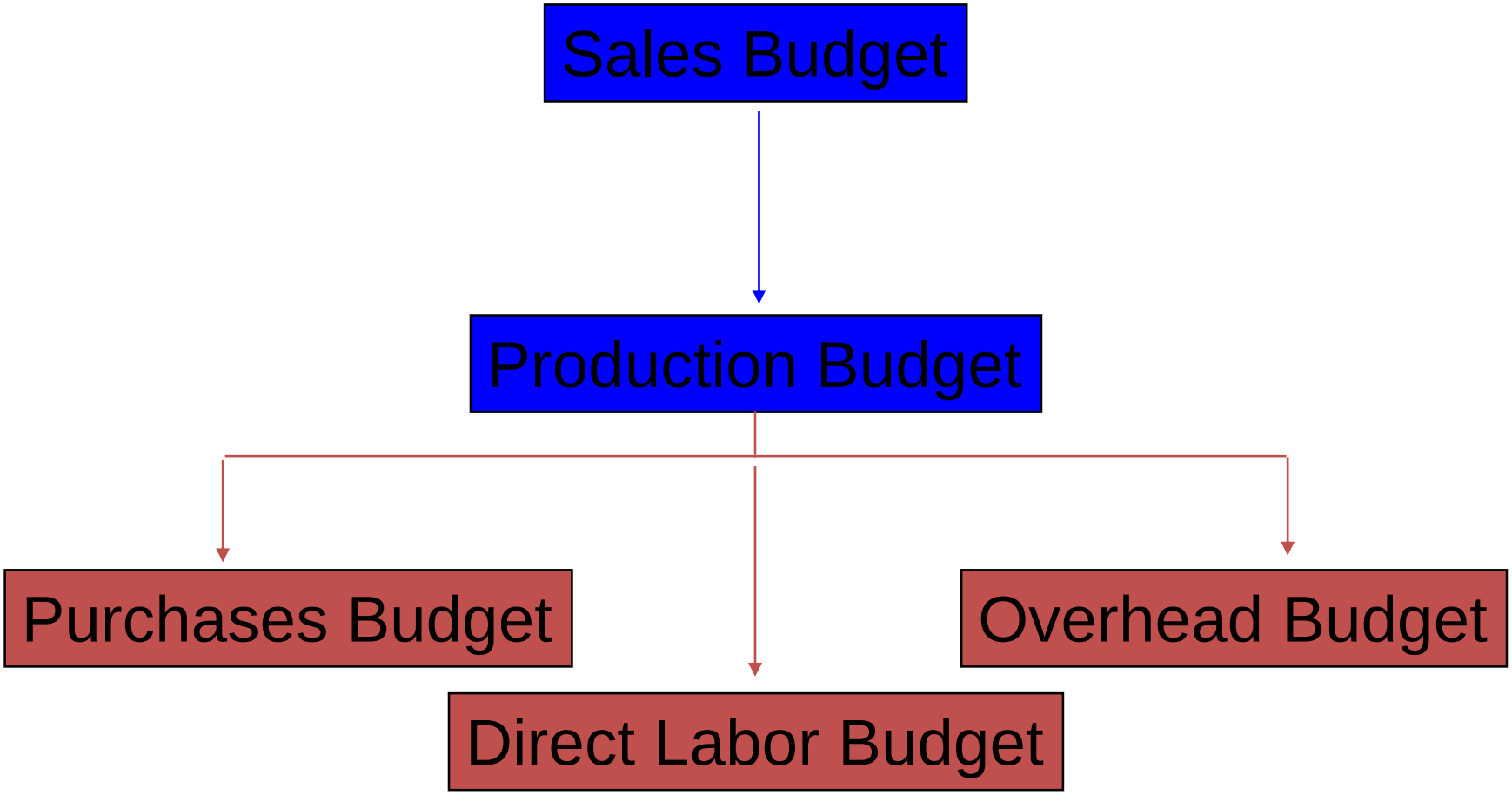
- Ask sales personnel
- Extrapolate past trends
- Use market research
- Employ statistical models and simulation



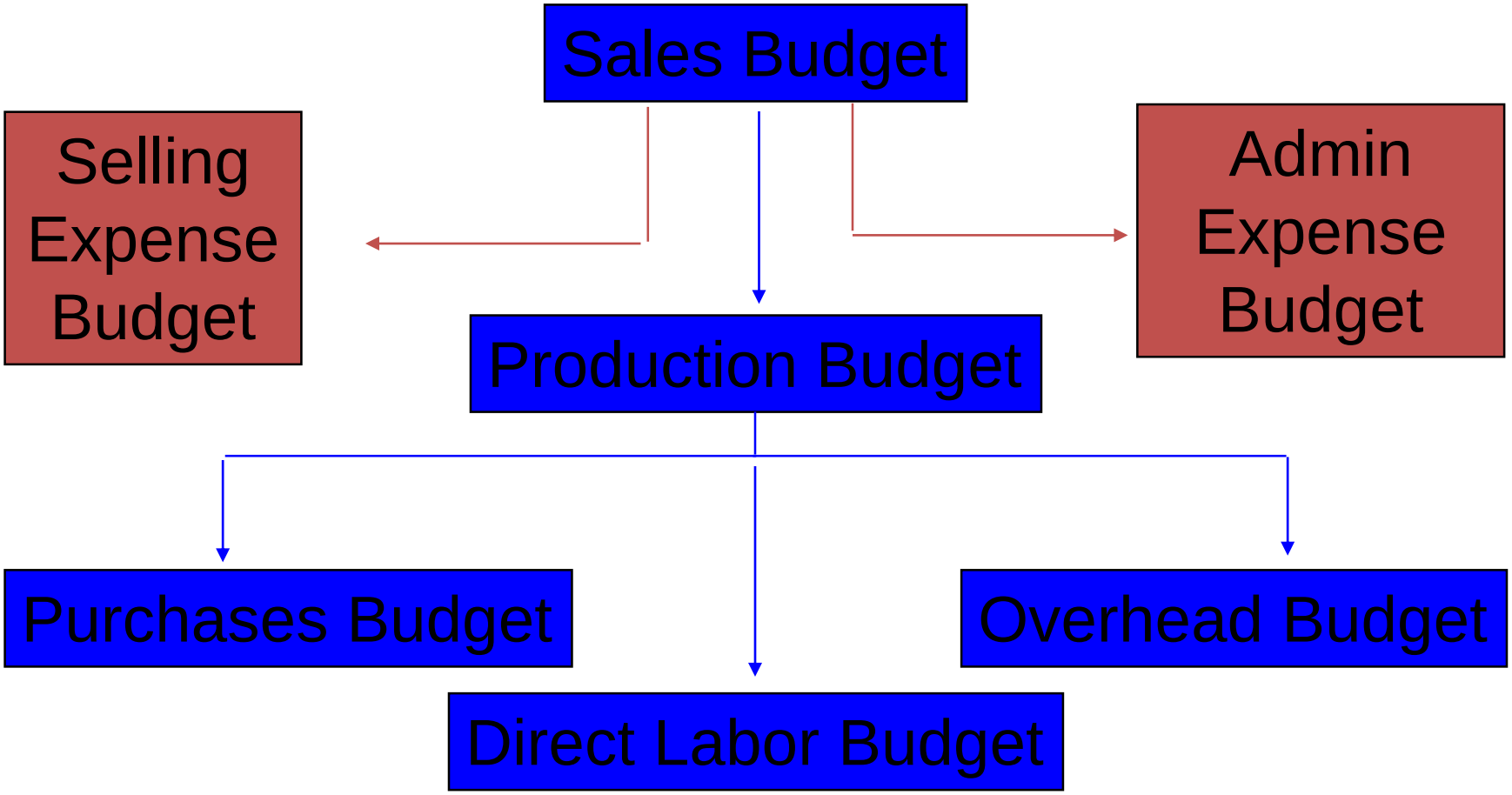
The Operating Budget



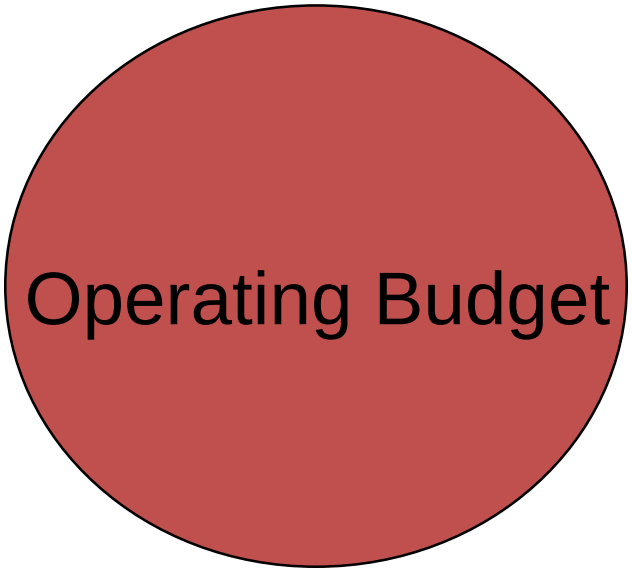
The Operating Budget



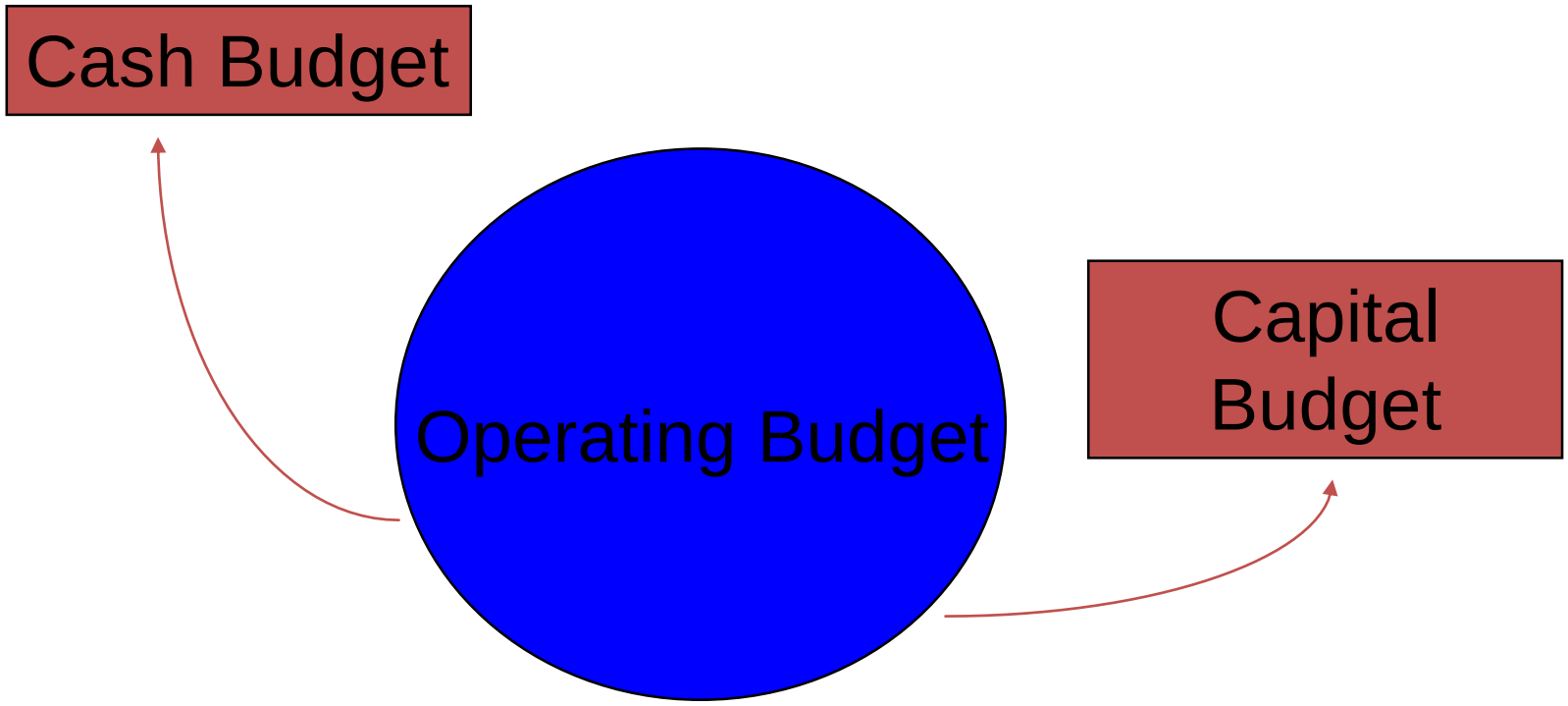
The Operating Budget



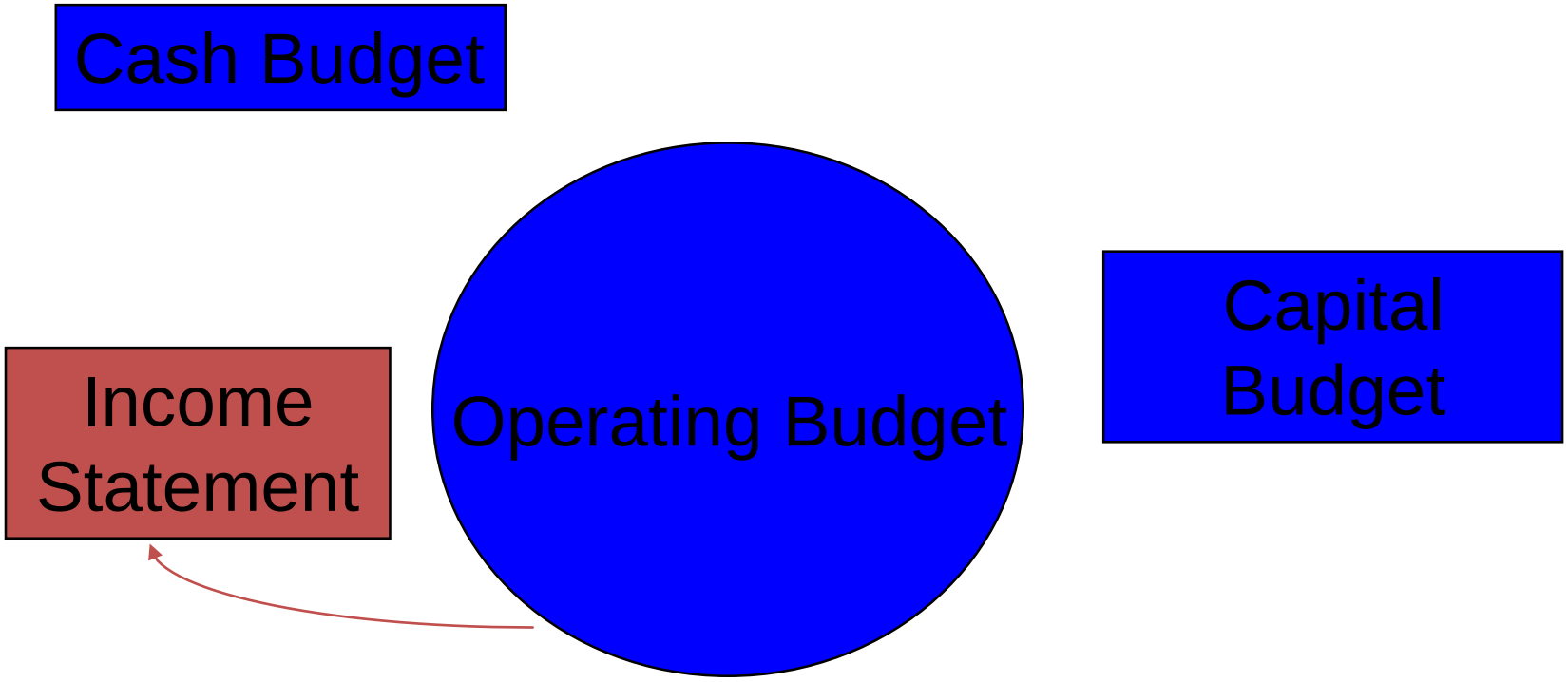
The Financial Budget



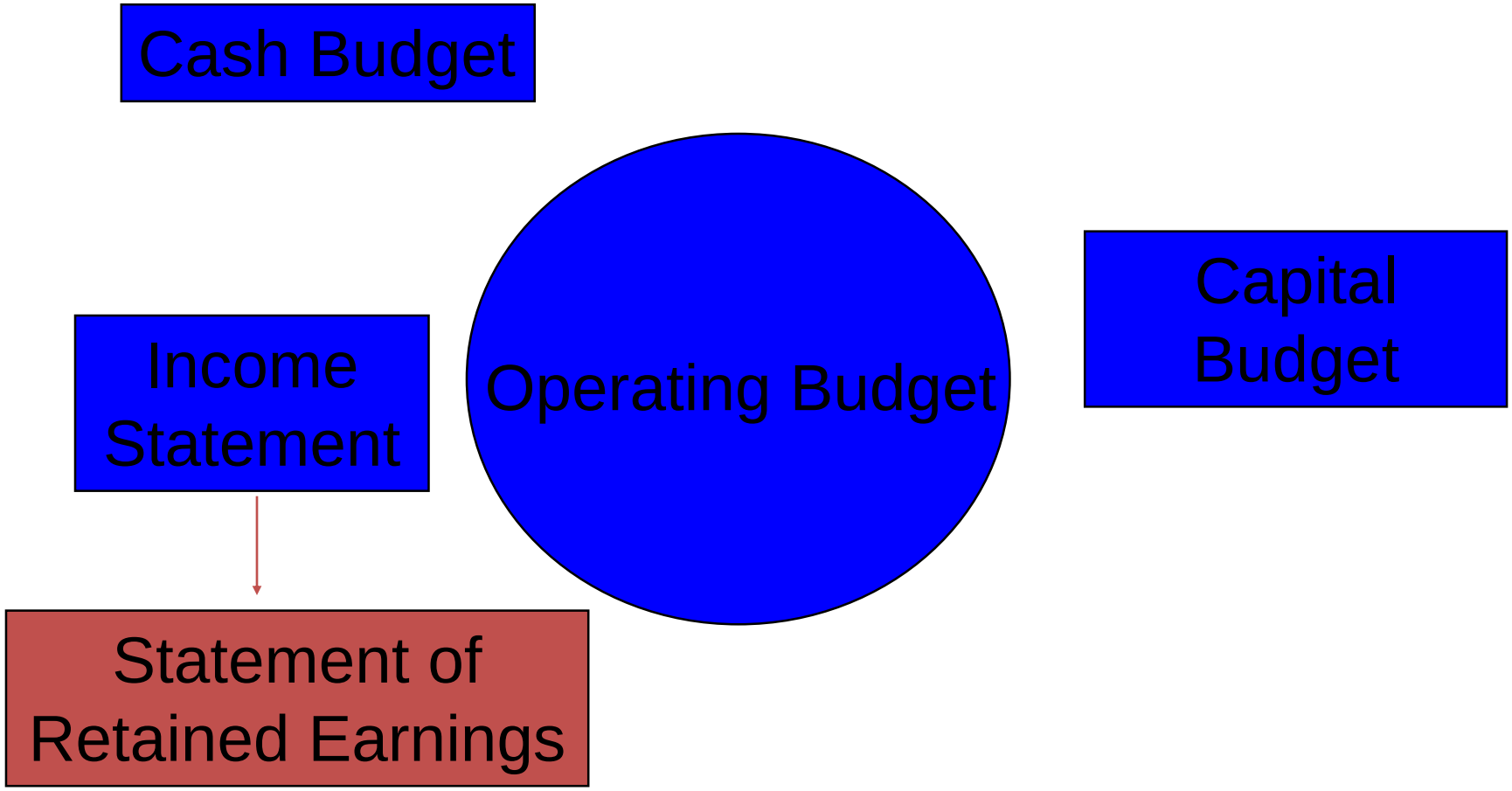
The Financial Budget



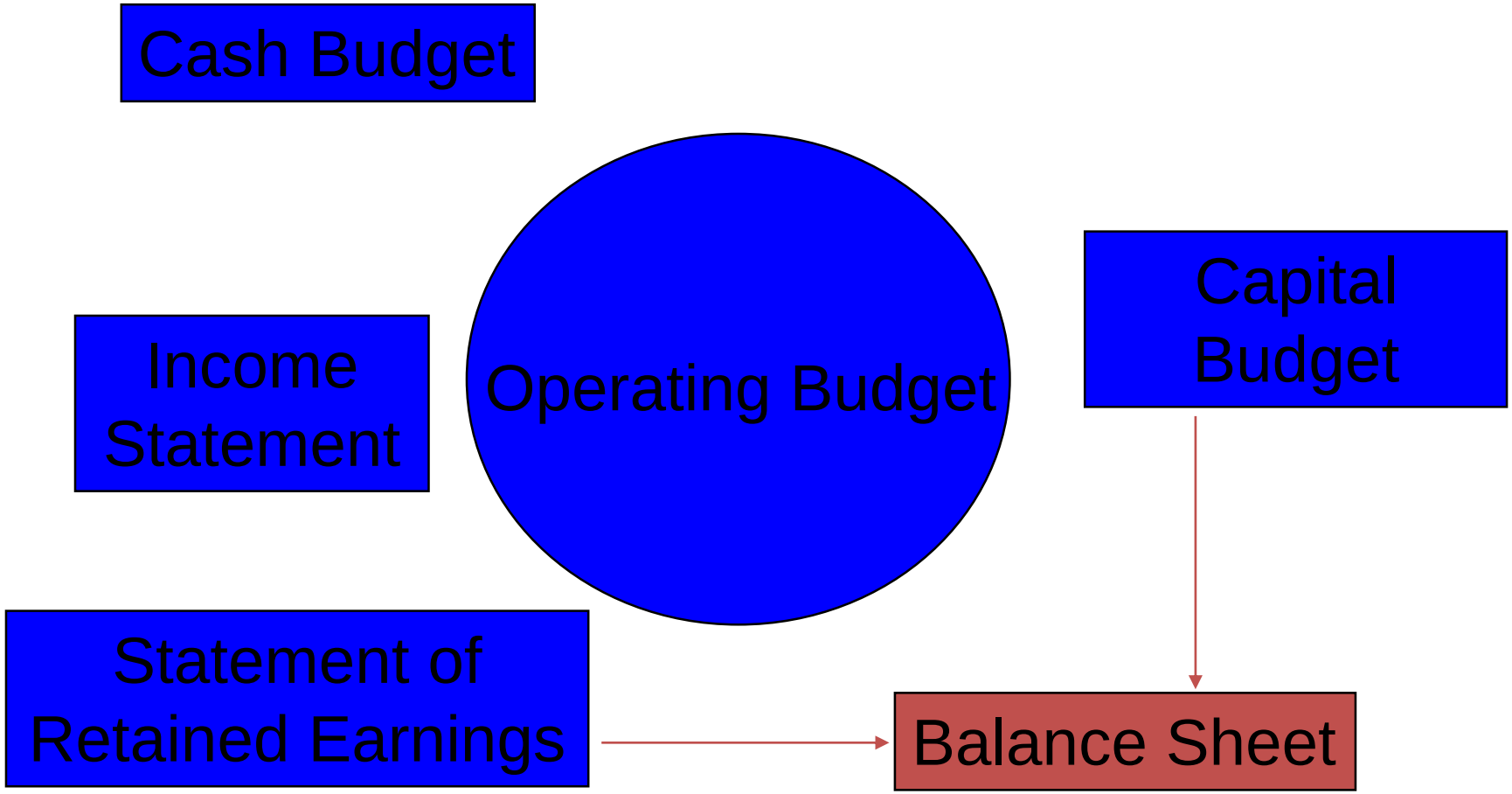
The Financial Budget



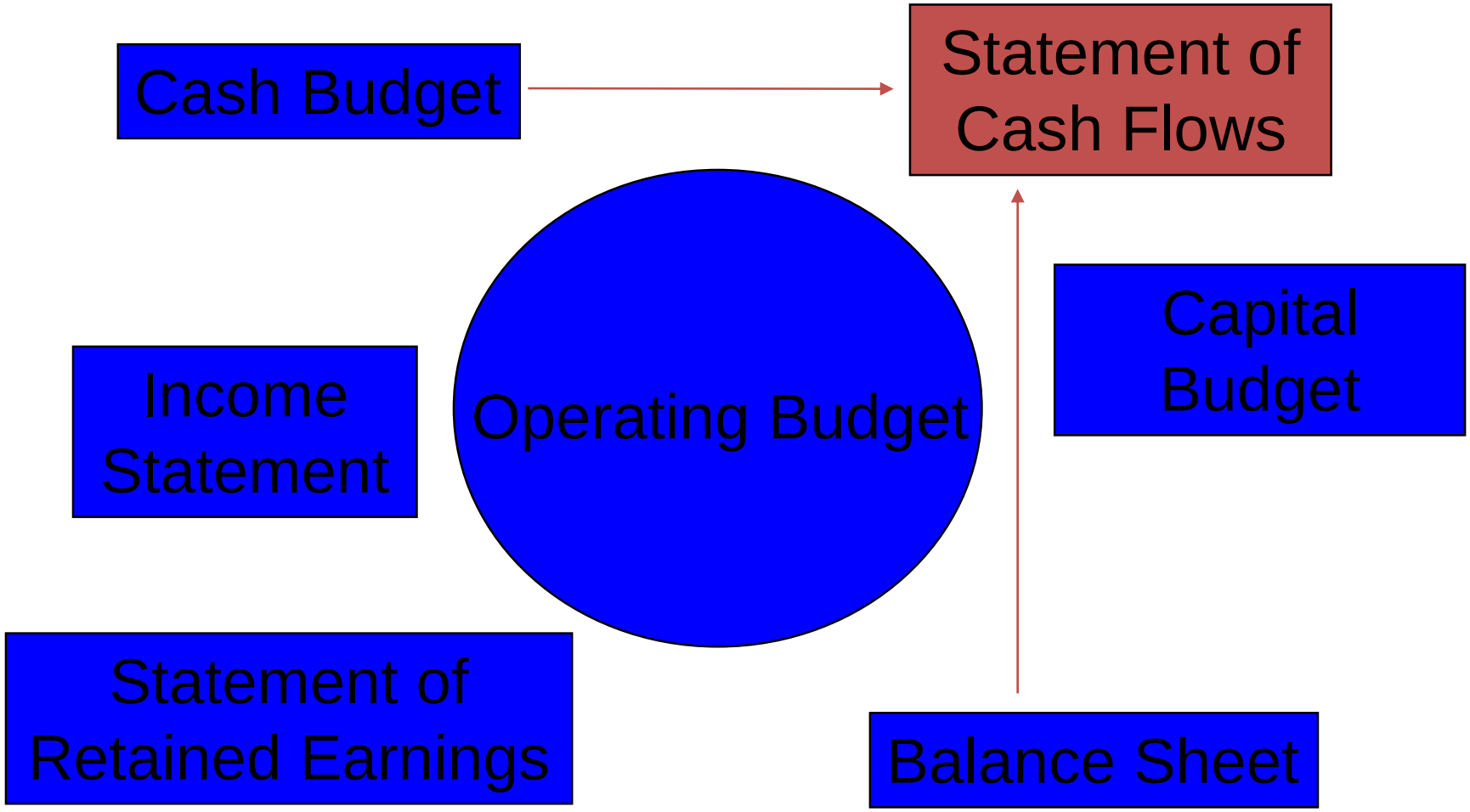
The Financial Budget



The Financial Budget



The Financial Budget



Budgets Provide

- Guide to align activities and resources with organizational goals
- Vehicle to promote employee participation, cooperation, and departmental coordination
- Tool to enhance planning, controlling, problem solving, and evaluating



Budgeting Provides

- Basis to sharpen responsiveness to internal and external factors
- Model to view future performance and consider alternative measures



Budgeting Terms

- Continuous budgeting
  - 12-month rolling budget



Budgeting Terms

- Continuous budgeting
- Budget slack
  - intentional underestimation of revenue
  - intentional overestimation of expenses
  - overcome by linking actual performance to budget through a bonus system

Budgeting Terms

- Continuous budgeting
- Budget slack
- Participatory budget
  - developed by top management and operating personnel

Budgeting Terms

- Continuous budgeting
- Budget slack
- Participatory budget
- Imposed budgets
  - developed by top management
  - imposed on operating personnel

Activity Budget

- Map line items in budget to list of activities
- Raise awareness of non-value-added activities
- Question and reduce non-value-added costs

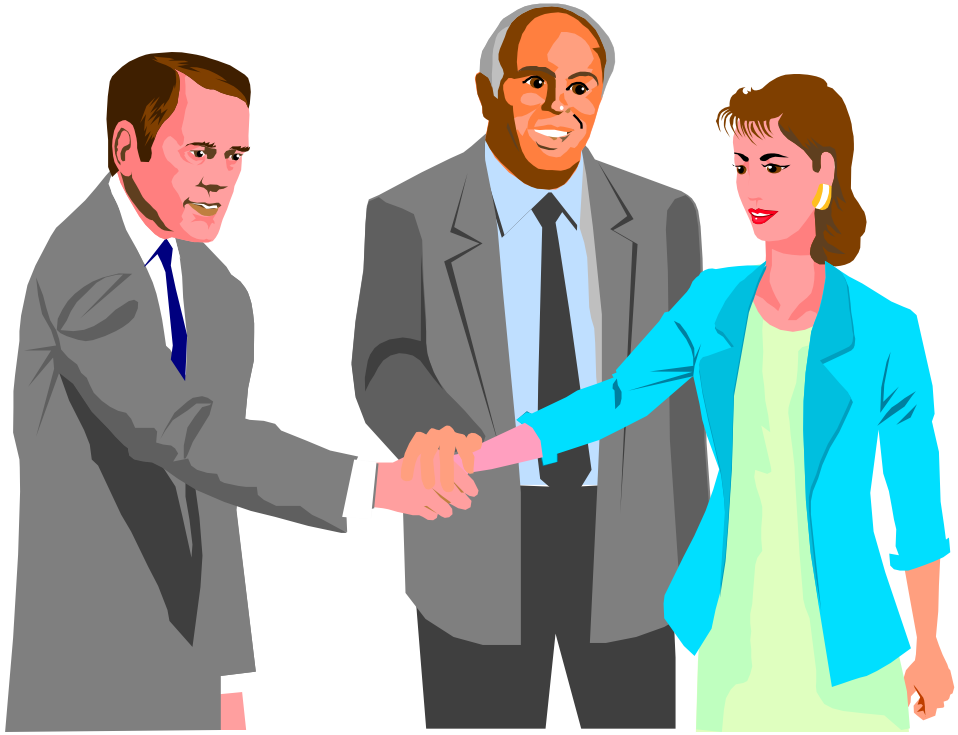


Budget Manual

- Statements of budgetary purpose and its desired results
- Listing of specific budgetary activities to be performed
- Calendar of scheduled budgetary activities
- Sample of budgetary forms
- Original, revised, and approved budgets

Creating Key Performance Indicators for financial and non-financial performance

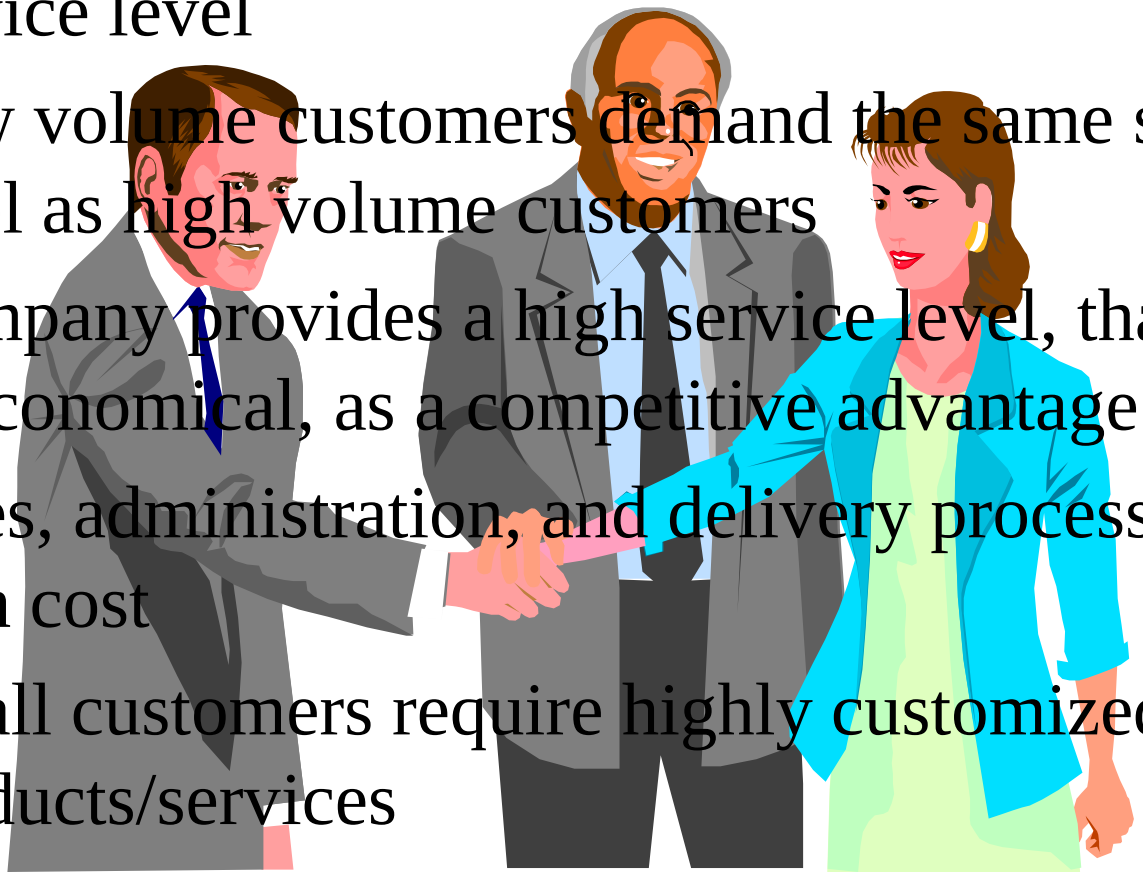
Customer Focus



To achieve profitability, it is essential to attract and satisfy customers

Common Causes of Unprofitable Customers

- Large customers demand low prices and high service level
- Low volume customers demand the same service level as high volume customers
- Company provides a high service level, that is uneconomical, as a competitive advantage
- Sales, administration, and delivery processes are high cost
- Small customers require highly customized products/services
- High customer turnover

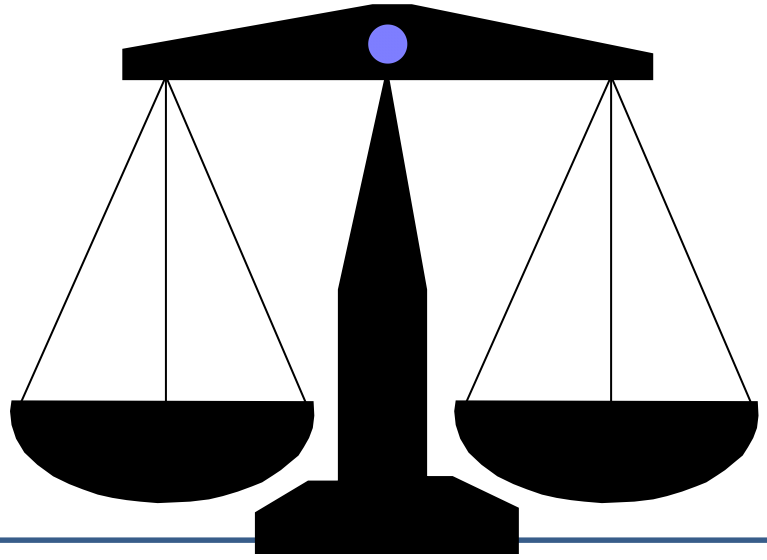


Use Performance Measures to

- Judge organizational performance
- Relate missions and goals to managerial performance
- Foster growth of subordinate managers
- Stimulate managerial motivation
- Enhance organizational communication
- Make judgments about promotion
- Implement organizational control

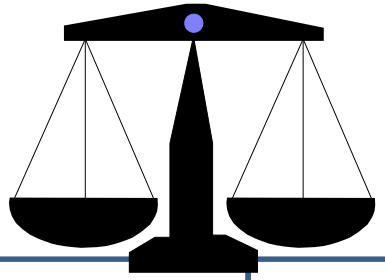
Types of Performance Measurements

- Capital market performance
- Organizational learning and change
- Products/subunit performance



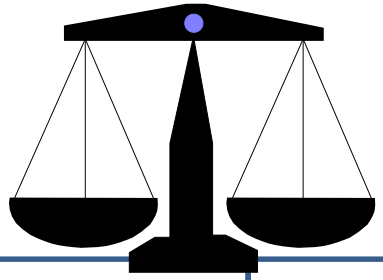
Capital Market Performance

- Effective and efficient use of capital resources
- Financial accounting (GAAP)
- Comparability across firms
- Risk/return evaluation
- Maximize return on stockholders' investment
- Ability to generate profits



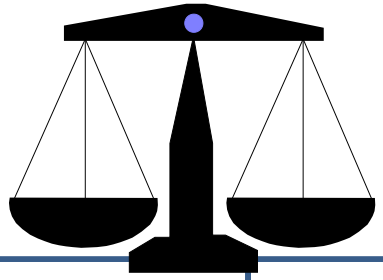
Organizational Learning and Change

- Assess performance in serving customers
- Provide customers with more value at less cost
- Embrace a culture of change and organizational evolution
- Foster cooperation across the organization



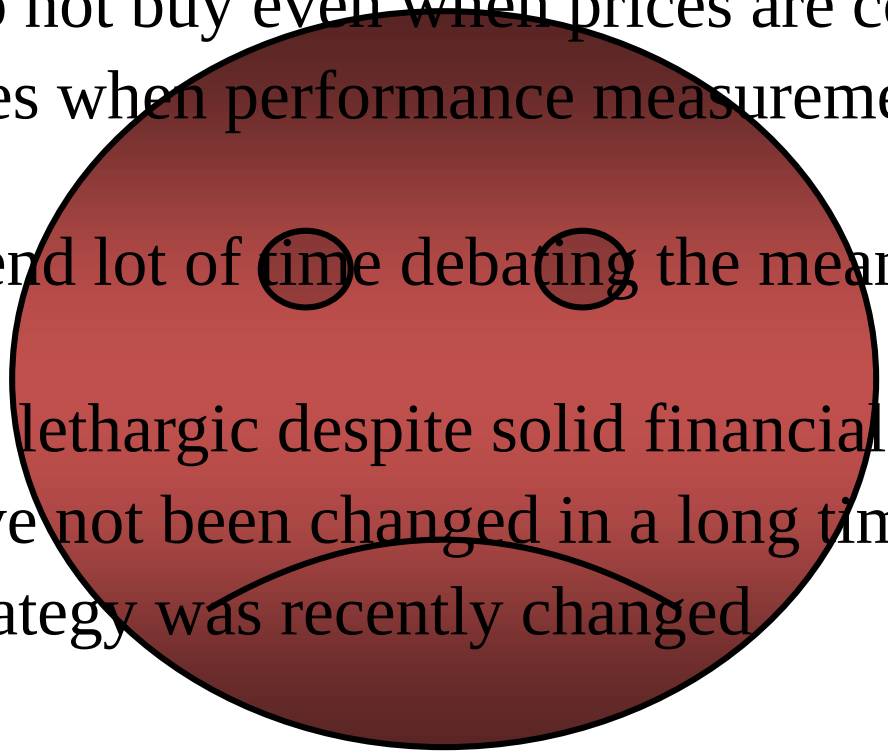
Product/Subunit Performance

- Measure competitiveness of
  - price
  - quality
  - functionality (product features)
- Measure how each subunit makes specific contributions to the business



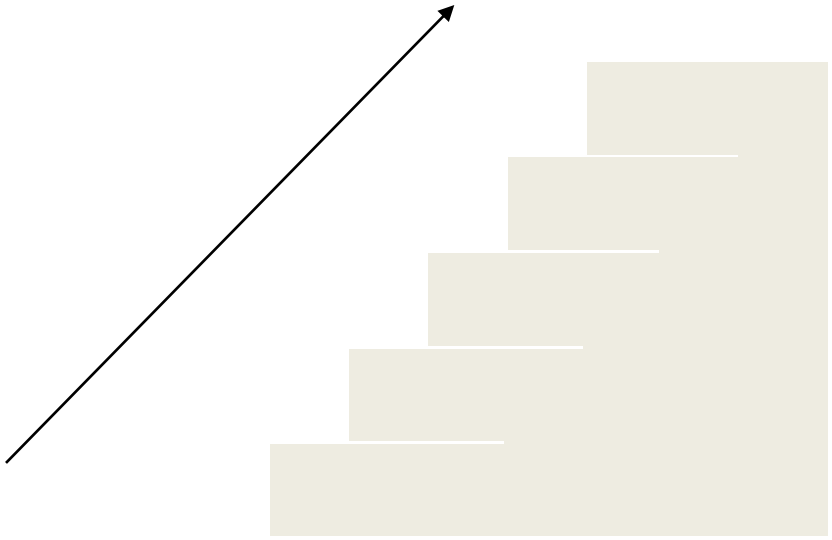
Signs of Problems with Performance Measures

- Performance is acceptable except for profit
- Customers do not buy even when prices are competitive
- No one notices when performance measurement reports are not produced
- Managers spend lot of time debating the meaning of the measures
- Share price is lethargic despite solid financial performance
- Measures have not been changed in a long time
- Corporate strategy was recently changed



Designing a Performance Measurement System

- Select Performance Measures
  - Assess progress toward goals and objectives



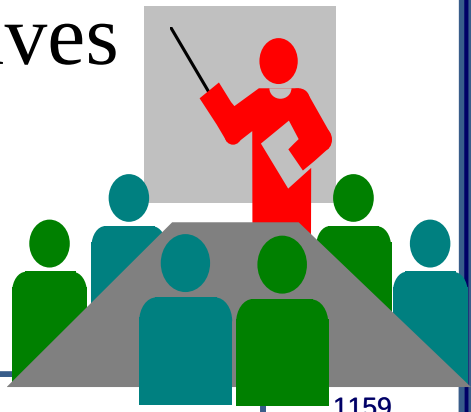
Designing a Performance Measurement System

- Select Performance Measures
  - Assess progress toward goals and objectives
  - Participant is aware of and participates in developing measures



Designing a Performance Measurement System

- Select Performance Measures
  - Assess progress toward goals and objectives
  - Awareness of and participation in developing measures
  - Available skills, equipment, information, and authority to achieve goals and objectives



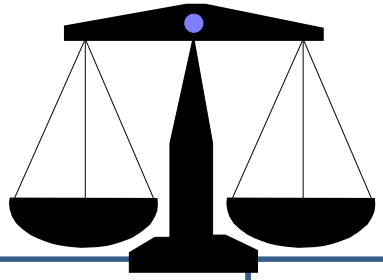
Designing a Performance Measurement System

- Select Performance Measures
  - Assess progress toward goals and objectives
  - Awareness of and participation in developing measures
  - Available skills, equipment, information, and authority to achieve goals and objectives
  - Timely and useful feedback

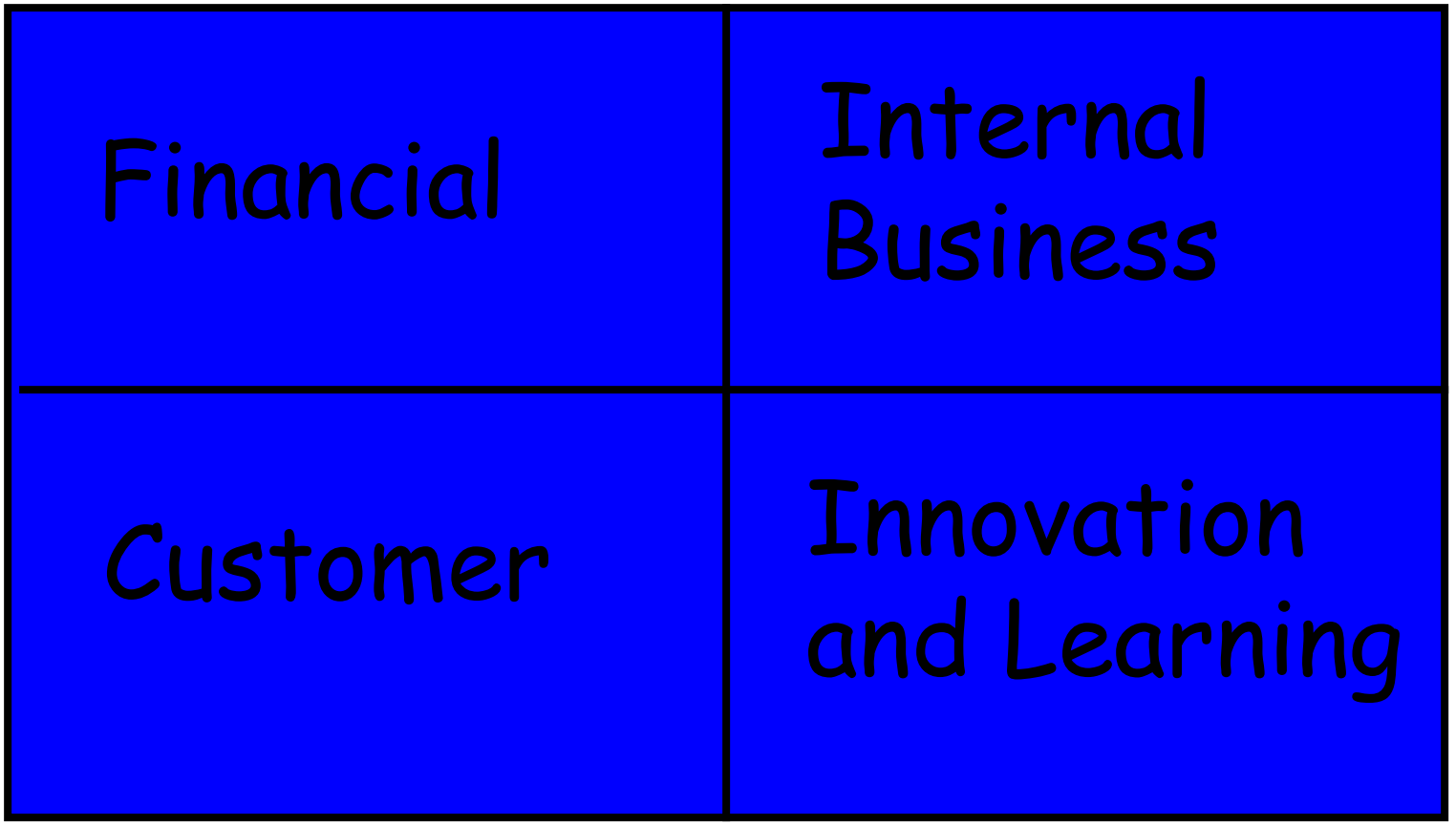


Multiple Performance Measures

- Financial performance measures
- Customer satisfaction
- Zero defects
- Minimal lead time to market
- Social responsibility for environment



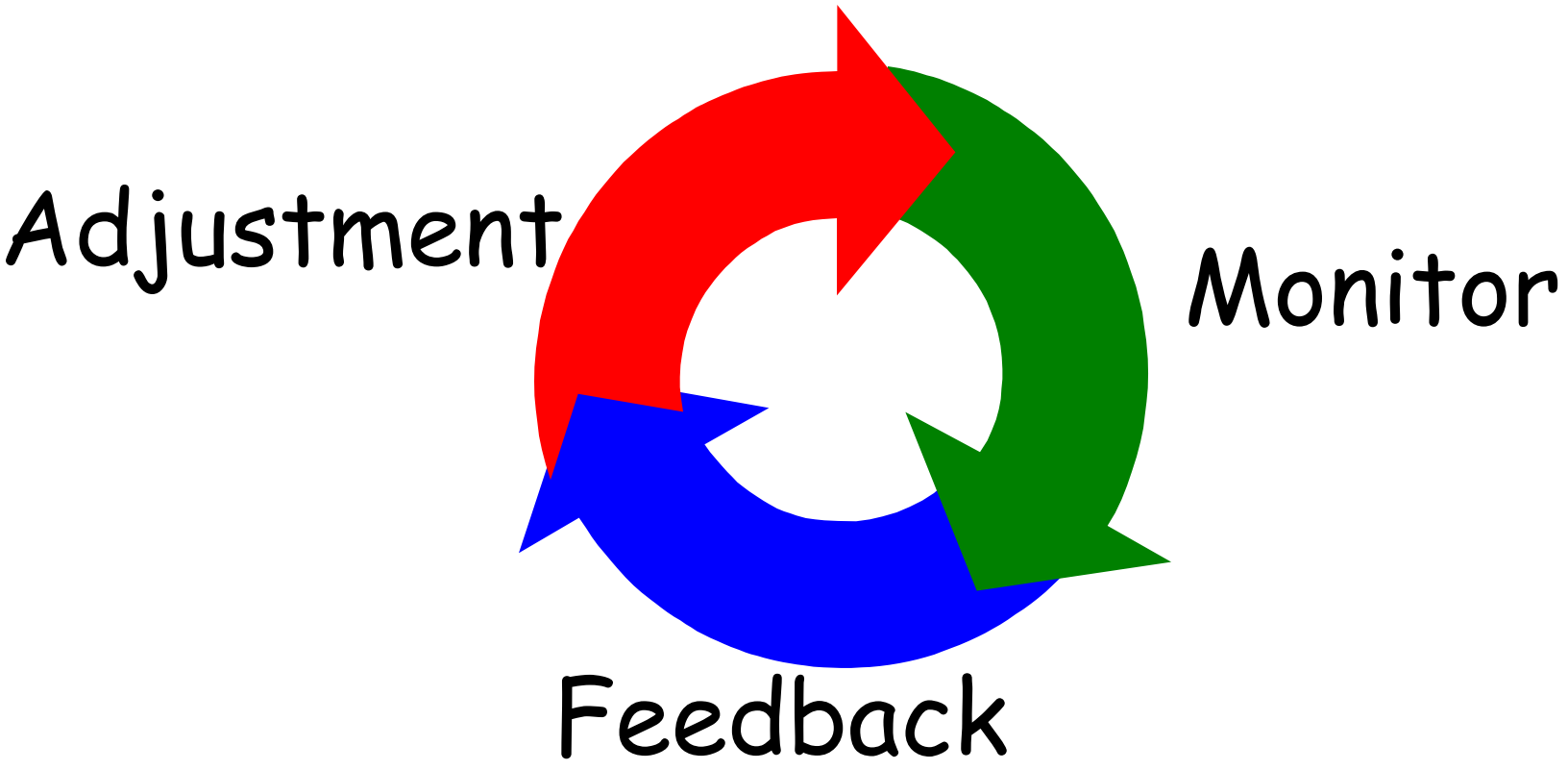
Balanced Scorecard



Awareness and Participation in Performance Measures

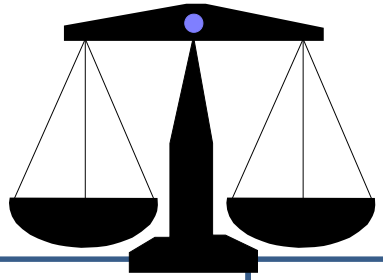
- Communicate standards to those being measured
  - Workers act specifically in accordance with how they are to be measured
- Participation in setting standards forms a "social contract"
  - Workers understand and accept the standards

Monitoring Performance



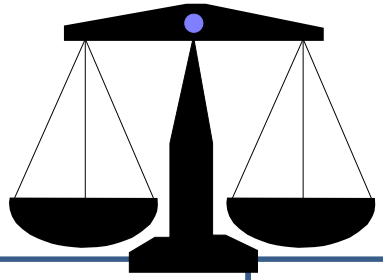
Short-Term Financial Performance Measures

- Divisional profits
- Achievement of budget objectives
- Variances from budget or standard
- Cash flow



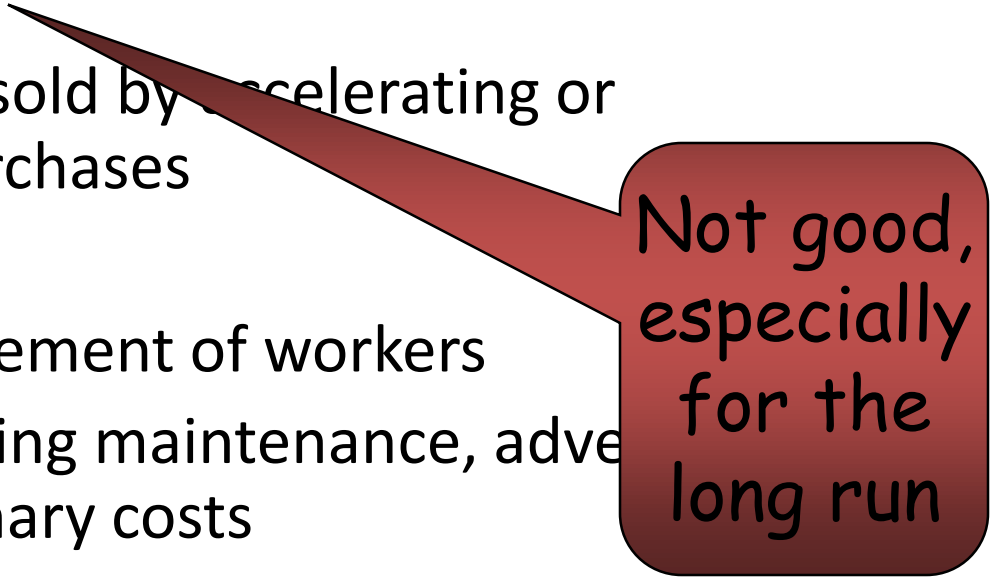
Performance Measures

- Cost Center
  - Variances from budgeted costs
- Revenue Center
  - Compare budget to actual revenue
- Profit Center
  - Segment profit margin
  - Cost and revenue variances
- Investment Center
  - Divisional performance
  - Cost and revenue variances



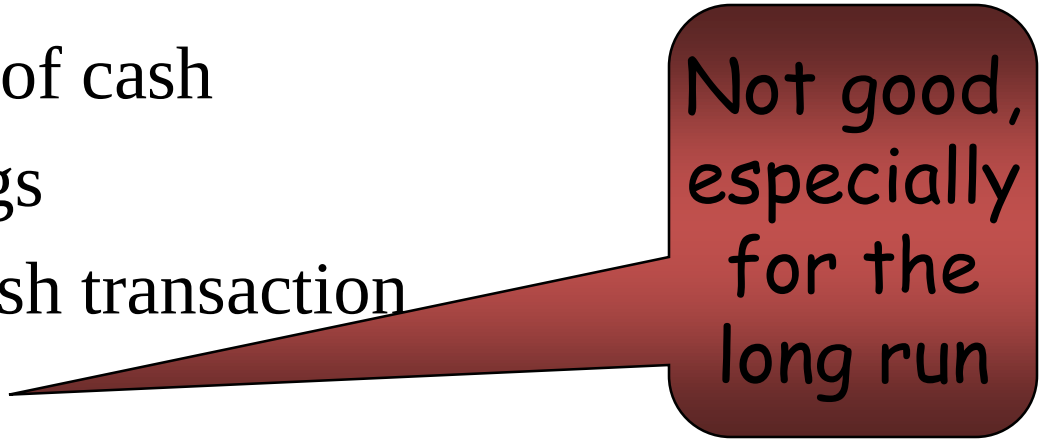
Manipulating Segment Margin

- Manage cost of goods sold by accelerating or deferring inventory purchases
- Minimize expenses by
  - deferring the replacement of workers
  - delaying or eliminating maintenance, adve and other discretionary costs
  - changing depreciation methods
- Reduce overhead per unit by increasing production
- Manage revenue by shifting sales between periods



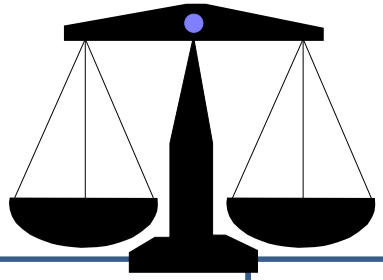
Manipulating Cash Flows

- Statement of Cash Flows shows
  - sources and uses of cash
  - quality of earnings
  - significant noncash transaction
- Manipulate by
  - deferring purchases, expenses
  - misassigning collections



Investment Center Performance Measures

- Return on Investment (ROI)
- Residual Income (RI)
- Economic Value Added (EVA)



Return on Investment

$$\text{Return on Investment} = \frac{\text{Income}}{\text{Assets Invested}}$$

- Income
  - Segment or operating
  - Before tax or after tax
- Assets
  - Total assets utilized, total assets available or net assets
  - Plant assets at original cost, book value, current value
  - Beginning, ending, or average assets

Return on Investment

Dupont Formula

$$\text{Return on Investment} = \frac{\text{Income}}{\text{Sales}} * \frac{\text{Sales}}{\text{Assets Invested}}$$

Profit Margin

Asset Turnover

Increase ROI

- Raise sales price (if it doesn't impact demand)
- Decrease expenses
- Decrease dollars invested in assets

Residual Income

- Top management establishes a minimum rate of return

  12%

- Multiply the asset base ($100,000) by the minimum rate of return

  $100,000 * 12% = $12,000 (required return)

- Residual income is income ($30,000) minus the required return

  $30,000 - $12,000 = $18,000 (residual income)

Residual Income

- In dollars, not a percentage
- Obtain new assets as long as they provide a positive residual income



Economic Value Added (EVA)

After-Tax Profits - (Capital Invested * Cost of Capital %)

- Measure of profit above the cost of capital
- Capital is market value of total equity and interest-bearing debt
  - EVA provides a better measure than ROI if market value is much greater than book value
- Short-term measure; may discourage investment in long-term projects
  - Invested capital increases before profits

ROI, RI, EVA Limitations

- Income
  - Income can be manipulated on short-run basis
  - To compare, all segments must use the same accounting methods
  - Income is based on accrual accounting; cash flows and time value of money are not considered

ROI, RI, EVA Limitations

- Asset Investment Base
  - Assets may be understated (e.g., R&D)
  - Current management may be judged on decisions of previous managers
  - Assets not restated for changing (rising) price levels (older assets will report higher ROI)
- ROI, RI, EVA do not measure performance relative to company-wide objectives; can lead to suboptimization of resources

Vision and Mission Statements

- Vision Statement
  - A conceptual view of the organization's future that is better than its present
- Mission Statement
  - Expresses the organization's purposes
  - Identifies how the organization will meets its customers' needs through products or services

Values Statement

- Reflects the organization's culture
- Identifies fundamental beliefs about what is important to the organization

Objective	Subjective
• profitability	• ethical behavior
• market share	• respect for others

Vision, Mission, Values Statements

Underlies organizational goals and objectives

Without short-run success,
there will be no long-run success

Without long-run planning,
short-run success will probably fade rapidly

Objectives

Short-run

- Predominantly financial
- Effective and efficient management of operating, financing, and investing activities
- Customer satisfaction issues - quality, delivery, service

Long-term

- Financial and nonfinancial
- Resource investments
- Competitive position - quality, speed of delivery, reputation of products/services

Nonfinancial Measures

Use nonfinancial measures IF:

- They can be articulated and defined
- They are relevant
- Responsibility can be assigned
- Data about measures can be gathered
- Targets about measures can be set
- Benchmarks can be established

Nonfinancial Measures

- Operational measures
  - Administrators, customer service, human resources
- Customer measures
  - Product development, order processing, inventory
- Soft measures
  - frequency of shortages, late shipments, delivery errors
- Employee measures
  - staff turnover, staff morale

Nonfinancial Performance Measures

- Measure directly performance that creates shareholder wealth
- Predict future cash flows
- Relevant to nonmanagement employees
- More timely
- Highlight problems
- Less likely to result in suboptimization

Nonfinancial Performance Measures

- Focus on
  - long term
  - processes
  - outputs
  - teamwork
- Cross-functional
- Benchmarked externally
- Tied to reward system

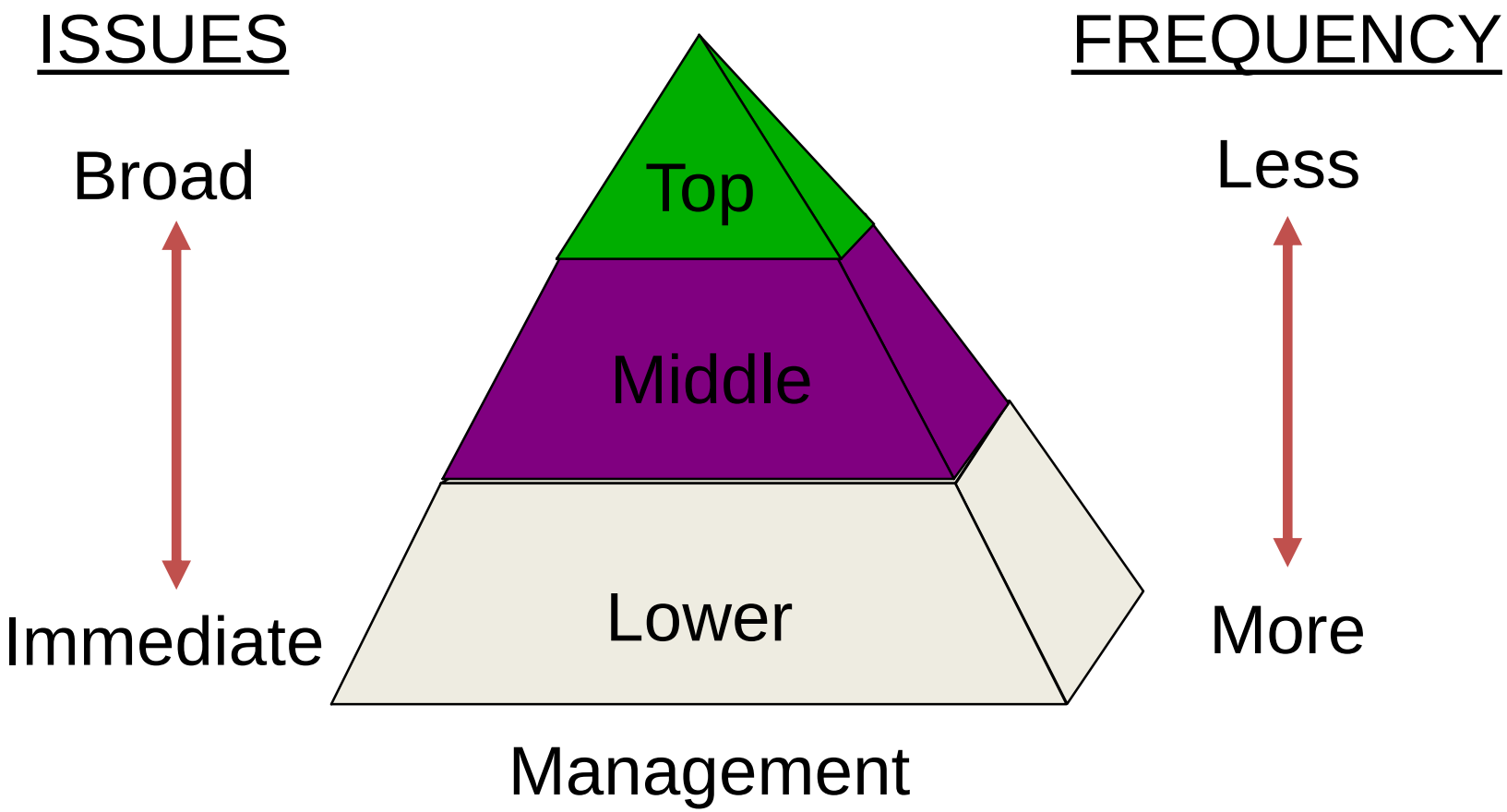
Selecting Nonfinancial Performance Measures

- Identify critical success factors
  - direct causes of achievement of organizational goals and objectives
- Choose some short-run and long-run attribute measures of critical success factors
- Use qualitative and quantitative measures
- Limit the number of measures

Comparison Bases

- Establish benchmark
- Assign specific responsibility
- Monitor and report at appropriate intervals

Performance Evaluation System



Throughput
Nonfinancial Performance Measure

- Number of good units or quantity of services that are produced and sold within a specified time
- Increase throughput in time and in quality
  - decrease non-value-added activities
  - use flexible manufacturing systems
  - use computer technology (bar code, CIM, EDI)

Throughput Formula

Manufacturing Cycle Efficiency

$$\frac{\text{Value-Added Processing Time}}{\text{Total Time}}$$

X

Process Productivity

$$\frac{\text{Total Units}}{\text{Value-Added Processing Time}}$$

X

Process Quality Yield

$$\frac{\text{Good Units}}{\text{Total Units}}$$

Throughput Formula

$$\frac{\text{Good Units}}{\text{Total Time}}$$

Manufacturing Cycle Efficiency X Process Productivity X Process Quality Yield

$$\frac{\text{Value-Added Processing Time}}{\text{Total Time}}$$

$$\frac{\text{Total Units}}{\text{Value-Added Processing Time}}$$

$$\frac{\text{Good Units}}{\text{Total Units}}$$

Activity-Based Management

- Increase throughput by reducing non-value-added activities
- Minimize nonquality work
- Performance Measures
  - Activities that create customer value
  - Quality and Service

Activity-Based Management

Quality

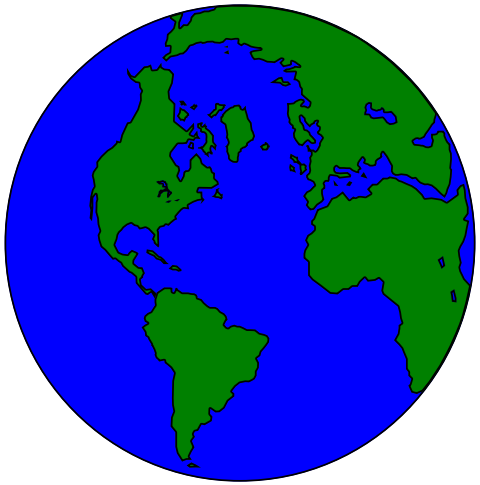
- Measure cost of quality
- Adjust
  - products design
  - training
  - asset acquisition and utilization
  - interaction with suppliers and customers

Service

- Measure lead time
- Adjust
  - parts (fewer, interchangeable, few/no engineering changes)
  - building layout

Multinational Performance Measures

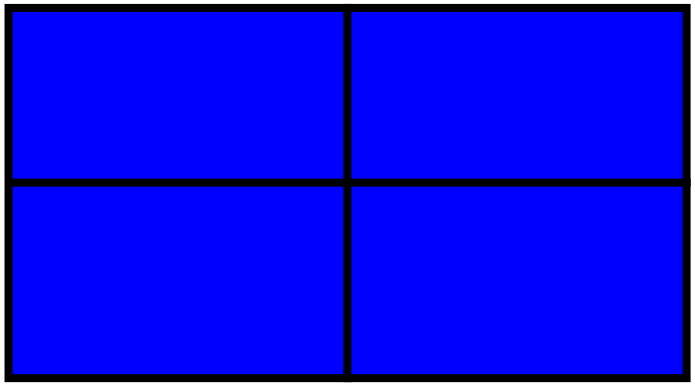
- Adjust measures to reflect different environments
  - economic
  - legal
  - political
  - tax



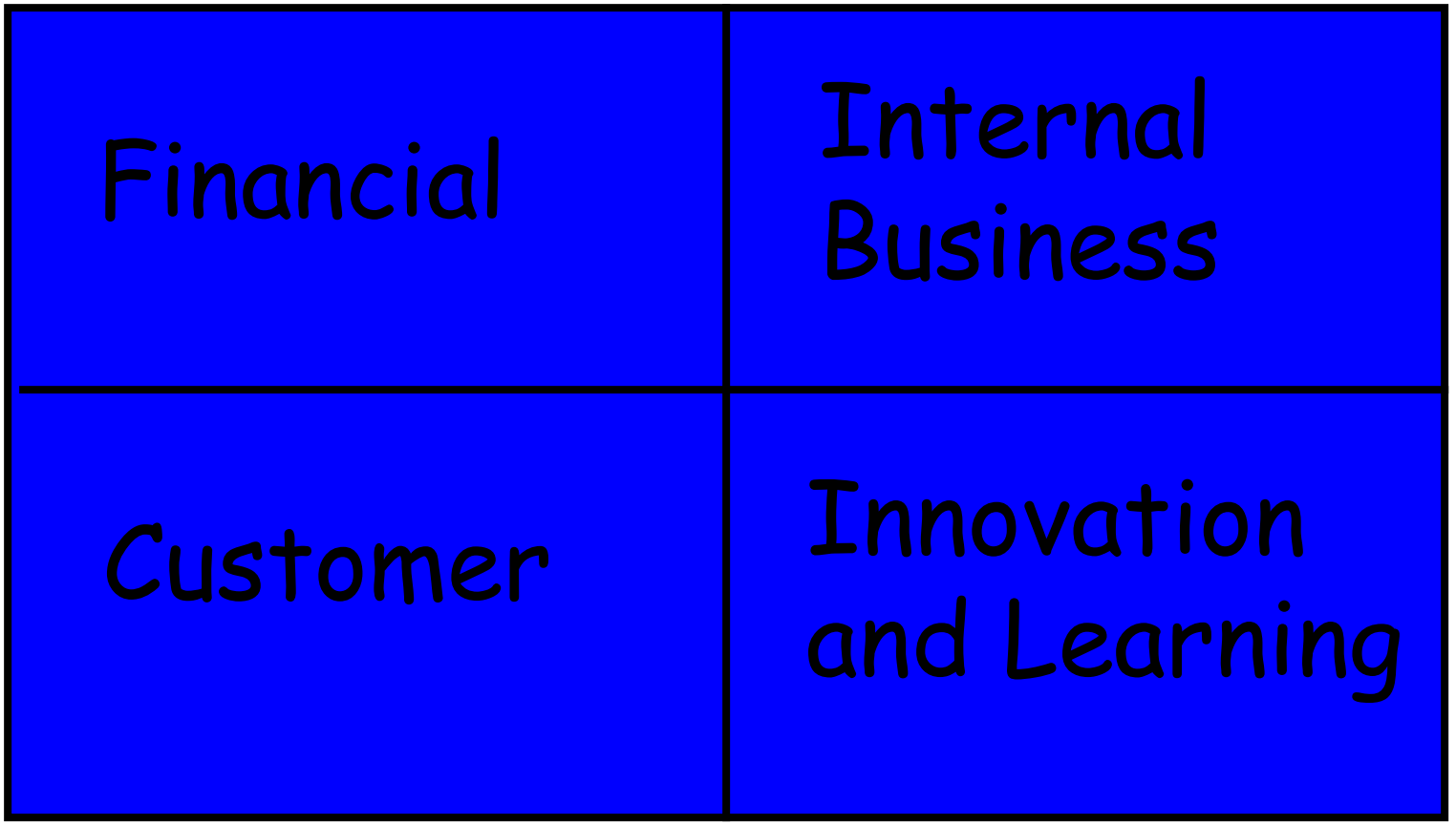
- Manager cannot control impact of accounting standards, economic conditions, and risks

Measuring Performance

- Design an effective, integrated Performance Management System
- For example, the Balanced Scorecard

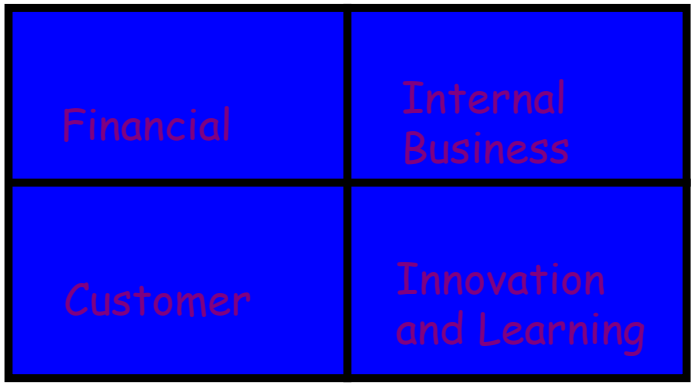


Balanced Scorecard



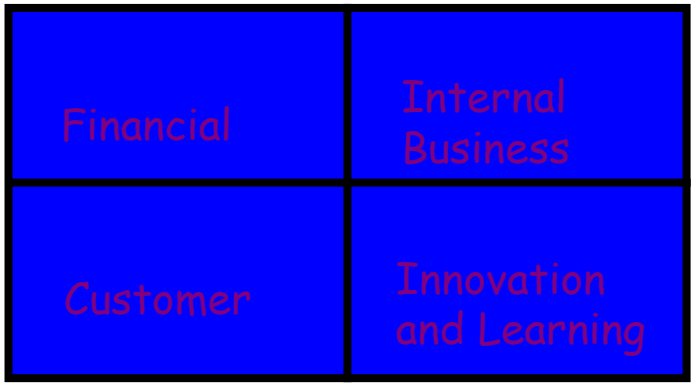
Balanced Scorecard Measures

- Financial
  - Shareholder-relevant issues
  - Profitability
  - Organizational growth
- Customer
  - Lead time
  - Quality
  - Service
  - Price



Balanced Scorecard Measures

- Internal Business
  - Quality
  - Cycle efficiency
  - Time-to-market
  - On-time delivery
- Innovation and Learning
  - Number of patents or copyrights
  - Percentage of R&D projects that are patentable
  - Time of R&D from conception to commercialization



Performance Indicator System Steps

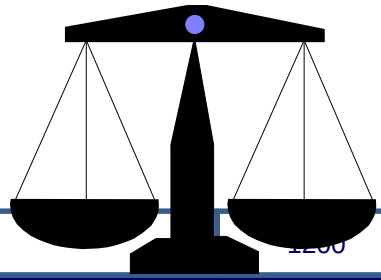
- Recognize need for enhanced performance indicators
- Include top management in steering committee
- Create a cross-functional implementation team
- Develop a business performance model that views the business as a stage in the value chain
- Divide firm's goals into environment, markets and customers, products and lines, technology, operations, finance, and organization/management

Performance Indicator System Steps

- Define critical success factors
- Assess current performance measurement system
- Determine which current measures should be eliminated
- Develop the performance indicator structure
- Establish the necessary underlying technology
- Reevaluate current reward system
- Ensure continual improvement

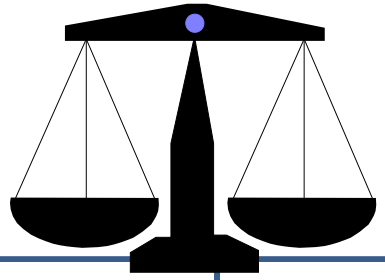
Sample Performance Indicators

- Design for Manufacturability
  - Number and severity of engineering changes
  - First pass reject rate
  - Number of parts
  - Percent common parts per product
  - Time from design to finished project
  - Number of operations per finished product
  - Number of tools per finished product



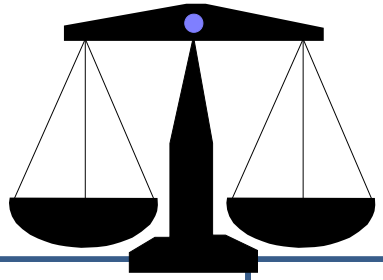
Sample Performance Indicators

- Zero Defects
  - Units scrapped by cell
  - Downtime due to quality problems
  - Units reworked
  - Yield of finished product per raw material batch
  - Time required for quality test procedures
  - Time lost due to quality control
  - Number of checkpoints



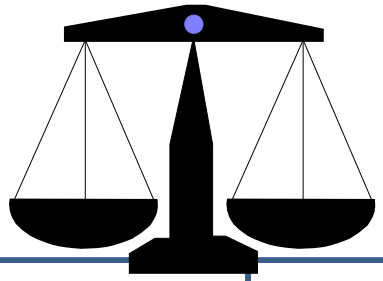
Sample Performance Indicators

- Minimize Raw and In Process Inventory
  - Number and location of vendors
  - Number and frequency of deliveries
  - Lead time from order to delivery
  - Flexibility in order quantity, delivery, variety
  - Complexity of components
  - Demand variation
  - Forecast accuracy
  - Availability/accuracy of information



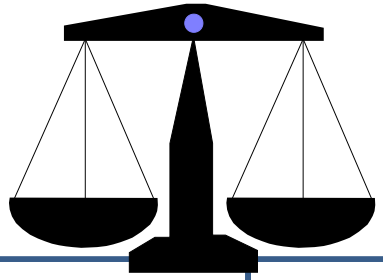
Sample Performance Indicators

- Zero Lead Time
  - Actual production time
  - Queue time
  - Move, setup, inspection times
  - Scrap, rework, yield percentages
  - Late and on-time deliveries
  - Back orders
  - Product mix



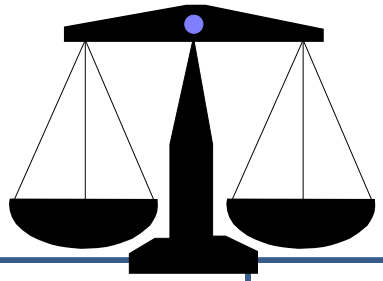
Sample Performance Indicators

- Minimize Process Time
  - Number and quality of components
  - Availability/ease of use of components
  - Skills necessary
  - Number of procedures
  - Process capabilities and limitations
  - Plant layout



Sample Performance Indicators

- Optimize Production
  - Bottlenecks
  - Setup time
  - Lot size constraints
  - Labor availability, qualifications, flexibility
  - Material resources availability, lead time
  - Number of distribution centers
  - Volume variations
  - Schedule changes



Measuring Performance

Key Performance Indicators – KPI's

- Care must be taken in selecting KPI's
- Must be relevant and linked to critical success factors
- Act to initiate action
- Not just add to "sea of information"

Measuring Performance

What is a critical success factor

- " an issue or aspect of organisational performance that determines the ongoing health, vitality and well being of that enterprise"
- Characteristics of critical success factors
  - Usually fairly obvious
  - Influence cuts across several aspects of performance

Measuring Performance

Examples of critical success factors

- Delivery in full on time, all the time, to key customers
- Completion of projects on time and to budget
- Getting the right product in the right place at the right time
- Increasing the gross margin
- Customers being active advocates for our business
- Positive brand recognition

Measuring Performance



Measuring Performance

British Airways

Financial KPI: Operating profit margin of 10%

Financial

We must achieve a consistent, strong financial performance if we are to continue investing in the future success of the business and reward our shareholders through the payment of a dividend. Operating margin – which we define as operating profit divided by revenue expressed as a percentage – is the main way we measure our financial performance.

In 2002 we set ourselves a target of achieving a 10 per cent operating margin through the economic cycle. In 2007/08 we set ourselves the goal of hitting a 10 per cent margin for the year for the first time.

Measuring Performance

British Airways

Operations KPI: punctuality target of 48% “ready to go”

Operations

We must run a robust operation if we are to meet our customers' expectations and create a cost-effective business. Having Heathrow at the heart of our operations, with all its infrastructure constraints, puts a significant strain on delivering operational excellence, day in, day out.

Within our business plan we have focused our efforts on five key areas of operational delivery – the 'BA Basics'. Among these, departure punctuality is our primary operational performance measure. Punctuality ensures other operational processes run smoothly and remains a key factor in whether customers would recommend British Airways to other travellers.

We call our chosen measure of punctuality 'Ready to Go'. This measures how many of our flights are prepared for departure at three minutes before the scheduled departure time. So many issues can have an impact on punctuality, but using this measure ensures we focus on the aspects of the departure process within our control. The target range for 'Ready to Go' punctuality for 2007/08 was set at 44-48 per cent.

Measuring Performance

British Airways

Customer KPI: 63% of customers likely to recommend BA

Customers

Customer recommendation is a key measure of our success. Our Global Performance Monitor (GPM) survey, an onboard customer survey covering all the key stages of the flight experience, together with a follow-up online survey on the arrivals process, provides monthly insights into customers' views. The survey is carried out by GfK NOP, the independent market research company, and involves more than 55,000 customers each month.

The customer recommendation measure is based on the percentage of customers who, when surveyed, would highly recommend British Airways to friends, family or colleagues. Apart from being extremely important in its own right, we believe that this measure indicates how the customer experience will affect future profitability. Our target for 2007/08 was for 63 per cent of customers to be 'extremely likely' or 'very likely' to recommend British Airways.

Measuring Performance

British Airways

Employees KPI: involvement measure of 74%

Employees

Progressive, high performing organisations are increasingly recognising that involved employees are more committed to organisational goals and values, and more willing to embrace change and improve customer service. Last year we started using an Employee Involvement index, as measured by an all-employee Speak Up! survey. This is run twice a year, with a full version in September and a shorter tracker version in March.

The Speak Up! surveys are conducted and hosted by the independent research organisation, Ipsos MORI, and are completely confidential. As a business we aim to match the involvement scores of other leading service sector organisations, and a target of 73 per cent for Employee Involvement was set for 2007/08.

Measuring Performance

Key Performance Indicators

- Care must be taken in selecting KPI's
- Must be relevant and linked to critical success factors
- Act to initiate action
- Not just add to "sea of information"
- No more than 20 – ideally 10 or less
- Work well where profit is not organisational priority
- But must be regularly monitored to be effective

Building a budget

Basic Terminology

A budget*:*

- is a financial or nonfinancial expression of a *plan of action* for a specified period

- identifies the resources and commitments required to achieve the organization's goals for an upcoming period

Budgeting:

- The process of preparing a budget (or set of budgets) is called *budgeting*

Strategy and the Master Budget

- The starting point in the budget-preparation process is specification of the organization's *strategy*
- The organization's long-range plan identifies required actions over a 5- to 10-year period to attain the organization's strategic goal(s)
- An organization expresses its strategic goals and long-term objectives in its *capital budget* and *master budget*
- *Strategic budget expenditures* represent a special class of capital budgeting proposals, that is, those that lead to long-term value and competitive advantage by the organization

The Budgeting Process

- Budget Committee
- Budget Period
- Budget Guideline
- Negotiation, Review, and Approval
- Revision

The Master Budget

- Represents the “grand plan of action” for an upcoming period
- Translates the organization’s short-term objectives into action steps
- Culminates in the preparation of a set of *pro-forma* financial statements
- Communicates to employees and managers alike the expectations of top management
- Helps coordinate subunit activities

The Master Budget

The master budget comprises a set of operating and financial budgets:

- ***Operating budgets*** are plans that identify resources needed to carry out the budgeted activities, such as sales and services or production
  - Operating budgets include production, purchase, personnel, marketing budgets, and a budgeted income statement
- ***Financial budgets*** identify sources and uses of funds for the budgeted operations
  - Financial budgets include the cash budget, budgeted statement of cash flows, the budgeted balance sheet, and the capital expenditures budget

Preparing Individual Budgets (e.g., a Sales Budget)

Three-step process:

(1) Define the “bottom-line” information contained in the budget (e.g., sales for the upcoming period)

(2) Determine what this information is a function of (e.g., budgeted unit sales, budgeted selling price/unit)

(3) Put together information in a user-friendly way

Sales Budget

The *sales budget* is often referred to as the cornerstone of the entire master budget

The sales budget has two components:

- Forecasted sales *volume*
- Budgeted selling *prices*

Sales Budget

Kerry Industrial Company
Sales Budget
For the Quarter Ended June 30, 2013

	April	May	June	Quarter
Sales in units	20,000	25,000	35,000	80,000
Selling price per unit	× $30	× $30	× $30	× $30
Total sales	$600,000	$750,000	$1,050,000	$2,400,000

Production Budget

- After the sales budget, we prepare a set of manufacturing budgets, beginning with a *production budget,* which shows planned production for a given period

- Budgeted production (in units) can be calculated through use of the following formula:

$$\text{Budgeted production (in units)} = \text{Budgeted Sales (in units)} + \text{Desired ending inventory (in units)} - \text{Beginning inventory (in units)}$$

Production Budget

Kerry example:

(1) Beginning inventory (April 1st) = 5,000 units (assumed)

(2) Desired ending inventory (April 30th) = 30% of the following month's projected unit sales

(3) The sales budget has total sales for May at 25,000 units.

Production Budget

Desired ending level at **April 30:**

30% × 25,000 units (May sales) = 7,500 units

Budgeted production for April

22,500 = 20,000 + 7,500 − 5,000

From the Sales Budget

Inventory from **April 1**: 5,000 units

Production Budget

July sales are budgeted at 40,000 units: 30% × 40,000 = 12,000

Kerry Industrial Company
Production Budget
For the Quarter Ended June 30, 2013

	April	May	June	Quarter
Budgeted sales in units	20,000	25,000	35,000	80,000
Desired ending inventory	7,500	10,500	12,000	12,000
Units needed	27,500	35,500	47,000	92,000
Beginning inventory	5,000	7,500	10,500	5,000
Budgeted production	**22,500**	**28,000**	**36,500**	**87,000**

30% of June's budgeted sales

Direct Materials Budgets

Two required budgets:

- Direct material *usage* budget
- Direct materials *purchases* budget

The direct materials *usage* budget :

- Shows the amount (and budgeted cost) of direct materials required for budgeted production
- The last line of the production budget = first line of the direct materials usage budget

Direct Materials Purchases Budget

The direct materials *purchases* budget *:*

- Contains budgeted purchases, in units and dollars, of direct materials for the upcoming period
- Is needed to complete the direct materials usage budget (i.e., provides unit cost data)
- Is a function of: materials required for production (from materials usage budget), target ending inventory of materials, beginning-of-period materials inventory, budgeted purchase price per unit of raw material

Direct Materials Purchases Budget: Kerry Company

KERRY WINDOW SYSTEMS, INC.
Direct Materials Purchases Budget
For the Quarter Ended June 30, 2013

Line	Item		April		May		June		Quarter
1.	Total direct materials needed in production (from part A of Exhibit 10.5), in lbs.		67,500		84,000		109,500		261,000
2.	Add: Desired direct materials ending inventory	+	8,400	+	10,950	+	10,800*	+	10,800
3.	Total direct materials needed		75,900		94,950		120,300		271,800
4.	Less: Direct materials beginning inventory	−	7,000	−	8,400	−	10,950	−	7,000
5.	**Total Direct materials purchases**		**68,900**		**86,550**		**109,350**		**264,800**
6.	Purchase price per pound	×	$ 2.45	×	$ 2.50	×	$ 2.60		
7.	**Total cost of direct materials purchases**		**$168,805**		**$216,375**		**$284,310**		**$669,490†**

*Assumed, based on estimated production in July.
†$669,490 = $168,805 + $216,375 + $284,310

Direct Labor Budget

- Enables the personnel department to plan for hiring & repositioning of employees, based on production needs

- Is prepared for each class (type) of labor, e.g., skilled and semi-skilled

- Is a function of:
  - Budgeted output (from *production budget*)
  - Standard labor hours per unit of output
  - Standard wage rate per hour

Direct Labor Budget

Kerry uses 0.5 hours of semiskilled labor and 0.2 hours of skilled labor per unit @ standard wage rates of $8 and $12 per hour, respectively



Direct Labor Budget: Kerry Company

KERRY WINDOW SYSTEMS, INC.
Direct Labor Budget
For the Quarter Ended June 30, 2013

Line			April		May		June		Quarter
	Semiskilled Labor								
1.	Budgeted production (Exhibit 10.4)		22,500		28,000		36,500		87,000
2.	Semiskilled direct labor-hours per unit	×	0.5	×	0.5	×	0.5	×	0.5
3.	Total semiskilled direct labor-hours needed		11,250		14,000		18,250		43,500
4.	Hourly wage rate of semiskilled labor	×	$8	×	$8	×	$8	×	$8
5.	Total wages for semiskilled labor		$90,000		$112,000		$146,000		$348,000
	Skilled Labor								
6.	Budgeted production (Exhibit 10.4)		22,500		28,000		36,500		87,000
7.	Skilled direct labor-hours per unit	×	0.2	×	0.2	×	0.2	×	0.2
8.	Total skilled direct labor-hours needed		4,500		5,600		7,300		17,400
9.	Hourly wage for skilled labor	×	$12	×	$12	×	$12	×	$12
10.	Total wages for skilled labor		$ 54,000		$ 67,200		$ 87,600		$208,800
11.	**Total cost for direct manufacturing labor (5 + 10)**		**$144,000**		**$179,200**		**$233,600**		**$556,800**
12.	Total direct manufacturing labor-hours (3 + 8)		15,750		19,600		25,550		60,900

Cost of Goods Manufactured & Cost of Goods Sold (CGS) Budget

- The *cost of goods manufactured and CGS budget* is prepared after the factory overhead budget is prepared

- The budgeted income statement and the budgeted balance sheet both use information from this budget

Kerry Company: Cost of Goods Manufactured & CGS Budget, April 2013

	April
Direct materials (Line 12, Exhibit 10.5)	$165,025
Direct labor (Line 11, Exhibit 10.7)	144,000
Total factory overhead (Exhibit 10.8)	133,600
Total cost of goods manufactured	$422,625
Finished goods beginning inventory	90,000*
Total cost of goods available for sale	$512,625
Finished goods ending inventory†	140,875
Cost of goods sold	**$371,750**

*Finished goods beginning inventory, April 1, 5,000 units @ $18/unit.

Selling & Administrative Expense Budget

- This budget includes all the planned expenditures for selling and general administrative activities
- Many of the expenses included in this budget are considered discretionary and are a likely place for spending cuts
- Managers must be careful not to focus solely on short-term affects when making cuts in these areas (e.g., customer-service expenditures)

Kerry Company—Cash Receipts Budget: Operating Activities April 2013

Sales Data	March	April
Cash and bank credit card sales (70% of total sales)	$315,000	$420,000
Credit sales (30% of total sales)	135,000	180,000
Gross sales revenue (Exhibit 10.3)	$450,000	$600,000
Cash received from cash sales		
(60% of cash plus bank credit card sales)		$252,000
Cash received from bank credit card sales		
(40% of cash and bank credit card sales × 97%)		162,960
Collections of accounts receivable:		
From credit sales the month before this month:		
Within cash discount period		
(Prior month's credit sales × 80% × 60% × 98%)		63,504
After the cash discount period		
(Prior month's credit sales × 80% × 40%)		43,200
From credit sales two months before this month		
(75% of 20% of credit sales two months prior)		18,000
Total cash receipts, net of bank service charge (3%)		$539,664

Cash Budget

The *cash budget* brings together the cash effects of all budgeted activities--to ensure that the firm has adequate cash on hand:

- This budget generally has three sections:
  - Cash flow from operations
  - Investing activities, and
  - Financing activities

- Preparation of this budget involves careful review of all other budgets to identify cash inflows and outflows

Kerry Company—Cash Budget: April 2013

	April
Cash balance, beginning of period	**$75,000**
Cash flow from operations:	
Operating cash inflows (Exhibit 10.13)	$539,664
Operating cash outflows:	
Cash payments for direct material purchases	$163,283
Direct labor (Exhibit 10.9, line 11)	$144,000
Factory overhead (Exhibit 10.10, last line)	$83,600
Selling & administrative expenses (Exhibit 10.12, last line)	$139,000
Net cash flow from operations	$9,781
Investing activities	
Equipment purchase	$0
Cash balance before financing activities	$84,781
Financing activities:	
Bank borrowing, beginning of month	$0
Payments (i.e., cash outflows, for interest and principal)	$0
Net effect of financing activities	$0
Ending cash balance	**$84,781**

Budgeted I/S and B/S

The *budgeted income statement (I/S)* and *budgeted balance sheet* (B/S) can then be prepared using all the aforementioned budgets:

- The budgeted I/S describes the expected net income for the upcoming period
- The budgeted B/S, the last budget in the budget-preparation process, incorporates the effects of all operations and cash flows during the budget period and shows projected ending balances in asset, liability, and equity accounts

Budgeted Income Statement: Kerry Company

	April
Gross sales revenue (Exhibit 10.3)	$600,000
Less: Cash discounts for early payment of credit sales (last month's credit sales × 80% × 60% × 2%)	$ 1,296
Bank service charge (3% of bank credit-card sales)	$ 5,040
Net sales	$593,664
Less: Cost of goods sold (Exhibit 10.9)	371,750
Gross profit	$221,914
Selling and administrative expenses (Exhibit 10.10)	175,000
Net operating income	$ 46,914
Less: Interest expense (Exhibit 10.12)	0
Income before income taxes	$ 46,914
Less: Income taxes (@30%)	14,074
Net income	**$ 32,840**

Budgeted Balance Sheet: (Total Assets)

Assets			
Current assets:			
Cash (Exhibit 10.12)		$ 90,980	
Net accounts receivable[a]		333,000	
Direct materials inventory (Exhibit 10.5, line 11)		28,080	
Finished goods inventory (Exhibit 10.9)		224,852	
Total current assets			$ 676,912
Property, plant, and equipment:			
Land (Exhibit 10.14)		$ 40,000	
Buildings and equipment, gross	$969,750		
Less: Accumulated depreciation[b]	349,000	620,750	
Total property, plant and equipment			660,750
Total assets			**$1,337,662**

Budgeted Balance Sheet: (Liabilities + Stockholders' Equity)

Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable[c]	$113,724	
Income tax payable (Exhibit 10.13)	94,841	
Total liabilities		$ 208,565
Stockholders' equity:		
Common stock (Exhibit 10.14)	$303,300	
Retained earnings[d]	825,797	
Total stockholders' equity		1,129,097
Total liabilities and stockholders' equity		**$1,337,662**

Uncertainty and the Budgeting Process

- What-If Analysis
- Sensitivity Analysis
- Scenario analysis:
  - Best-case scenario
  - Worst-case scenario
  - Most-likely scenario

Budgeting in Service Companies

- These firms have different operating characteristics, operating environments, and considerations than those of manufacturing and merchandising firms

- Service firms are different due to the absence of production or merchandise purchase budgets and their ancillary budgets–the focus of the budgeting process must be personnel planning:

  - Does the firm have sufficient staff and resources to provide the expected level of service output in the upcoming period?
  - Do staff members have the appropriate skills?

Alternative Budgeting Approaches

Zero-base budgeting (ZZB) is a budgeting process that requires managers to prepare budgets from a zero base

- This type of budgeting allows no activities or functions to be included in the budget unless managers can justify their needs
- In-depth reviews and analyses of all budget items make managers aware of activities and functions that have outlived their usefulness
- Can be a difficult and time-consuming process

Alternative Budgeting Approaches

- *Activity-based budgeting (ABB)* is a budgeting process based on activities and cost drivers of operations:
  - Starts with the budgeted output and segregates costs required for the budgeted output into homogeneous cost pools
  - Can be a simple extension of a firm's ABC system
- *Time-driven activity-based budgeting* is a budgeting process based on the use of time-driven activity-based costing (TDABC) system

Alternative Budgeting Approaches

- Budgeting in both ABC and TDABC systems facilitates resource capacity planning
  - Role of practical capacity?
- Kaizen (Continuous improvement) budgeting:
  - Incorporates continuous improvement expectations into the budgets
  - Promotes active engagement in reforming and altering business practices and processes

Behavioral Issues in Budgeting

- *Budgetary slack,* or padding the budget, is the practice of managers knowingly including a higher amount of expenditures or a lower amount of revenue in a budget
- *Spending the budget* is another issue; managers often feel if they do not use all the resources they receive, next year's budget may be cut
- *Goal congruence* is a term that refers to the degree of consistency between goals of the firm, its subunits, and its employees
  - Involving employees in the budgeting process fosters goal congruence

Behavioral Issues in Budgeting

- Difficulty level of the budget target?
  - An easy budget may fail to encourage employees to give their best efforts, while a very difficult target can be discourage managers from even trying
  - A “highly achievable target” is suggested with incentives for exceeding the budgeted figures
- Authoritative or participative budgeting?
  - Top-down budgeting is referred to as *authoritative budgeting*
  - Bottom-up budgeting is referred to as *participative budgeting*
  - Effective budgeting processes often combine the two types

Behavioral Issues in Budgeting

- **Linkage of compensation and budgeted performance:**
  - Problems with the “fixed performance contract”
  - Gaming the performance measure
- **Suggested improvements to basing incentive compensation on the basis of the fixed performance contract:**
  - Use of linear compensation plan
  - Use of “rolling forecasts” and relative performance (relative improvement contracts

Summary

- A *budget* is a financial or nonfinancial expression of an organization's plan of action for a specified period; it identifies the resources and commitments required to achieve the organization's goals for the period identified
- Strategy is the starting point in preparing its plans and budgets
- The "grand plan of action" for an upcoming period is the organization's *Master Budget*

Summary

Components of a master budget for a manufacturing firm include:

- Sales budget
- Production budget
- Direct materials usage budget
- Direct materials purchases budget
- Direct labor budget
- Factory overhead budget
- Budgeted cost of goods manufactured/cost of goods sold budget
- Selling and general administrative expenses budget
- Cash receipts budget
- Cash budget
- Budgeted income statement (I/S), and
- Budgeted balance sheet (B/S)

Summary

- Service organizations have different operating characteristics, operating environments, and considerations than those of manufacturing and merchandising firms

- ZBB, ABB (activity-based budgeting), time-driven activity-based budgeting (TDABB), and kaizen are alternative approaches to budgeting that can improve budgeting effectiveness

Summary

Primary behavioral issues associated with the budgeting process:

- Managers must be aware of the potential for budgetary slack and "budget spending"
- Participative budgeting often increases motivation in employees
- goal-congruence problems associated with the use of "fixed performance" contracts
- future role of *relative performance* (relative improvement) contracts and *rolling financial forecasts*

Budgets – the financial expression of the operating plan

Budgeting fundamentals

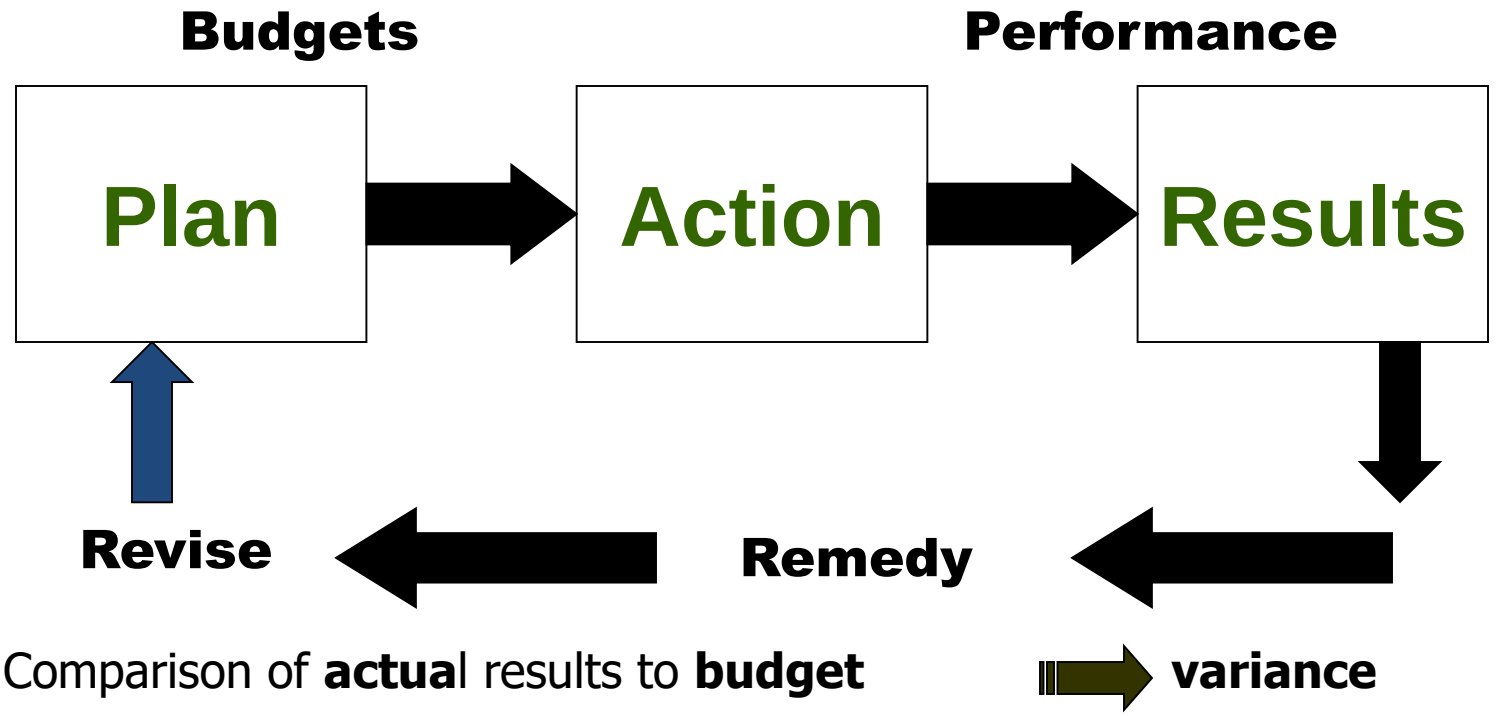
- Budgeting is the process used to develop:
  - A formal written statement
  - Of managements plans for the future
  - Expressed in financial terms

Types of plans

- Long term: 5 to 10 years
- Medium term: 1 to 5 years
- Short term: up to 1 year

The planning cycle

Budgets are the mechanism by which management control of an organisation becomes possible.



The purpose of budgets – control

Purpose of budgets

- **Planning:**
  Necessitates setting of goals and establishing actions needed to attain goals.
- **Organising:**
  Involves the allocation of resources.
- **Leading:**
  Two main aspects are communicating & motivating.
- **Controlling:**
  Process of setting standards, measuring current performance and taking remedial action if needed.

The human side of budgeting

Behavioral aspects of budgeting

- To maintain supportive and cooperative relationships with staff.
- The use of punishment (authoritarian style) tends to encourage attempts to ‘beat the system’.
- Padding the budget means overestimating costs and/or underestimating revenue.
- Participation in the budgetary process tends to result increased productivity and satisfaction.

Advantages arising out of staff participation

- Improved communication.
- Greater understanding of what is involved.
- Opportunity to thrash out problems.
- Increased acceptance.
- Improved commitment.

Factors affecting behaviour

- Targets perceived by employees as being too difficult.
- Targets that do not provide any challenge.
- Insufficient flexibility.
- Narrow-minded managers.
- Emphasis on financial goals to the detriment of non-financial goals.

Motivation and the behavioural aspect of budgeting

- Budgets can affect motivation of staff and affect the direction of an organisation.

Behavioral Issues in Budgeting

- *Budgetary slack,* or padding the budget, is the practice of managers knowingly including a higher amount of expenditures or a lower amount of revenue in a budget
- *Spending the budget* is another issue; managers often feel if they do not use all the resources they receive, next year's budget may be cut
- *Goal congruence* is a term that refers to the degree of consistency between goals of the firm, its subunits, and its employees
  - Involving employees in the budgeting process fosters goal congruence

Behavioral Issues in Budgeting

- Difficulty level of the budget target?
  - An easy budget may fail to encourage employees to give their best efforts, while a very difficult target can be discourage managers from even trying
  - A “highly achievable target” is suggested with incentives for exceeding the budgeted figures
- Authoritative or participative budgeting?
  - Top-down budgeting is referred to as *authoritative budgeting*
  - Bottom-up budgeting is referred to as *participative budgeting*
  - Effective budgeting processes often combine the two types

Behavioral Issues in Budgeting

- **Linkage of compensation and budgeted performance:**
  - Problems with the “fixed performance contract”
  - Gaming the performance measure
- **Suggested improvements to basing incentive compensation on the basis of the fixed performance contract:**
  - Use of linear compensation plan
  - Use of “rolling forecasts” and relative performance (relative improvement contracts

Summary

Primary behavioral issues associated with the budgeting process:

- Managers must be aware of the potential for budgetary slack and "budget spending"
- Participative budgeting often increases motivation in employees
- goal-congruence problems associated with the use of "fixed performance" contracts
- future role of *relative performance* (relative improvement) contracts and *rolling financial forecasts*

Criticisms of Budgeting

Is Budgeting the Corporate Curse?

In a recent survey by the CBI senior executives reported that up to 30% of their time was spent in preparing for and carrying out the budget process

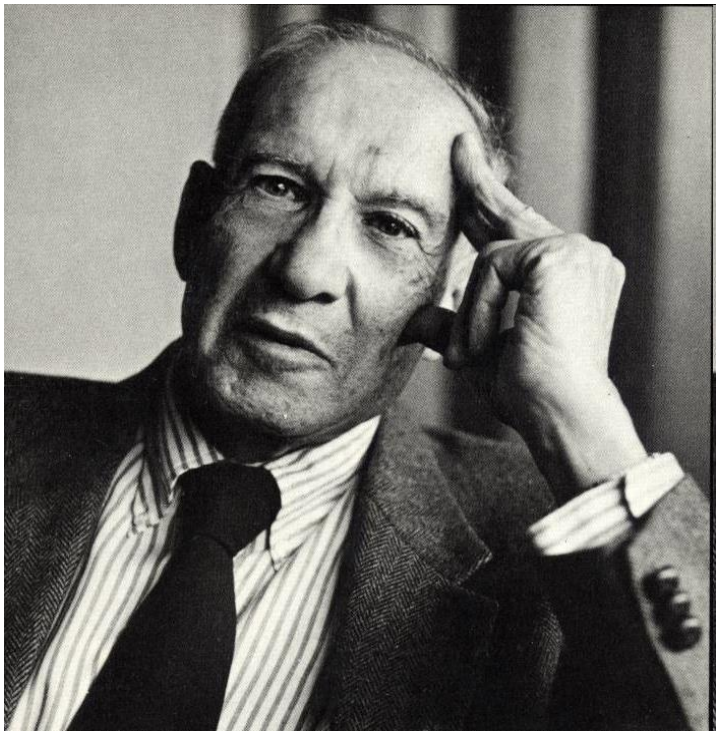
Criticisms of Budgeting



Lord Browne : ex-CEO of BP

"The process of management is not about administering fixed budgets, it is about the dynamic allocation of resources'

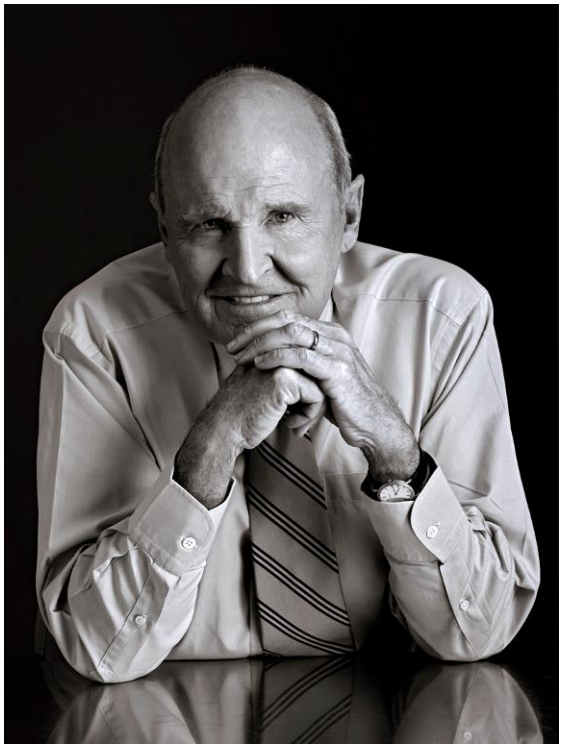
Criticisms of Budgeting



Peter Drucker

"Uncertainty…has become so great as to render futile, if not counterproductive, the kind of planning most companies still practice; forecasting based on probabilities'

Criticisms of Budgeting



Jack Welch : ex-CEO of General Electric

"Budgeting is the bane of corporate America"

Criticisms of Budgeting

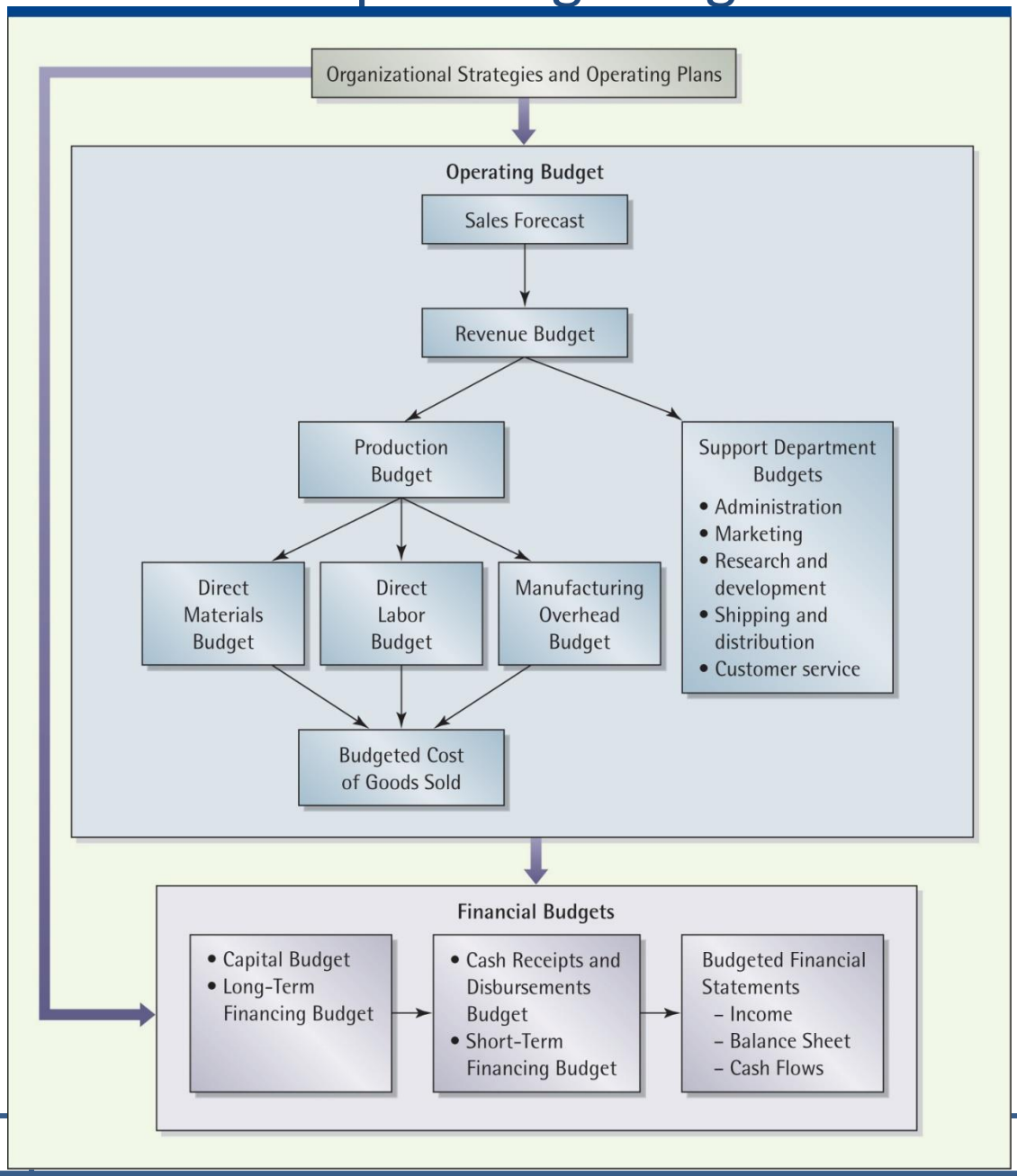
- Time consuming and expensive
- Encourages short term thinking
- Discourages risk taking
- Focus on sales rather than customer satisfaction
- Budgets divorced from long term strategy

Budgeting

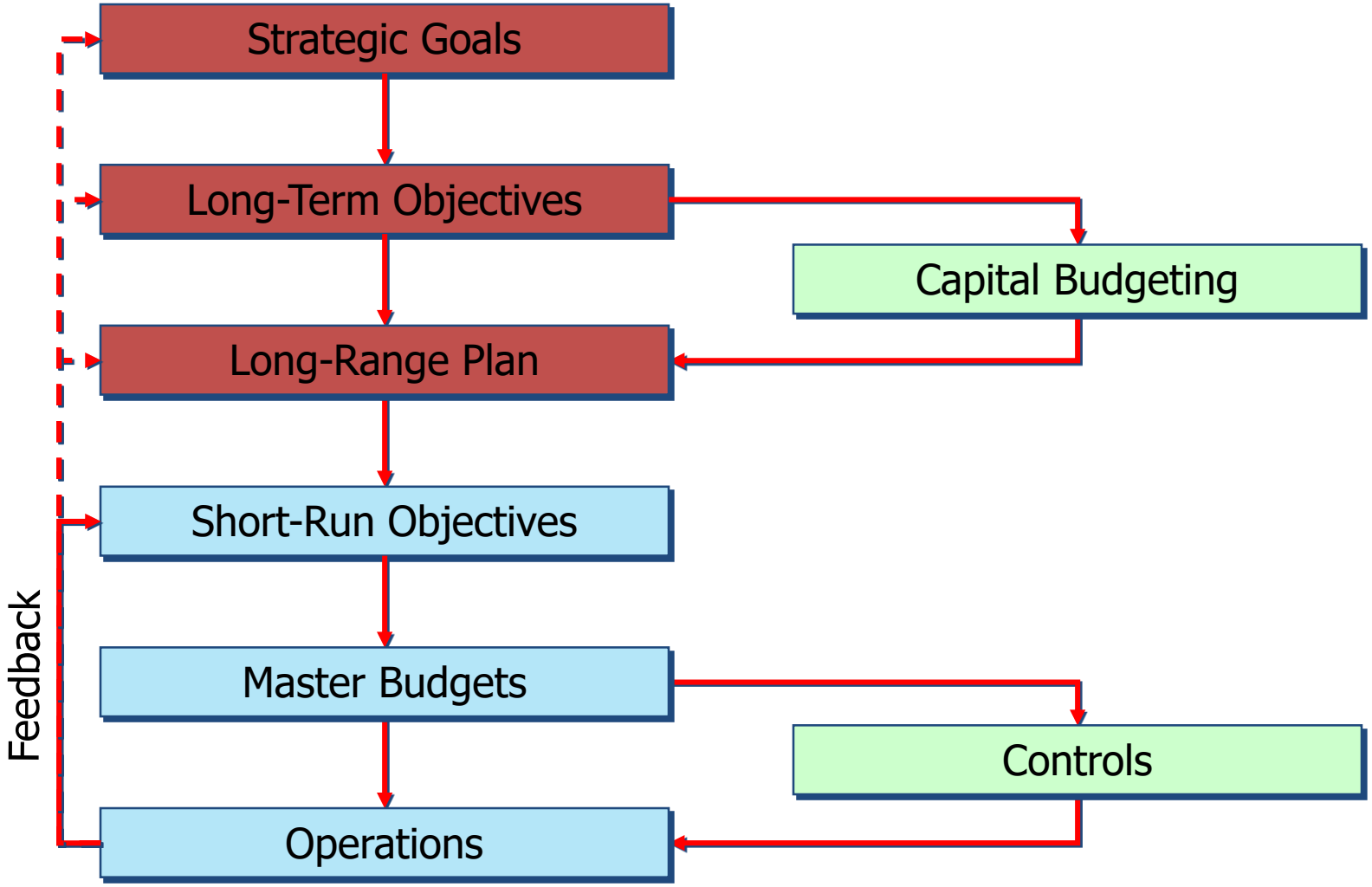
- To Summarise
  - The budget is part of the strategic planning process
  - Organisation gains from the budget process itself
  - Used correctly they can be a good management tool
  - The most successful budgetary control systems
    - Set realistic and achievable budgets
    - Are prepared in consultation with the whole team
    - Provide the best basis for motivation

Elements of the budget framework

Operating Budgets

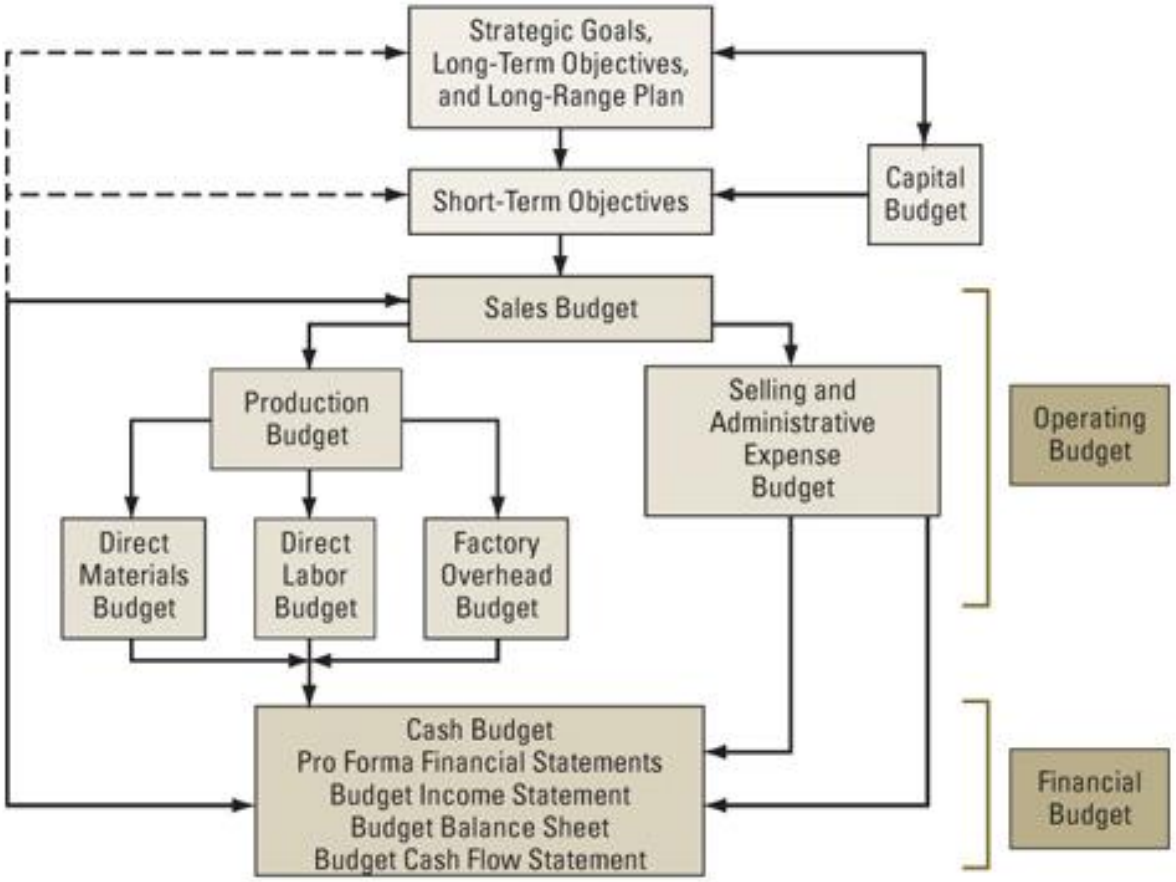


Budget Relationship



Master Budget

- A master budget is a comprehensive budget for a specific period
- It consists of **many interrelated operating and financial budgets**
- A **sales budget** often is regarded as the cornerstone of the entire budget
- The starting point in preparing a sales budget is **sales forecasts**



Budget classification

- **Static (fixed) budgets**: prepared for one level of activity, usually around the forecasts made for sales.

- **Flexible budgets**: a series of fixed budgets set to different levels of sales activity within which the organisation may operate.

Cost/volume relationships

- **Fixed costs**: in **total** remain the **same** for a period of time and over a particular range of activity.

- **Variable costs**: in **total** tend to **change** as the level of activity changes.

Budget processes

- **Zero-based budgeting**: sets the initial figures for each activity to zero.
- **Period budgets**: developed for a specific period of time, e.g. a month.
- **Rolling (continuous) budgets**: are continually updated by periodically adding a new incremental time period and dropping the period just completed.

Types of budgets

- **Revenue budgets**: estimates of the income of an organisation from the sale of goods and/or provision of services for a specific period.
- **Operating budgets**: estimate activities that will affect profit.
- **Budgeted financial statements**: show the estimated results and projected financial position of a business. That is budgeted income statement, balance sheet and statement of cash flows.

Putting The Budget Together

1285

Budget Process

- Start with:
- Mission/Vision
- Strategy
- Break down of operational strategy and targets
- Revenue or income budget then drive down

Budgeted income statement for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**
Sales				
less COGS				
Gross Profit				
Operating exp.				
Marketing				
Administration				
Financial				
Total Expenses				
Net Profit				

Advantages and limitations of budgets

Budgeting

The Purpose of Budgets

Meeting organization's objectives

Planning

Monitor & Control

Co-ordination

Evaluating Performance

Motivation for Managers

Management Contract

Communication

Provide a basis for authorising expenditure

Identify scarce resources

Delegation of responsibility

Benefits of budgets

1. Forces managers to do **planning.**
2. Realistic performance targets.
3. Basis for **controlling** what happens within the organisation.
4. Helps **coordinate** the activities of the various centres that make up the business.
5. **Communication** – managers exchange information on ideas, etc.
6. **Motivating** tool – if the process involves staff.

Limitations of budgets

- Only estimates, not statements of facts.
- No substitute for sound management practices.
- Need to be amended if circumstances change.
- Preparation does not guarantee success.
- Aspects of people's behaviour may undermine the value of the process.

The smallest problem…



73% of companies need more than 3 months to complete the annual budget.

Hackett Group 2008

Budgets are bad for business?

Main criticisms of budgets are

- *Too resource and time consuming*
- *Slow to detect problems*
- *Not reliable for performance evaluation*
- *Quickly out of date*
- *Game Playing (Agency Problem)*
- *Financial targets overwhelming what is good for the business and ultimately shareholders*
- *Over emphasis on short term financial measures*
- *Departmental budgets may encourage "silo" thinking*
- *Disrupts cooperation*
- *Discourages innovation and adaption to changing conditions and opportunities*
- *Process lacks rigor*

Reporting – the key to control

Performance reports

Performance reports

- **Responsibility accounting:**

  A management accounting system that encourages individuals to work together towards the achievement of organisational goals.

- **Performance reports:**

  A yardstick which compares actual results with the budget.

Responsibility accounting

- Where each division, branch or other sub-unit is known as a **responsibility centre**, the manager of which is accountable for the performance of the sub-unit.

- **Responsibility centers:**
  - Cost centre
  - Revenue centre
  - Profit centre
  - Investment centre

- **Performance reports** show any variance that may arise when actual figures are compared with budget figures.

- **Favourable variance (F)** means that actual income is >budgeted income or actual cost is <budgeted cost.

- **Unfavourable variance (U)** means that actual income is <budgeted income or actual cost is >budgeted cost.

- **Significant variances** (exceed an acceptable limit) are investigated by the manager of the organisational sub-unit.What is considered significant varies from business to business.

- **Reasons for variances** are numerous but fall into two main groups:
  1. are a result of external factors that management have no control over, and
  2. are a result of internal factors that management maybe able to change.

Objective of responsibility accounting

- Management by exception means that an appropriate person is notified when there is a significant deviation from plan.
- Performance reports highlight the areas that need attention.
- Major objective is to ensure that the set targets are achieved at all costs, not trying to find who is to blame.

Assumptions

- Since budgets are set for the future a set of assumptions need to be made.
- For every assumption made there is a corresponding risk increase.
- Every assumption needs to be tested for sensibility, sensitivity.
- In banks they use stress testing techniques.

Master budget

Master budget

A combination of all the budgets of an organisation.

Master budget

Merchandising firm	**Professional services**	**Manufacturing firm**
Sales budget	Fees or fees & sales budget	Sales budget
Purchases budget	Professional & support labour budget	Cost of production budget
Cost of goods sold budget	Cost of supplies used	Cost of goods sold budget
Other operating expense budgets	Other operating expense budgets	Other operating expense budgets

Master budget

- Irrespective of the type of organisation, the following budgets will be part of the master budget:
  - Statement of financial performance [revenue budget]
  - Statement of financial position [balance sheet]
  - Statement of cash flow

Proforma financial statements: Income statement, balance sheet, cash flow statement

Budgeted financial statements

Budgeted financial statements

- Income statement of financial performance
- Balance sheet of financial position
- Cash flow statement

The above budgets summarise the forecasts made in all other budgets.

Budgeted income statement is a summary of the following budgets

- Sales and/or fees
- Cost of goods sold
- Operating expenses
  - marketing
  - administration
  - financial

This budget is not affected by GST accounts.

Budgeted balance sheet

- This budget is prepared from asset, liability and owners equity accounts.
- If GST payable is >GST input tax credits, the net GST payable is shown as a current liability.
- If GST payable is <GST input tax credits, the net GST input tax credit is shown as a current asset.

Preparation budgeted balance sheet

Examples of the information needed:

- Net profit or loss
- Accounts receivable balance
- Accounts payable balance
- Pattern of paying expenses
- Rates and methods of depreciation
- Any acquisition or disposal of assets
- Any drawings made by the owner
- Any capital contributions made by the owner

Budgeted statement of cash flows

- Is a cash budget in a format that complies with either AASB107 or AASB1026.
- If the GST payable is >input credits receivable in the relevant period the resultant amount is paid to the ATO.
- If the GST payable is <input credits receivable in the relevant period the resultant amount will be refunded by the ATO.

The budgeted cash flow statement is divided into 3 main categories

- **Operating activities:** provision of goods and services.

- **Investing activities:** acquisition and disposal of non-current assets.

- **Financial activities:** changes to the financial structure of the business.

Cash budgets

Cash budgets

- Cash receipts budget:
  Estimated receipt of cash from **all** sources.
- Cash payments budget:
  All estimated payments of cash by the business.

GST and cash budgets

- This unit assumes all businesses are registered for GST and pay their liability monthly.
- Collection of Goods & Services Tax (GST) when the business makes a taxable supply.
- **Taxable supply:** a sale of a good or service that is not GST-free or input taxed.
- **GST input tax credits:** a credit for the GST included in the purchase of a good or service.

Sample cash receipts budget where all receipts are GST-free or input taxed

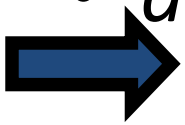
Cash receipts budget for the quarter ending 30 September				
	July	August	Sept.	Total
	$	$	$	$
Consultion fees received	12510	11970	10880	35360
Cash sales	3200	2980	2740	8920
Rental income	500	500	500	1500
Interest received			150	150
Total cash receipts	16210	15450	14270	45930

Sample cash payments budget where some acquisitions include GST

Cash payments budget for the quarter ending 30 September (p. 61)				
	July	August	Sept	Total
	$	$	$	$
Cash purchases				
Rent				
Laundry				
Telephone				
Insurances				
Stationery				
Vehicle running costs				
Massage table				
Payments including GST				
GST input taxcredit				

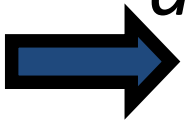
Cash budget format

- Cash balance @start
- *add* cash receipts
- *add* GST refund



total cash available for needs

- cash payments
- *add* GST payable



total payments

- Cash balance @end

Collections from debtors

- Calculate cash and credit sales.
  - work out cash sales GST exclusive
  - work out GST payable on cash sales
  - work out credit sales GST inclusive
- Prepare a collection from debtors schedule for the budget period.
- Show separately at bottom of schedule the GST payable included in the figures.

Dermott Jewellers

Schedule of collections from debtors for the quarter ending 31 March						
			Month received			
			Jan	Feb	March	Total
Month of sale		$	$	$	$	$
October		33600				
November		38400				
December		42000				
January		39600				
February		31200				
March		40800				
Total collections						
GST included above						

GST reported on accrual basis

- GST is payable at point of sale.
- Input tax credit is receivable when the entity receives the tax invoice.
- GST adjustment for a bad debt is made when the debt is actually written off as bad.
- GST adjustment for discount allowed is made when discount is given.
- GST collected each month is not the same as GST payable.

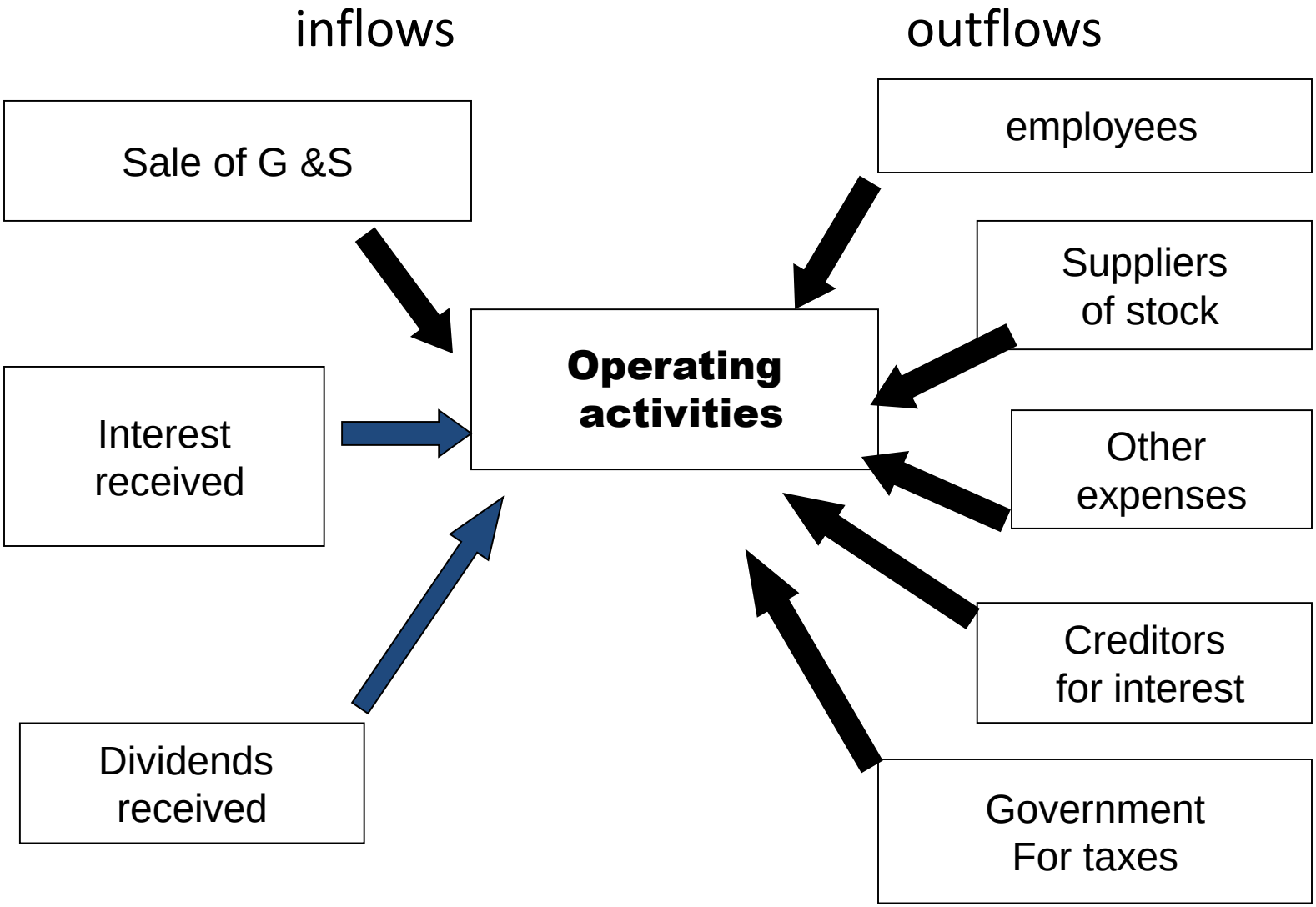
Collection from debtors with discount allowed and doubtful debts

Schedule of collections from debtors for the quarter ending 30 September								
					Month received			
			D. Debts	Dicount	July	August	Sept	Total
Month of sale		$	$	$	$	$	$	$
May		39900						
June		44100						
July		50400						
August		35700						
September		25200						
Total collections								
GST included above								

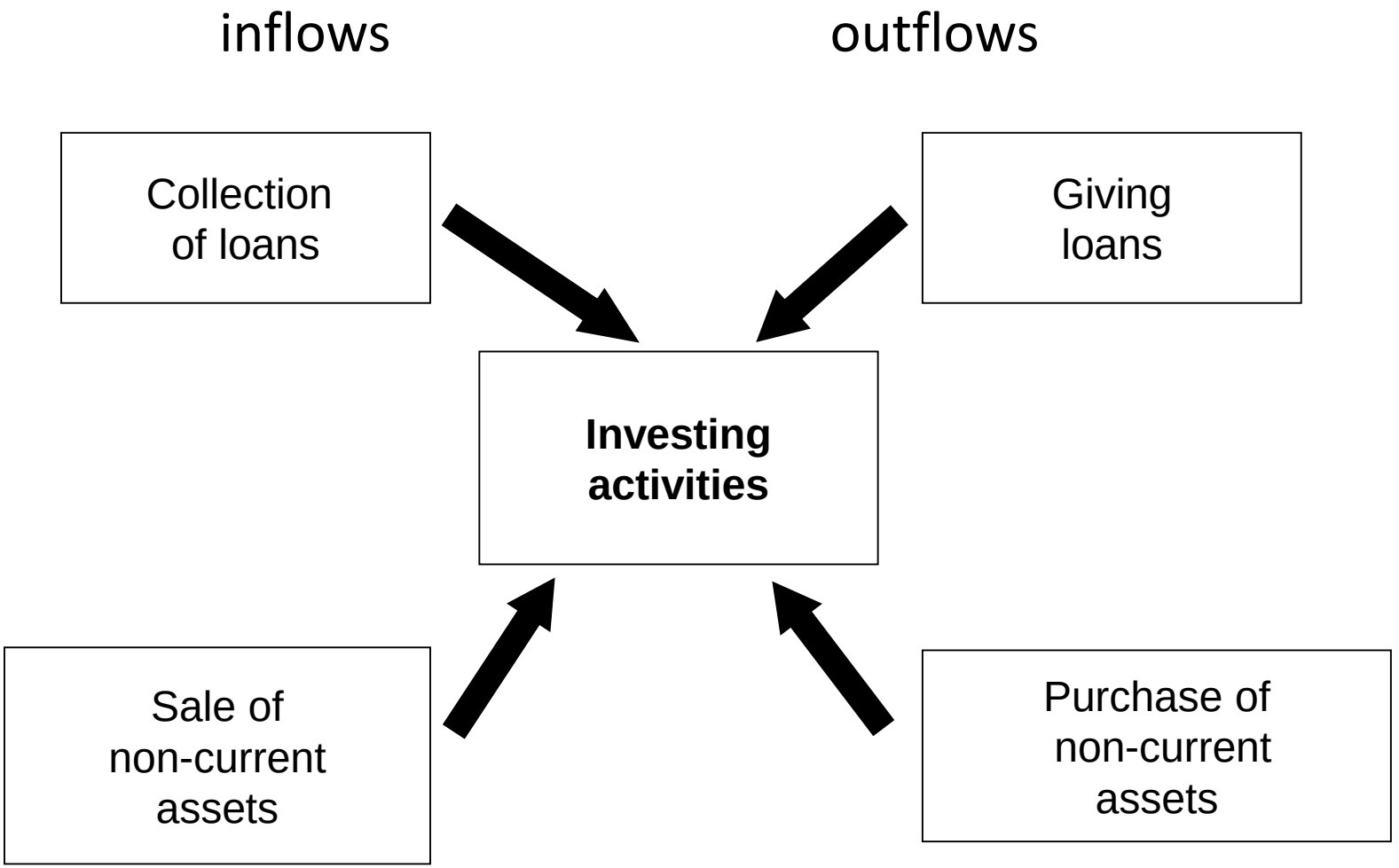
Desired balance and financial requirements

- Management may desire to have a minimum cash balance.
- May involve borrowing funds to attain required balance.
- Borrowings are made in the month that a deficit is likely.
- There may be conditions attached to the amounts that can be borrowed.

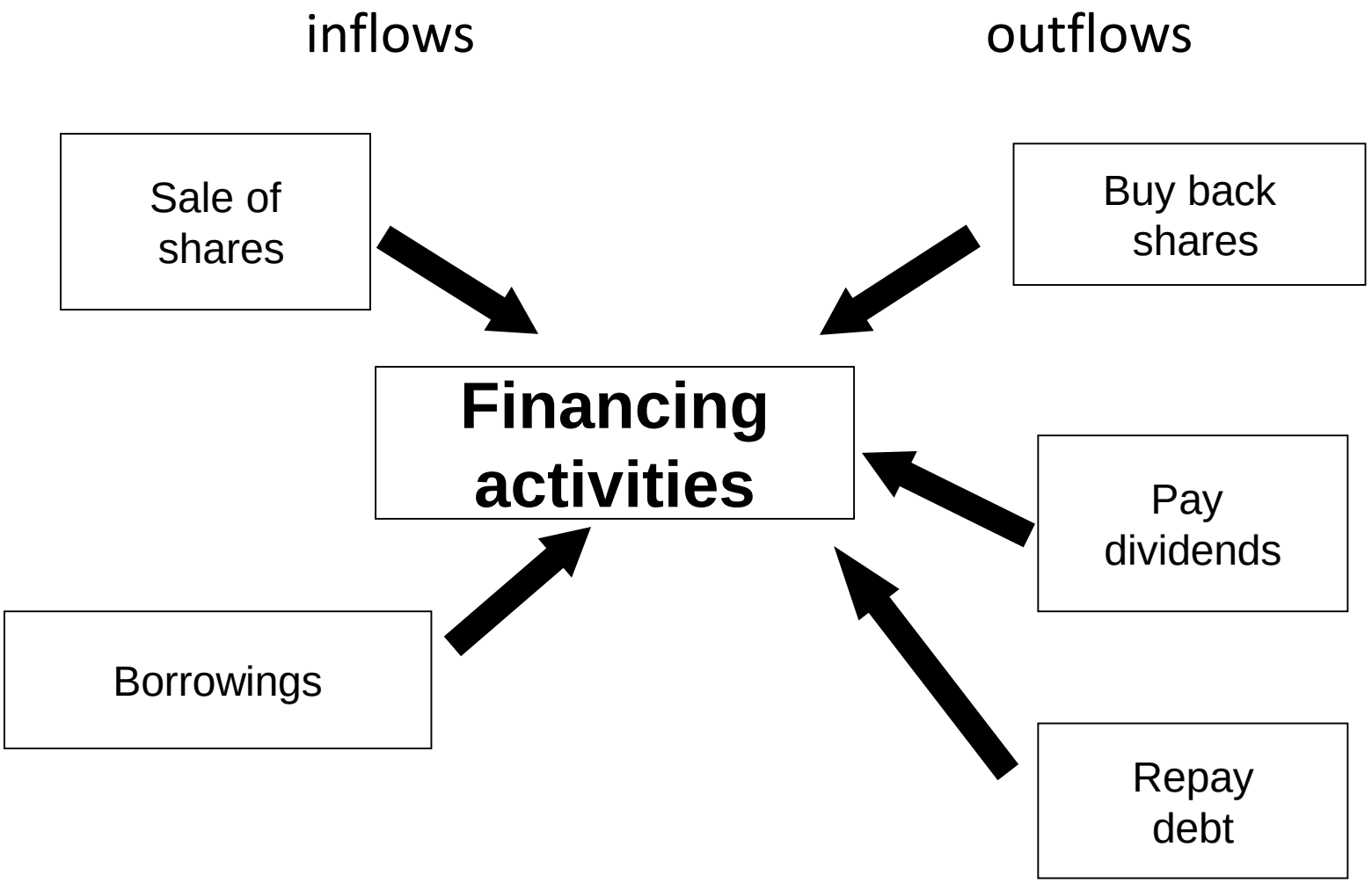
Classification of cash



Classification of cash



Classification of cash



Budgeted statement of cash flows for period ended...

	$	$
Cash flows from operating activities:		
Net cash inflow (outflow) from operating activities		
Cash flows from investing activities:		
Net cash inflow (outflow) from investing activities		
Cash flows from financing activities:		
Net cash inflow (outflow) from financing activities		
Net increase (decrease) in cash held		
Cash at beginning of period		
Cash at end of period		

Revenue budgets

Forecasting methods

- **Qualitative methods**: rely on attitudes, beliefs, feelings and experience.
  - Jury of executive opinion
  - Sales force composite
  - Delphi technique
  - Market research
- **Quantitative methods**: more objective, use mathematical models.
  - Time serious models
  - Causal models

Factors affecting revenue budgets

- Past sales levels for business and entire industry.
- General economic trends.
- Economic trends in the business's industry.
- Climatic changes affecting industry.
- Political and legal events.
- Intended pricing policy.
- Planned advertising.
- Expected actions of competitors.
- Market research studies.

Types of revenue budgets

- Sales by product.
- Sales by product and period.
- Sales by area and period.
- Sales by product, area and period.
- Fees income by type of service.
- Sales and fees income by period.

Sale by product

Sales budget for the year ending June 30

Type of biscuit	**Sales volume kg**	**Sales price $**	**Sales $**
Sweet Hearts			
Cherry Surprises			
Chocolate Supremes			
Almond Delights			
Total sales $			

Sales by product and period

Sales budget for the quarter ending
31 March

	Jan	Feb	March	Total
Hot Dogs				
Sales volume				
Selling price $				
Sales $				
Pies				
Sales volume				
Selling price $				
Sales $				

Fees income budget for the quarter ended 30 September

	July	Aug	Sept	Total
Normal consultations				
No. of patients				
Fee per visit $				
Fees income $				
Home visits				
No. of patients				
Fee per visit $				
Fees income				
Total fees income $				

Production budget

Operating budgets

Operating budgets

- Purchases budget
- Cost of goods sold budget
- Operating expense budgets
    1. Marketing expense budget
    2. Administration expense budget
    3. Financial expense budget
- Specialised service industry budgets
    1. Professional and support labour budget
    2. Materials usage budget
- Budgeted income statement of financial performance

Purchases budget in dollars for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**
Cost of sales				
a*dd* ending stock				
Total requirements				
less beginning stock				
purchases				

Purchases budget in units for quarter ending 31 March

	Jan	**Feb**	**March**	**Quarter**
Sales [units]				
Ending stock [units]				
Total req**.** [units]				
less beginning stock [units]				
Purchases [units]				
Cost per unit **$**				
Cost of purchases **$**				

Cost of goods sold budget for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**
Beginning stock				
Purchases				
Goods available for sale				
Ending stock				
Cost of sales				

General and Administrative budgets

Marketing expense budget for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**

Administration expense budget for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**

Financial expense budget for 3 months ending 30 June

	April $	**May $**	**June $**	**Quarter $**

Case study: Complete the budget

Master budget for manufacturing organisations

Cost classifications

- **Product costs** are the costs of converting raw materials into a finished product.
    1. Raw materials
    2. Direct labour
    3. Factory overhead

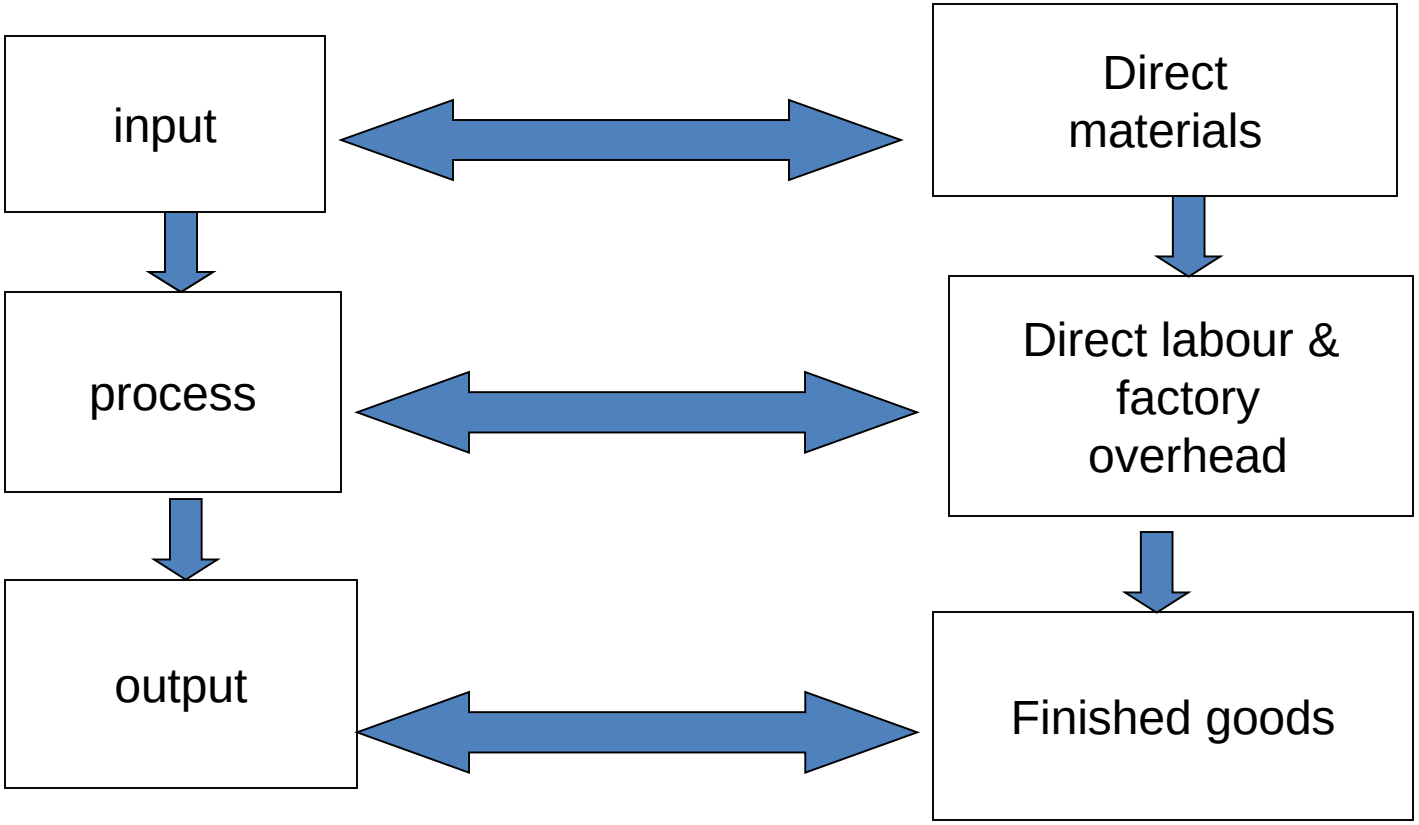
- **Period costs** are all **other** costs associated with the business.
    1. Marketing expenses
    2. General and administration expenses
    3. Financial expenses

Product costs

- **Direct costs:**
  major items of cost that can be relatively easily traced to the product, such as raw materials and direct labour.
- **Raw materials and direct labour**
  Prime cost
- **Raw materials and direct labour**
  → **Prime cost**

- **Indirect costs:**
  cannot **not** be easily traced directly to the product.
  All factory overhead.
- **Factory overhead:**
  all indirect costs of running a factory.
  Examples: indirect materials, indirect labour, factory insurance.

Manufacturing process



Cost of production requires the preparation of the following budgets

- Sales
- Production
- Direct materials usage
- Direct labour
- Factory overhead

Production budget for the year ending 30 June				
			Units	
sales				
add desired ending inventory				
total units needed				
less beginning inventory				
Units to be produced				

Factory overhead budget for year ended 30 June				
				$
Indirect materials				
Indirect labour				
Light & power				
Rates				
Factory insurances				
Depreciation on factory equipment				
Total factory overhead				

Direct materials and labour budget

***less* beginning inventory**						
Direct material usage budget for period ending June 30						
Boxes to be prduced						
kg per box						
Cardboard needed for production(kg)						
Cost per kg						
cost of cardboard to be used in production ($)						
Direct labour budget for period ending June 30						
Boxes to be produced						
Boxes produced per hour						

Factory overhead application rate

- This allows the business to charge the product with an estimated amount.

- Application rate can be calculated on different bases:
  - per unit
  - direct labour cost
  - direct labour hours
  - machine hours.

Cost of goods sold budget

- **Merchandising business**
  stock @ beginning
  add **net purchases**
  cost of goods available for sale
  less
  stock @ end
  cost of goods sold

- **Manufacturing business**
  stock @ beginning
  add **cost of production**
  cost of goods available for sale
  less
  stock @ end
  cost of goods sold

Budgetary control and variance analysis

Management Accounting & Control Systems

- *Control* = set of procedures, tools, and systems organizations use to monitor activities and to achieve organizational goals
- *Management accounting & control system* = core performance-measurement system of the organization, including both *planning* and *feedback* components:
  - Management Control Systems
  - Operational Control Systems → short-term operating performance

Evaluating Short-Term Operating Performance

– ***Financial Performance Measures:***

- Standard Cost (and Revenue) Variance Analysis
- Use of standard costs and flexible budgets
- Interpretation of variances

– ***Nonfinancial Performance Indicators:***

- These measures can be leading indicators (predictors) of future financial performance
- Variance analysis applies here, too!

Short-Term Financial Control

- Master (Static) Budget
  - Prepared before the start of the period
  - Contains the following items:
    - Budgeted sales volume
    - Budgeted sales price per unit
    - Budgeted variable cost per unit
    - Budgeted total fixed costs

Short-Term Financial Control

- Flexible (Control) Budget:
  - Prepared at the end of the period (after actual activity is known)
  - Actual sales volume is used, but with budgeted selling price per unit, budgeted variable cost per unit, and budgeted total fixed costs
  - Key to performing *variance analysis* at the end of the period

Short-Term Financial Control

- Essence of short-term financial control—explain the **total operating-income variance** for the period
- Total operating-income variance = master budget operating income – actual operating income
- The total operating-income variance can be subdivided into the following component variances:
  - Flexible-budget variance (with components)
  - Sales volume variance
- Key tool: use of *standard costs* and *flexible budgets*

Master Budget Example

	Per Unit Amounts		Master Budget
Unit sales			1,000
Sales revenue	$800	$	800,000
Less variable costs:	$450		450,000
Contribution margin	$350	$	350,000
Less fixed costs			150,000
Operating income		$	200,000

Actual Operating Profit Generated

During the period the company actual produced and sold 780 units (not 1,000 as was originally planned). The actual operating income was $128,000, as follows:

Unit sales	780
Sales revenue	$ 639,600
Less: variable costs	350,950
Contribution margin	$ 288,650
Less fixed costs	160,650
Operating income	$ 128,000

Total Operating-Income (Master Budget) Variance for the Period = $72,000 U

	Actual	Master Budget	Variances	
Unit sales	780	1,000	220	U
Sales revenue	$ 639,600	$ 800,000	$160,400	U
Less: variable costs	350,950	450,000	99,050	F
Contribution margin	$ 288,650	$ 350,000	$ 61,350	U
Less fixed costs	160,650	150,000	10,650	U
Operating income	$ 128,000	$ 200,000	$ 72,000	U

Explaining the Total Operating-Income Variance ($72,000 U)

- **The total operating-income variance should be traceable to a combination of the following four factors:**
  - Actual sales *volume* was different than planned
  - Actual *variable cost per unit* was different than planned
  - Actual *total fixed costs* were different than planned
  - Actual *selling price per unit* was different than planned
- **The flexible budget allows us to breakdown the total operating-income variance into components related to each of the above four factors**

Flexible Budget Example

To begin the variance-decomposition process at the end of the period we prepare a flexible (control) budget based on the 780-unit level, as follows:

Units	780
Sales ($800/unit)	$624,000
Variable costs ($450/unit)	$351,000
Contribution margin ($350/unit)	$273,000
Fixed costs	$150,000
Operating income	$123,000

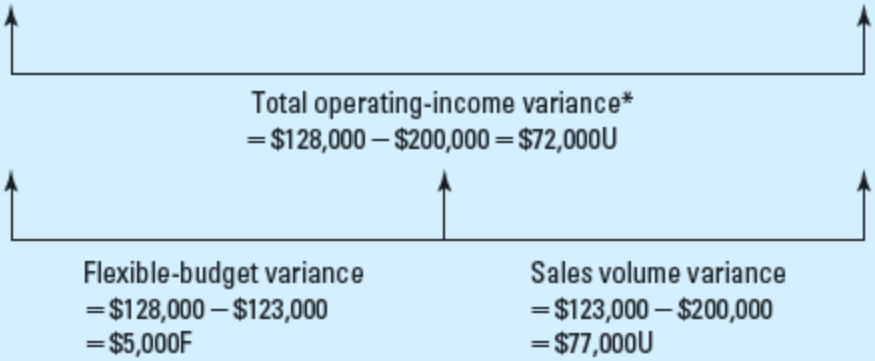
N.B.: Variable cost per unit = $400 manufacturing + $50 selling

Decomposing the Total Operating Income Variance ($72,000 U)

SCHMIDT MACHINERY COMPANY
Analysis of Financial Results
For October 2013

	(1) Actual	(2) Flexible-Budget Variances	(3) Flexible Budget	(4) Sales Volume Variances	(5) Master (Static) Budget
Units	780	0	780	220U	1,000
Sales	$639,600	$15,600F	$624,000	$176,000U	$800,000
Variable costs	350,950	50F	351,000	99,000F	450,000
Contribution margin	$288,650	$15,650F	$273,000	$ 77,000U	$350,000
Fixed costs	160,650	10,650U	150,000**	0	150,000**
Operating Income	$128,000	$ 5,000F	$123,000	$ 77,000U	$200,000

Analysis of Total Operating-Income Variance



*Also called the *total master (static) budget variance.*
**Budgeted fixed factory overhead cost = $120,000; budgeted fixed selling and administrative expense = $30,000.

Breakdown of Total Operating Income Variance ($72,000 U)

The difference between actual operating income and the flexible budget operating income = **$5,000 F**:

- This difference is called the *total flexible* (controllable) *budget variance*
- This variance captures the net effect of:
  - Actual selling prices per unit being different than planned
  - Actual variable cost per unit was different than planned
  - Actual total fixed costs were different than planned

Breakdown of Total Operating Income Variance

The difference between the flexible budget operating income and the master budget operating income = **$77,000 U**:

- This difference is called the *sales volume variance*
- Everything else other than volume is being held constant in calculating this variance; hence, the difference in operating income between the two budget columns is due entirely to sales volume being different than planned
- The sales volume variance can also be calculated as: budgeted cm per unit × (actual – budgeted) units
- In the example: $350/unit × 220 units = **$77,000 U**

Breakdown of Total Operating Income Variance: Summary

- Total Operating Income Variance = Actual Operating Income – Master Budget Operating Income

  = $128,000 – $200,000 = **$72,000 U**

- Flexible (Controllable) Budget Variance = Actual Operating Income – Flexible Budget Operating Income

  = $128,000 – $123,000 = **$5,000 F**

Breakdown of Total Operating Income Variance

- Sales Volume Variance = Flexible-Budget Operating Income – Master Budget Operating Income

  = $123,000 – $200,000 = **$77,000 U**

- Total Operating Income Variance = Flexible-Budget Variance + Sales Volume Variance

  = $5,000F + $77,000U = **$5,300 U**

Breakdown of Total Flexible-Budget Variance ($5,000 F)

Sales Price Variance

= Actual Sales $ – Flexible Budget Sales $

= $639,600 – $624,000 = **$15,600 F**

or, = AQ × (AP – SP)

= 220 units × ($820 – $800)/unit = **$15,600 F**

Breakdown of Total Flexible-Budget Variance ($5,000 F)

- Total Fixed Cost Variance = Actual Fixed Costs – Flexible Budget Fixed Cost

  = $160,650 – $150,000 = **$10,650 U**

- Note that this budget (spending) variance on fixed costs can be further broken down:
  - First, by functional categories (e.g., Marketing)
  - Second, by individual costs within categories (e.g., Sales Manager Salaries)

Breakdown of Total Flexible-Budget Variance ($5,000F)

- Total Variable Cost Variance = Actual Variable Costs – Flexible Budget Variable Costs

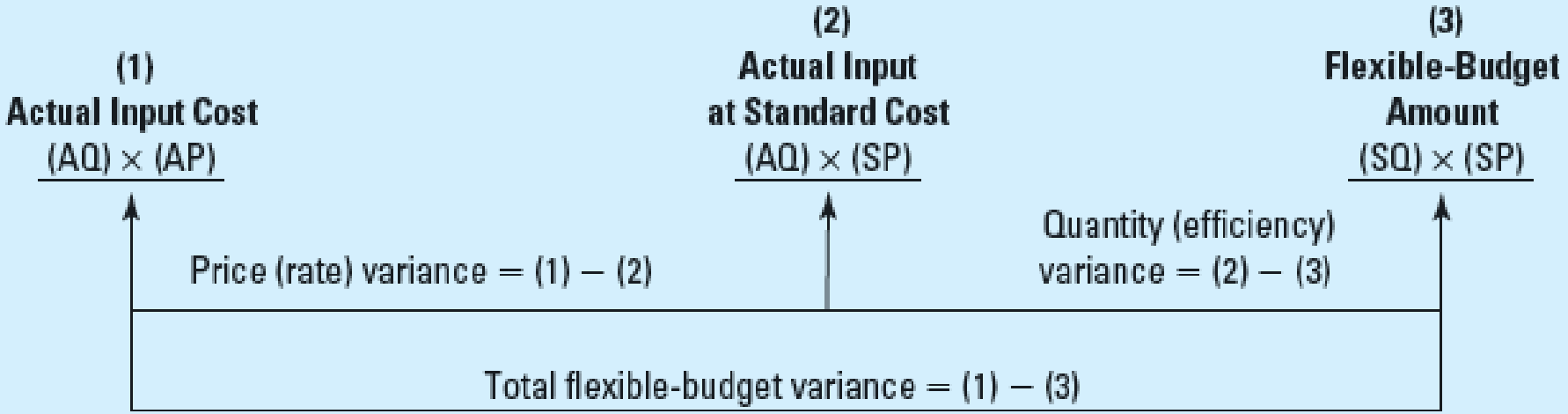
$$= \$350{,}950 - \$351{,}000 = \mathbf{\$50\ F}$$

or, $= AQ \times (AP - SP)$

$$= 780 \text{ units} \times (\$449.9359 - \$450.00)/\text{unit} = \mathbf{\$50\ F}$$

- This total variance can be further broken down:
  - First, by functional categories (e.g., Manufacturing)
  - Second, by individual costs within categories (e.g., Direct Materials Cost)

General Model for Analyzing Variable Cost Flexible Budget Variances



Legend:

AQ = Actual quantity of the resource (e.g., DM) purchased or used

AP = Actual cost per unit of the resource (e.g., per lb.)

SP = Standard cost per unit of the resource

SQ = Standard quantity of the resource that should have been used to produce the output for the period = Units of output × Standard resource input per unit of output

Formulas for Decomposing Variable Cost Flexible Budget Variances into Price and Quantity Components

- **Variable Cost Variance = Actual Variable Costs – Flexible Budget Variable Costs**

  = (AQ × AP) × (SQ × SP)

- **Breakdown of total variance:**
  - Price (Rate) Variance = AQ × (AP – SP)
  - Quantity (Efficiency) Variance = SP × (AQ – SQ)

Formulas for Decomposing Variable Cost Flexible Budget Variances into Price and Quantity Components

Notes:

- For DM: AQ in the Price Variance formula represents "actual quantity *purchased*"
- SQ = "standard quantity of resource input (e.g., DL) for the output of the period"
- In a standard cost system, these variances are recorded in the formal accounting records (i.e., each in a descriptive account, such as "Direct Labor Rate Variance")

Example: Direct Materials (DM) Variance Decomposition

Hanson Inc. has the following direct material standard to manufacture one unit of "Jerf":

1.5 pounds per Jerf at $4.00 per pound

Last month 1,700 pounds of material were purchased and used to make 1,000 Jerfs. The material cost a total of $6,630.

Direct Materials (DM) Variance: Question 1

What is the actual price per pound (AP) paid for the material?

a. $4.00 per pound.
b. $4.10 per pound.
c. $3.90 per pound.
d. $6.63 per pound.

Answer: Question 1

What is the actual price per pound (AP) paid for the material?

a. $4.00 per pound.
b. $4.10 per pound.
c. $3.90 per pound.
d. $6.63 per pound.

AP = $6,630 ÷ 1,700 lbs. = $3.90 per lb.

Direct Materials (DM) Variance: Question 2

Hanson's materials price variance (PV) for the month was:

a. $170 unfavorable.

b. $170 favorable.

c. $800 unfavorable.

d. $800 favorable.

Answer: Question 2

Hanson's materials price variance (PV) for the month was:

a. $170 unfavorable.
b. $170 favorable.
c. $800 unfavorable.
d. $800 favorable.

$$PV = AQ \times (AP - SP)$$
$$PV = 1{,}700 \text{ lbs.} \times (\$3.90 - 4.00)/\text{lb.} = \$170 \text{ Favorable}$$

Direct Materials (DM) Variance: Question 3

The standard quantity (SQ) of material that should have been used to produce 1,000 Jerfs is:

a. 1,700 pounds.

b. 1,500 pounds.

c. 2,550 pounds.

d. 2,000 pounds.

Answer: Question 3

The standard quantity of material (SQ) that should have been used to produce 1,000 Jerfs is:

a. 1,700 pounds.
b. 1,500 pounds.
c. 2,550 pounds.
d. 2,000 pounds.

SQ = 1,000 units × 1.5 lbs./unit = 1,500 lbs.

Direct Materials (DM) Variance: Question 4

Hanson's material usage variance (UV) for the month was:

a. $170 unfavorable.

b. $170 favorable.

c. $800 unfavorable.

d. $800 favorable.

Answer: Question 4

Hanson's material usage variance (UV) for the month was:

a. $170 unfavorable.
b. $170 favorable.
c. $800 unfavorable.
d. $800 favorable.

UV = SP × (AQ − SQ)
UV = $4.00 × (1,700 − 1,500) lbs. = $800 unfavorable

Hanson, Inc. Example: Summary

Actual Quantity × Actual Price	Actual Quantity × Standard Price	Standard Quantity × Standard Price
1,700 lbs. × $3.90 per lb.	1,700 lbs. × $4.00 per lb.	1,500 lbs. × $4.00 per lb.
$6,630	$ 6,800	$6,000

Price variance
$170 favorable

Usage variance
$800 unfavorable

Total Flexible Budget Variance = $6,630 - $6,000 = $630U

Causes of DM Variances

- **Price Variances:**
  - Purchase of materials of different grade
  - Quantity discounts
  - Freight/delivery expediting cost (“rush orders”)
- **Quantity Variances:**
  - Purchase of non-standard quality materials
  - Poorly trained or poorly supervised workers
  - Poorly maintained machinery (not calibrated properly)

Causes of DL Variances

- **Price (Rate) Variances:**
  - Labor substitution
  - Out-of-date standards (e.g., new labor contract)
- **Quantity (Efficiency) Variances:**
  - Poorly trained workers
  - Poor quality raw materials used in production
  - Poorly maintained equipment
  - Poor supervision of workers
  - Out-of-date standards

Standard Costs

Standard Costs vs. a *Standard Cost System?*

- Standard Costs = costs that should be incurred under efficient operating conditions
- Standard Cost System = standard costs recorded in the formal accounting records
- Regardless of whether a standard cost system is used, standard costs can be useful at the end of the period for *financial control purposes* (i.e., conducting variance analysis)

Standard Costs

- Types of Standards:
  - Ideal (Perfection) Standards
  - Continuous-Improvement Standards
  - Currently Attainable Standards
- Standard-Setting Procedures:
  - Authoritative Standards
  - Participative Standards
- Standard Cost Sheet:
  - Contains both price and quantity components of each cost

Recording Standard Costs: Hanson, Inc. Example

Recording DM Purchases:

Materials Inventory (AQ × SP)	$6,800	
Materials Purchase Price Variance	$ 170	
Accounts Payable (AQ × AP)		$6,630

Recording DM Usage:

Work-in-process Inventory (SQ × SP)	$6,000	
Materials Usage Variance	$ 800	
Materials Inventory (AQ × SP)		$6,800

The Strategic Role of Nonfinancial Performance Indicators

- Limitations of short-term financial-performance indicators?
- Need to focus on business processes, including:
  - operating processes
  - customer-management processes
  - innovation processes
  - social/regulatory processes

The Strategic Role of Nonfinancial Performance Indicators

- Example: Operating Process—Assessing the Move to JIT
- *Costs* of Implementing JIT?
- *Benefits* of Implementing JIT:
  - reduction in out-of-pocket inventory carrying costs
  - reduction in inventory holding (i.e., opportunity) costs
  - increases in sales, productivity, and market share
  - decreased production costs
- Relevant *nonfinancial performance indicators*:
  - customer-response time (CRT)
  - process cycle efficiency

Summary

- We defined the terms *control systems, management accounting & control systems, short-term financial control*, and *operational control systems*
- We discussed the development of *standard costs* for product costing, performance evaluation, and control
- We distinguished between *flexible budgets* and *master budgets*; the former are key for evaluating short-term financial performance (i.e., for financial control purposes)

Summary

- The difference between actual operating income and master budgeted operating income = total operating income variance
  - Also called “total master (static) budget variance”
- Through the introduction of a *flexible budget* based on actual output, the total operating income variance is broken down into:
  - A *total flexible-budget variance*, and
  - A *sales-volume variance* = budgeted cm/unit × (actual – budgeted) sales in units

Summary

- The *total flexible-budget variance* is then broken down into component variances:
  - Total variable manufacturing cost variance
  - Total variable selling & administrative cost variance
  - Total fixed manufacturing cost variance
  - Total fixed selling & administrative cost variance
- Further breakdown of the total variable manufacturing cost variance:
  - Total DM variance
  - Total DL variance
  - Total variable overhead variance

Summary

- Breakdown (decomposition) of total DM variance:
  - DM Price Variance:

    $= AQ \times (AP - SP)$
  - DM Quantity Variance:

    $= SP \times (AQ - SQ)$
- Breakdown (decomposition) of total DL variance:
  - DL Price (Rate) Variance:

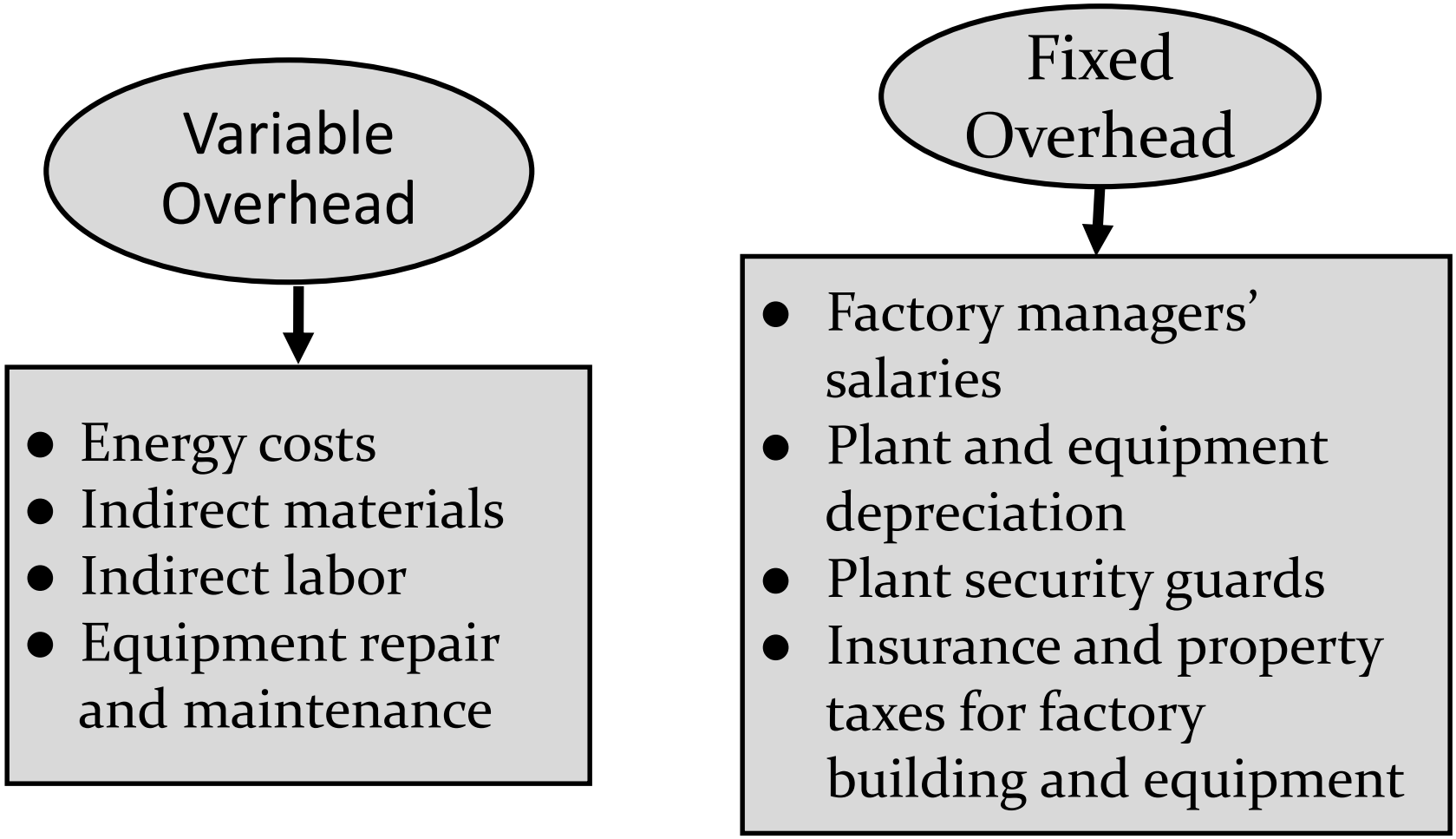
    $= AQ \times (AP - SP)$
  - DL Quantity (Efficiency) Variance:

    $= SP \times (AQ - SQ)$

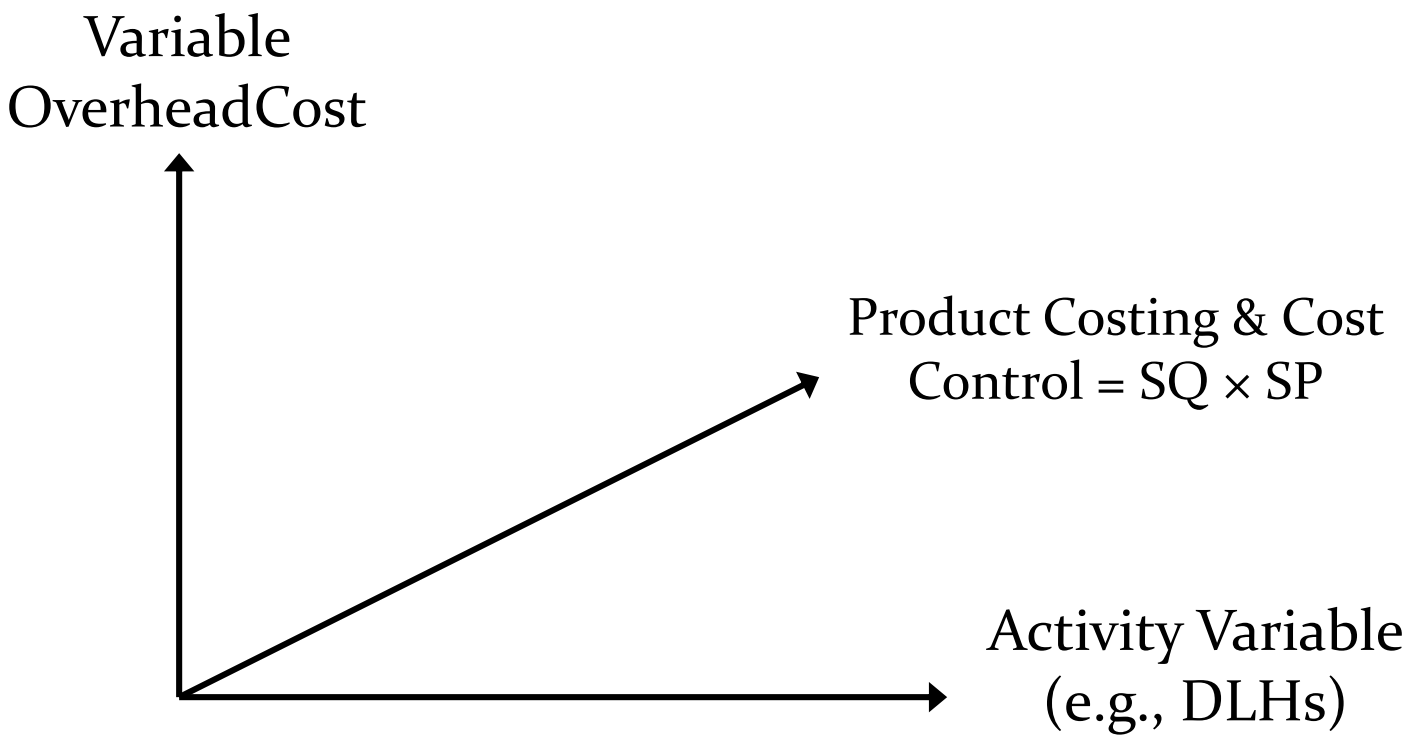
Summary

- We discussed how to record manufacturing cost flows and associated variances in a *standard cost system*
  - Standard cost variance analysis for overhead costs
  - The end-of-period disposition of standard cost variance accounts
- Finally, we discussed the strategic role of nonfinancial performance indicators for operational control purposes
  - The basic idea is the need to control business processes, such as operating processes

Manufacturing (Factory) Overhead Costs: Examples

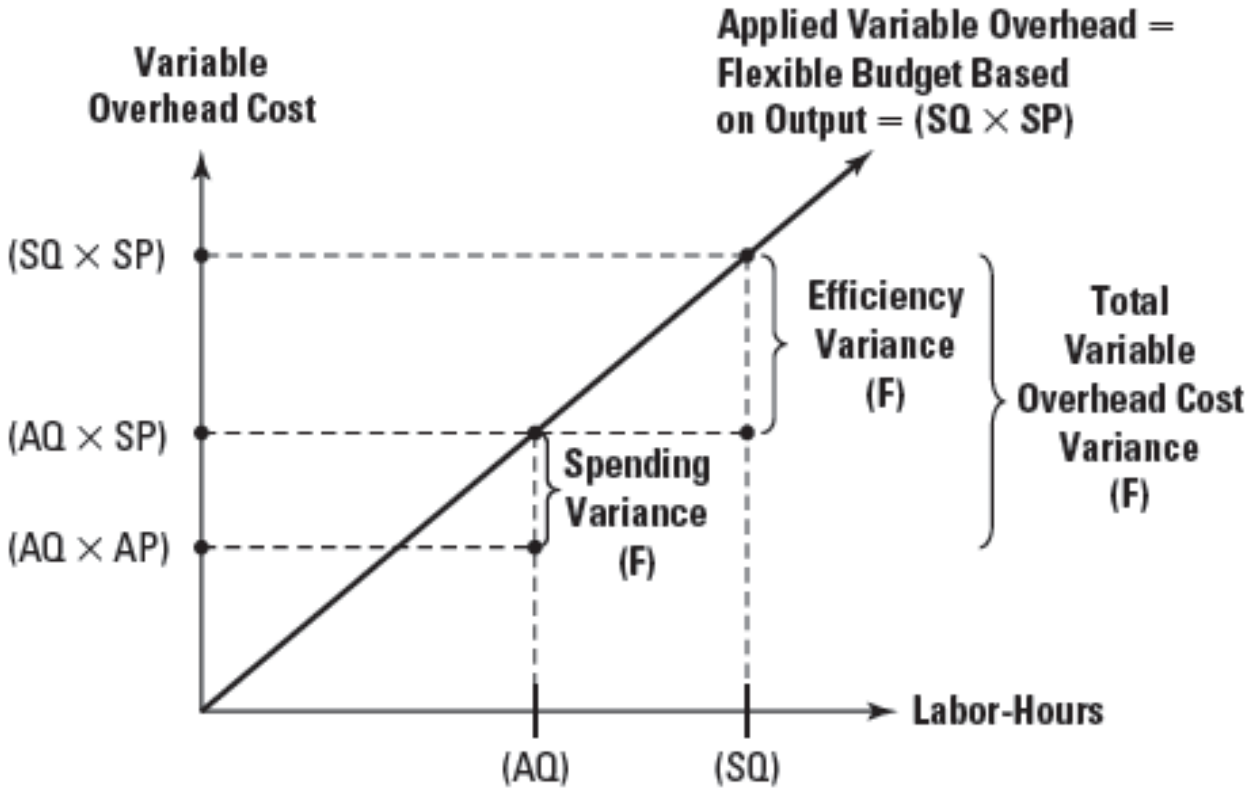


Standard Variable Overhead Costs: Product Costing vs. Control



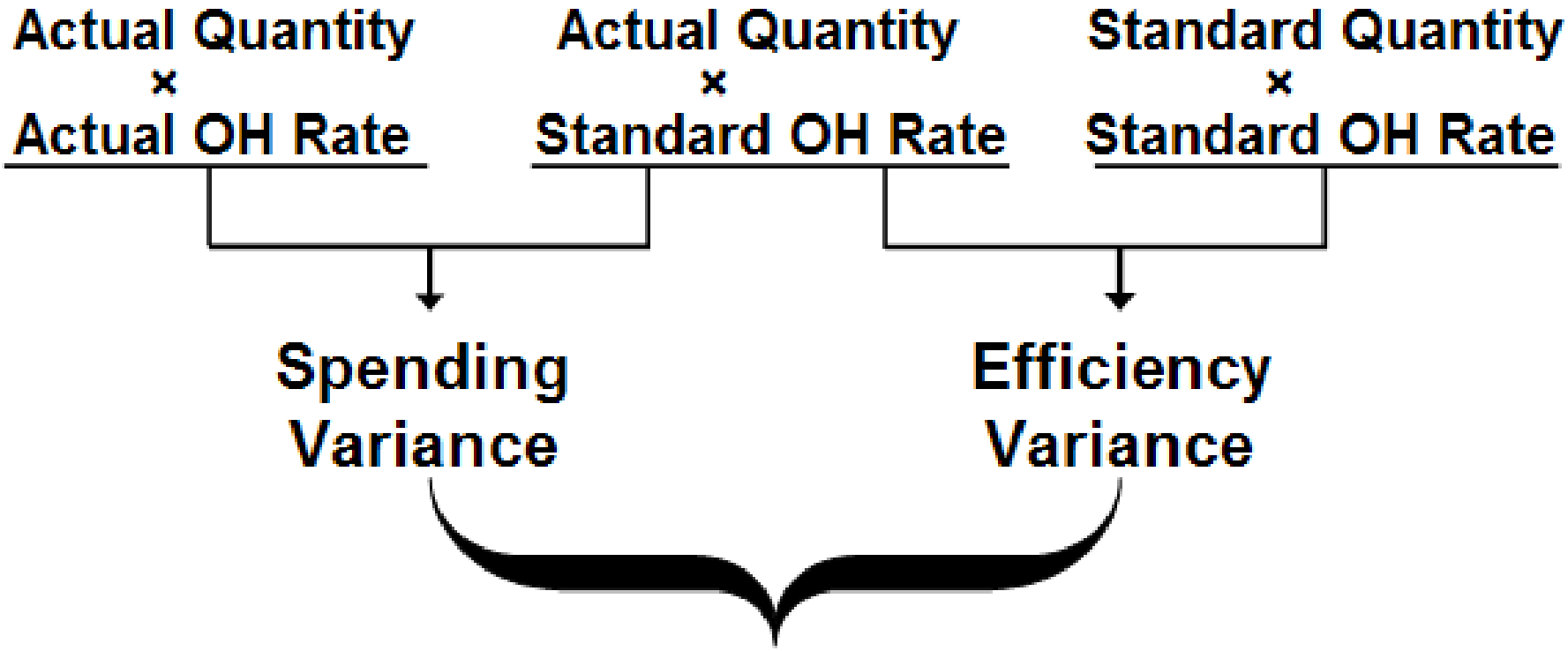
SQ = Standard allowed DLHs for units produced; SP = Standard *variable* overhead cost/DLH

Variable Overhead Variance Analysis



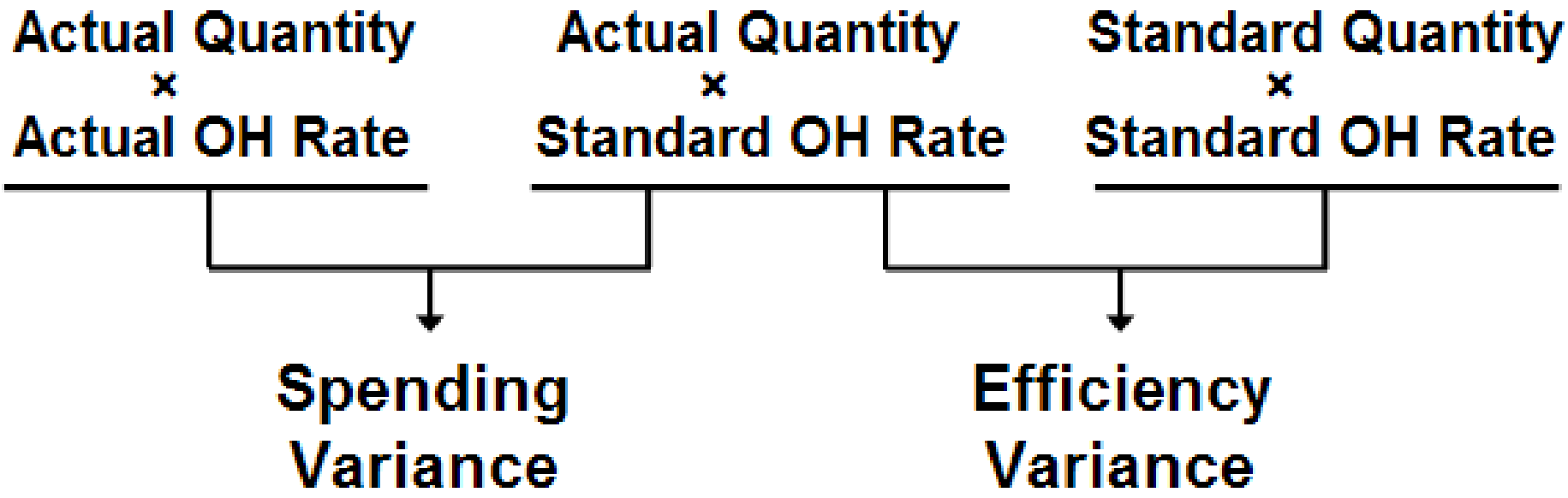
Legend: SQ = Standard direct labor-hours allowed for units produced = 5 hours/unit × 780 units = 3,900 hours
SP = Standard variable overhead cost per labor-hour = $12 (see Exhibit 15.2)
AQ = Actual labor-hours worked = 3,510 hours (Exhibit 14.6)
AP = Actual variable overhead cost per labor-hour worked = $40,630 ÷ 3,510 = $11.5755 (rounded)
Total variable overhead variance = Spending variance + Efficiency variance
F = A favorable effect on operating income

Variable Overhead Variance Analysis: Equation Approach



The total variance is the flexible budget variance.

Variable Overhead Variance Analysis: Equation Approach



AQ x (AR - SR)	SR x (AQ - SQ)
AQ = Actual Quantity	SR = Standard Rate
AR = Actual Rate	SQ = Standard Quantity

Variable Overhead Variance Analysis: Example Calculations

Schmidt Machinery Co. applies variable factory overhead on the basis of DLHs. Hanson has the following variable factory overhead standard to manufacture one unit of product:

5.0 standard DLHs per unit @ a standard variable overhead rate of $12.00 per DLH

In October 2010, 3,510 hours were worked to make 780 units, and $40,630 was spent for variable factory overhead

Variable Overhead Variance Analysis: Example Calculations

Actual Hours	Actual Hours	Standard Hours
x	x	x
Actual Rate	Standard Rate	Standard Rate
3,510 DLHs	3,510 DLHs	3,900 DLHs
x	x	x
$11.5755/DLH	$12.00/DLH	$12.00/DLH
$40,630	**$42,120**	**$46,800**



Spending Variance	Efficiency Variance
$1,490 F	**$4,680 F**

Variable Overhead Variance Analysis: Alternative Presentation Format

Total Variable Overhead Variance = Actual Variable Overhead – Flexible Budget for Variable Overhead

= $40,630 – $46,800 = **$6,170 F**

Variable Overhead *Spending* Variance = AQ × (AP – SP)

= 3,510 DLHs × ($11.5755 – $12.00)/DLH = **$1,490 F**

Variable Overhead *Efficiency* Variance = SP x (AQ – SQ)

= $12.00/DLH x (3,510 – 3,900) DLHs = **$4,680 F**

Interpretation of Variable Overhead Cost Variances

Spending Variance

Results from spending more or less than expected for overhead items such as supplies and utilities.

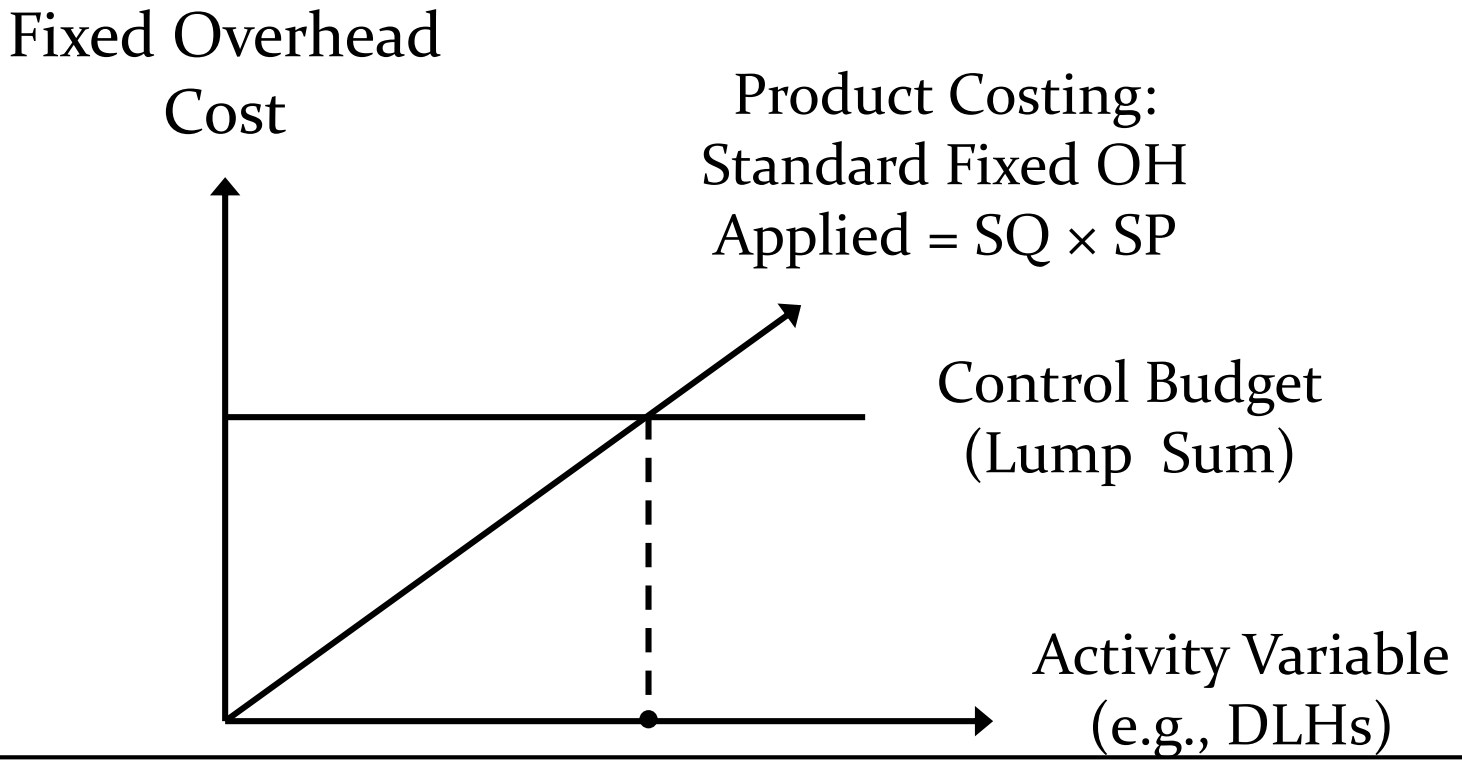


Efficiency Variance

Reflects efficiency or inefficiency in the use of the selected activity measure; does *not* reflect overhead control.



Standard Fixed Overhead Cost: Planning vs. Control



SQ = Standard allowed DLHs for units produced; SP = Standard *fixed* overhead cost/DLH; denominator volume = no. of DLHs used to set the fixed overhead application rate.

Product Costing: Determining the Standard Fixed Overhead Application Rate

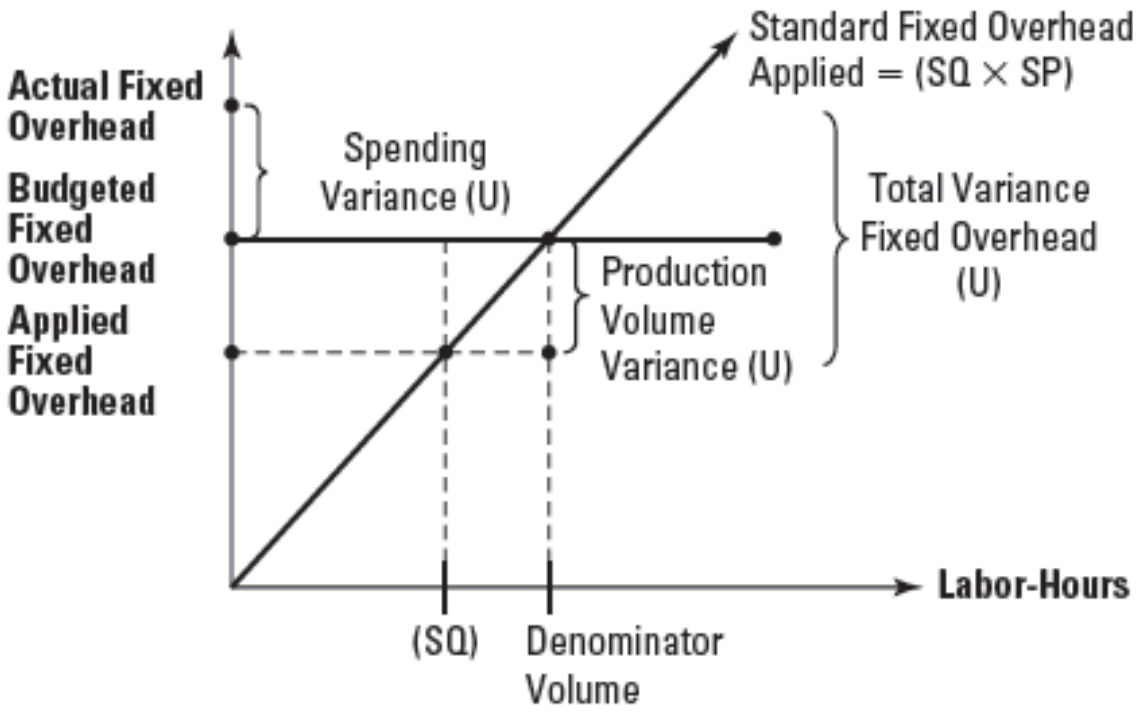
❶ Determine the total budgeted fixed manufacturing overhead for the upcoming period

❷ Select an activity variable for applying fixed factory overhead costs to outputs

❸ Choose a denominator volume level for the selected activity variable(e.g., “practical capacity”)

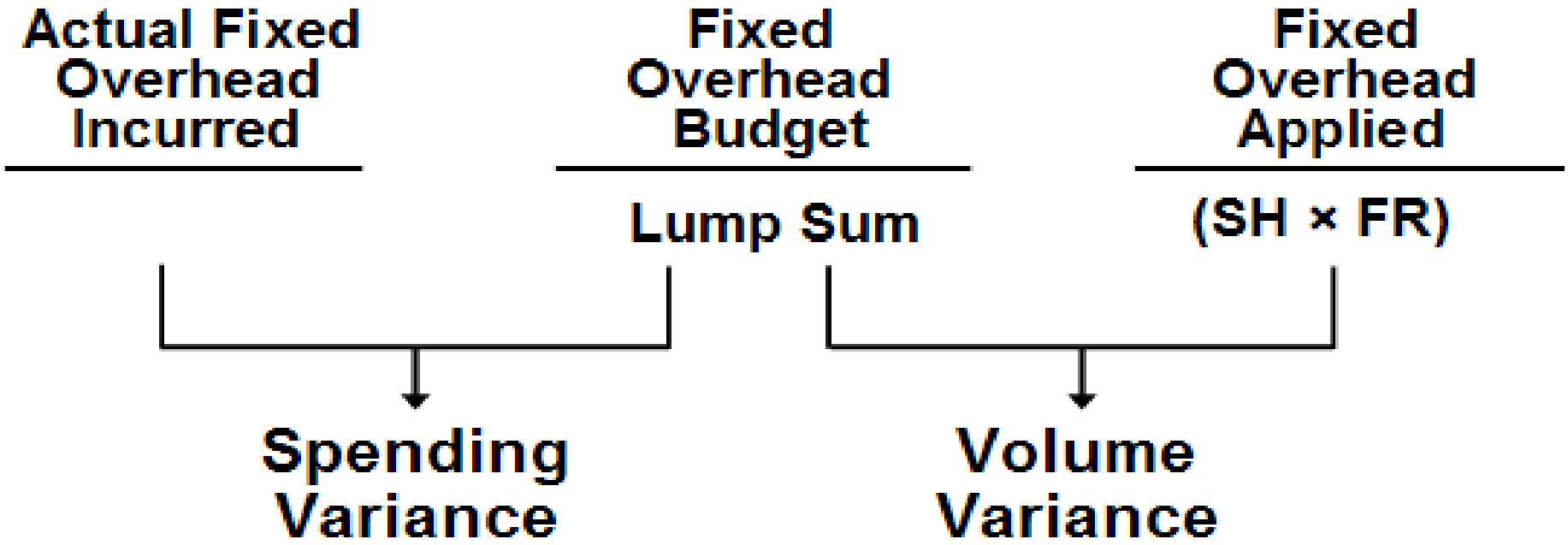
❹ Divide the amount in Step 1 by the amount in Step 3 to determine the standard fixed overhead application rate for product-costing purposes

Fixed Overhead Variance Analysis



Legend: SQ = Standard labor-hours allowed for units produced = 5 × 780 = 3,900 hours
Denominator volume = Number of labor-hours used to determine the fixed overhead application rate = 5,000 (i.e., 1,000 units × 5 hours/unit)
Budgeted fixed overhead = $120,000 (assumed)
SP = Standard fixed overhead cost per labor-hour = $120,000 ÷ 5,000 = $24 (see Exhibit 15.2)
Actual fixed overhead = $130,650 (assumed)
Total fixed overhead variance = Spending variance + Production volume variance

Calculating Fixed Overhead Variances



FR = Standard Fixed Overhead Rate; SH = Standard Hours Allowed

Example: Calculating Fixed Overhead Variances

Schmidt's budgeted fixed manufacturing overhead cost is $120,000 for October 2010. The budgeted activity measure for the month is 1,000 units (@ 5 DLHs/unit).

Actual production is 780 units and actual fixed overhead is $130,650 for the month.

Compute the fixed overhead *spending* and *production volume* variances.

$$FR = \frac{\$120{,}000 \text{ budgeted fixed overhead}}{5{,}000 \text{ DLHs}} = \$24.00/\text{DLH}$$

Example: Calculating Fixed Overhead Variances

Actual Fixed Overhead Incurred	Budgeted Fixed Overhead	Fixed Overhead Applied (780 units x 5 DLHs/unit x $24.00/DLH)
$130,650	**$120,000**	**$93,600**



Spending Variance	Production Volume Variance
$10,650 U	**$26,400 U**

Fixed Overhead Variance Analysis: Alternative Presentation Format

Total Fixed Overhead Variance = Actual Fixed Overhead – Fixed Overhead Applied to Production

= $130,650 – $93,600 = **$26,400 U** (also called *Under*applied fixed overhead)

Fixed Overhead Spending (Budget) Variance

= Actual Fixed Overhead – Budgeted Fixed Overhead

= $130,650 – $120,000 = **$10,650 U**

Fixed Overhead Production Volume Variance

= Budgeted Fixed Overhead – Applied Fixed Overhead

= $120,000 - $93,600 = **$26,400 U**

Fixed Overhead Production Volume Variance: Alternative Calculation

Fixed Overhead Production Volume Variance = Standard Fixed Overhead Application Rate × (Actual Units Produced – Denominator Volume, in units)

= $120.00/unit × (780 – 1,000) units

= **$26,400 U** (i.e., *under*applied fixed overhead)

Interpretation of Fixed Overhead Variances

Spending (Budget) Variance

Results from spending more or less than expected for individual fixed overhead items. That is, spending on individual fixed overhead items was different than planned.

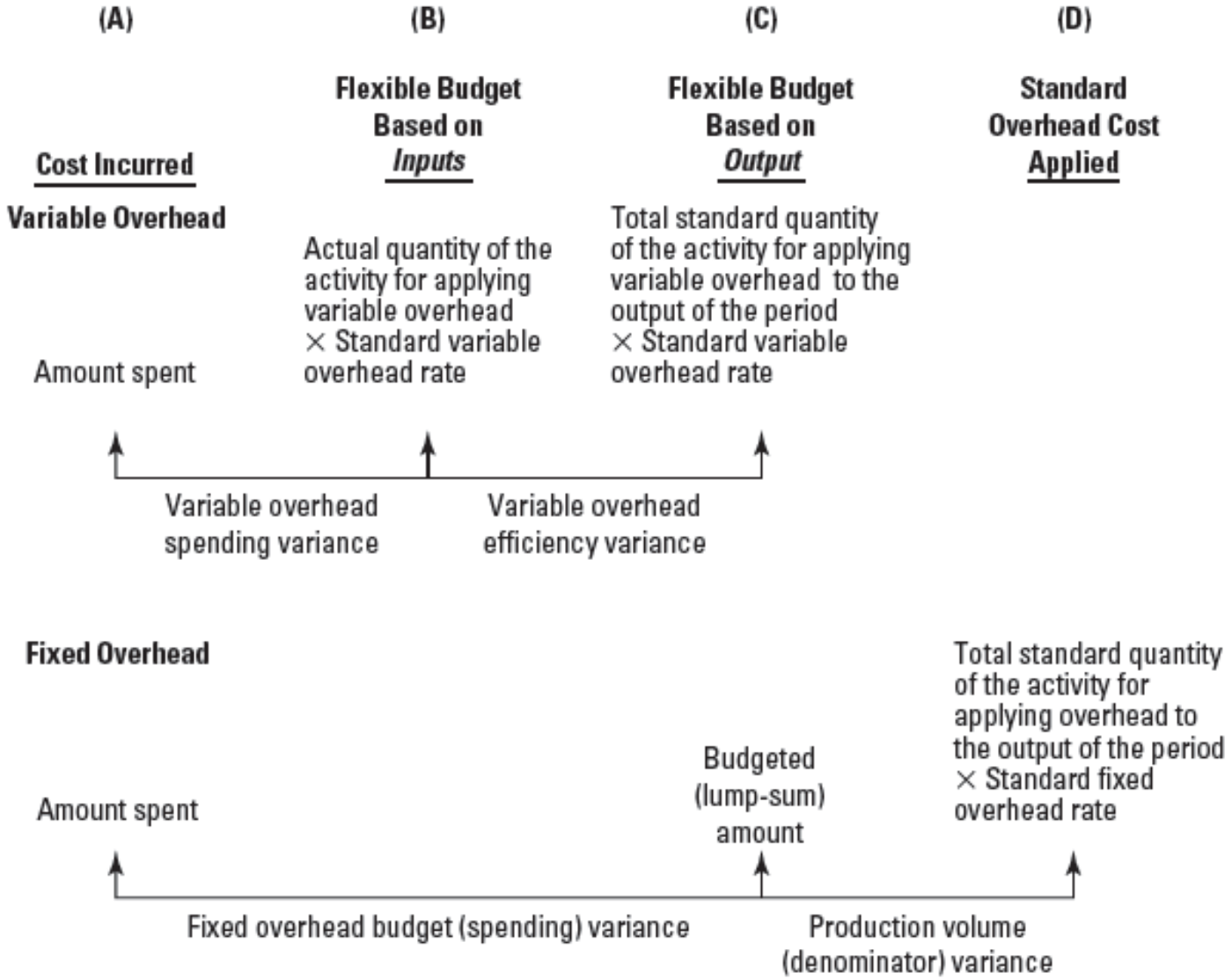
Production Volume Variance

Results from operating at a level other than the denominator volume level. Arises because of the *product-costing* purpose of fixed overhead. Not of direct interest for control purposes.

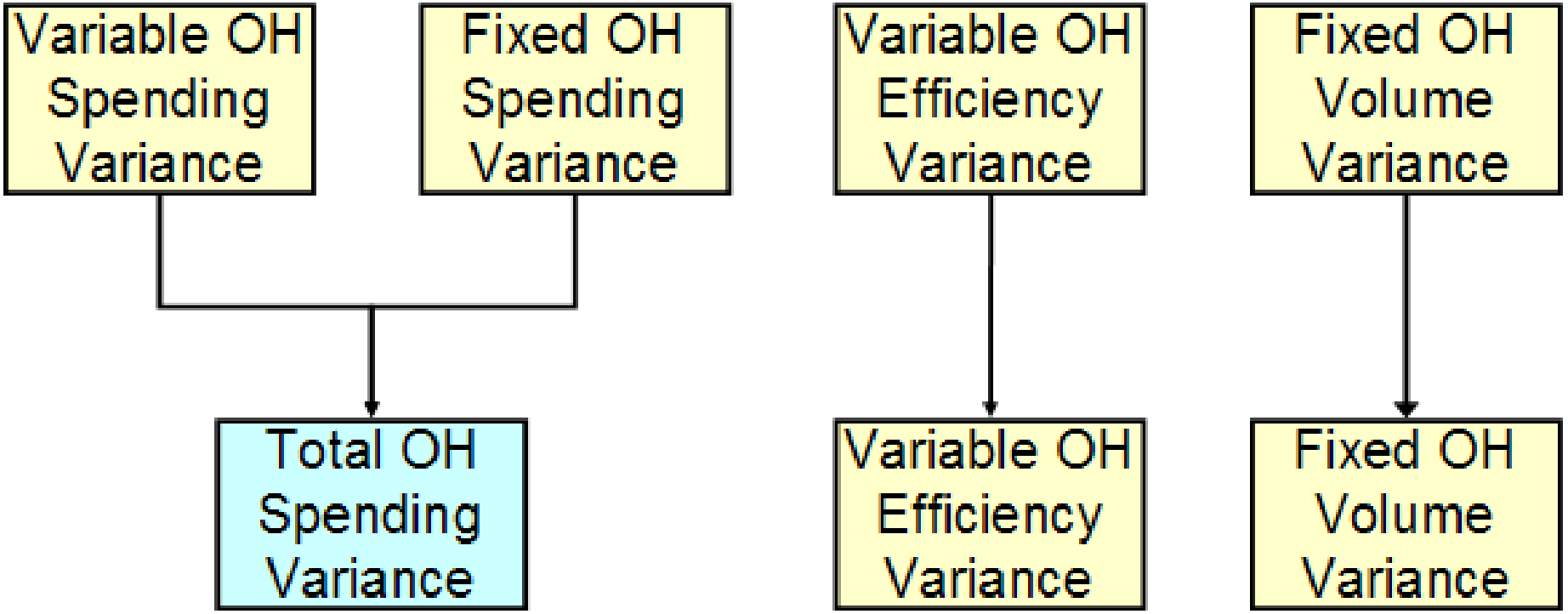
Causes of Fixed Overhead Variances

- Spending (Budget) Variance:
  - Ineffective budget procedures
  - Inadequate control of costs
  - Misclassification of cost items
- Production Volume Variance:
  - Management decisions
  - Unexpected changes in market demand
  - Unforeseen problems in manufacturing operations

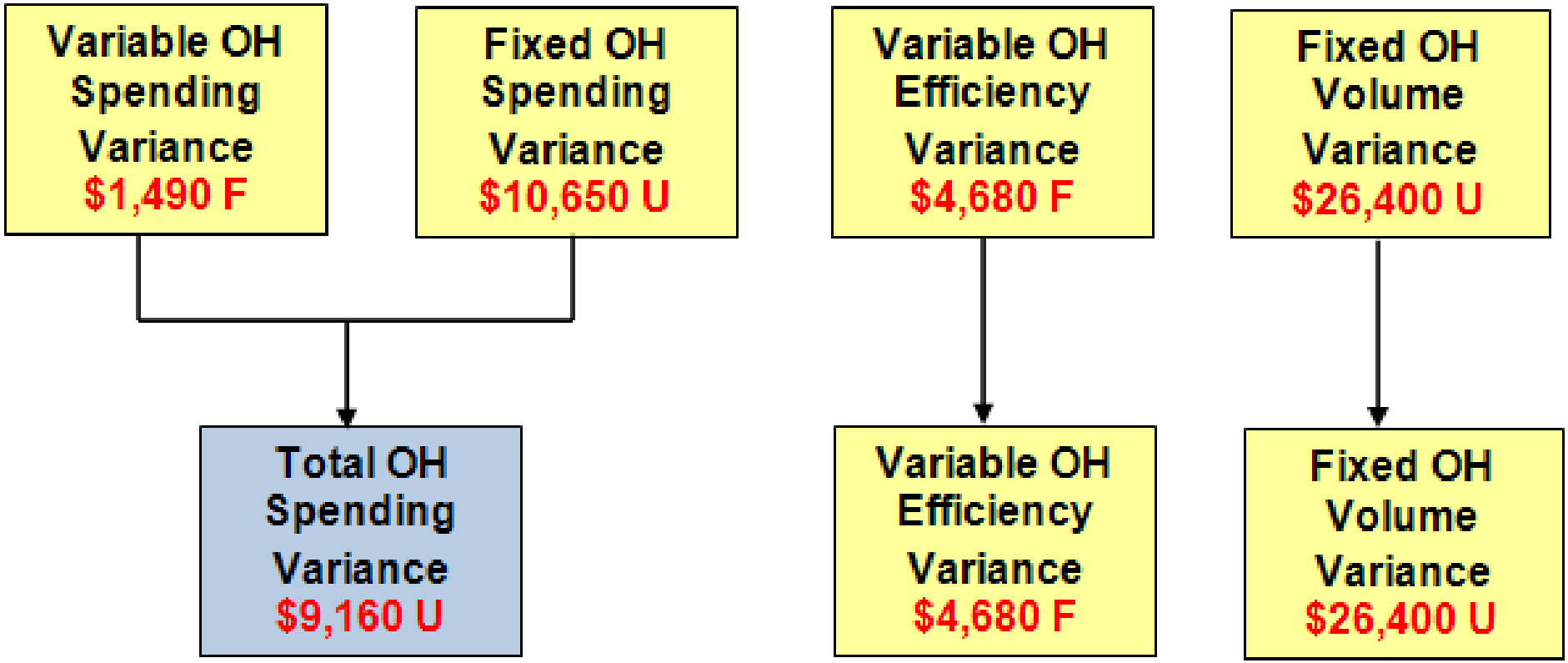
Four-Way Breakdown of the Total Overhead Variance: Summary



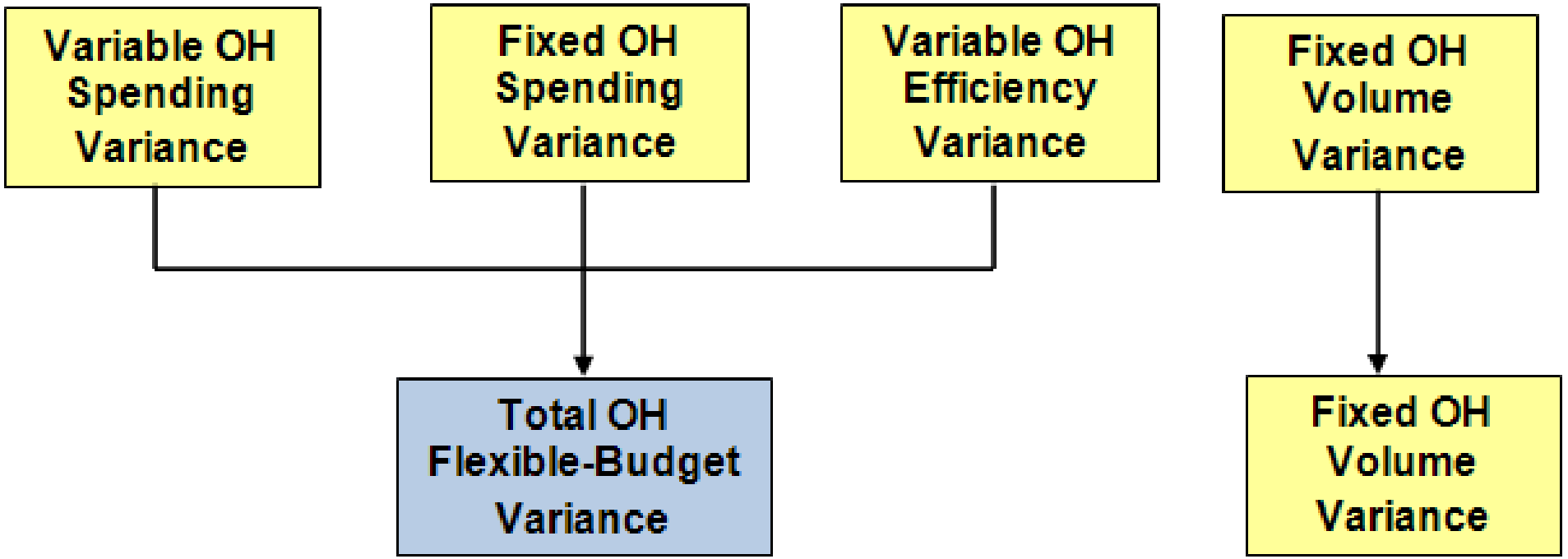
Alternative Analysis: Three-Way Breakdown of the Total Overhead Variance



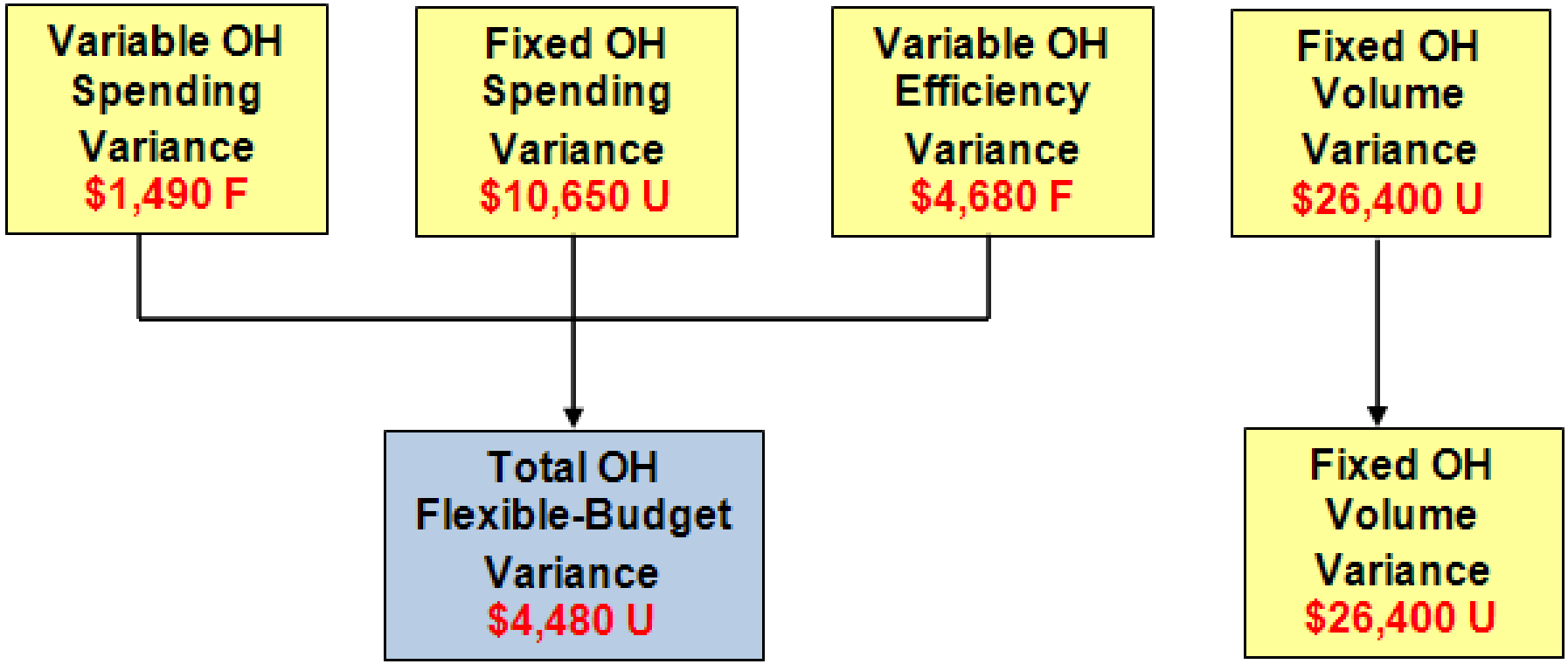
Schmidt Company: Three-Way vs. Four-Way Analysis of Total Factory Overhead Variance



Two-Way Analysis of Total Factory Overhead Variance



Schmidt Company: Two-Way Analysis of Total Factory Overhead Variance



Disposition of Standard Manufacturing Cost Variances

Schmidt Company
Manufacturing Cost Variances

From Chapter 14:	
DM purchase price variance	$ 4,350 U
DM usage variance	10,350 U
DL rate variance	7,020 U
DL efficiency variance	15,600 F
From Chapter 15:	
Variable factory overhead spending variance	1,490 F
Variable factory overhead efficiency variance	4,680 F
Fixed overhead spending variance	10,650 U
Fixed overhead production volume variance	26,400 U
Net manufacturing cost variance	$ 37,000 U

Alternative 1: Close Net Manufacturing Cost Variance to CGS

Dr. CGS (net variance)	**$37,000**	
Dr. DL Efficiency Variance	15,600	
Dr. VOH Efficiency Variance	4,680	
Dr. VOH Spending Variance	1,490	
Cr. DM Purchase Price Variance		$4,350
Cr. DM Quantity (Efficiency) Variance		10,350
Cr. DL rate variance		7,020
Cr. FOH spending variance		10,650
Cr. FOH Production Volume Variance		26,400

Income Statement after Disposition of Net Manufacturing Cost Variance

SCHMIDT MACHINERY COMPANY
Income Statement
For 2013

Sales (Exhibit 14.4), at standard selling price	$624,000	
Add: Selling price variance (Exhibit 14.4)	15,600F	
Net sales, at actual selling price		$639,600
Cost of goods sold (at standard: 780 units × $520/unit) (Exhibit 15.2)	$405,600	
Add: Net manufacturing cost variance	+37,000U†	
Total cost of goods sold		442,600
Gross margin		$197,000
Selling and administrative expenses ($39,000 variable + $30,000 fixed)		69,000
Operating income (before disposition of sales volume variance)		$128,000

Alternative 2: Prorate (Allocate) Net Manufacturing Cost Variance

- If the net variance is considered *material*, then the variance should be allocated (prorated) to the Inventory and CGS accounts
- Allocation should be based on the relative amount of this period's standard cost in the end-of-period balance of each affected account
- For external-reporting purposes, the provisions of FAS #151 regarding the treatment of "abnormal amounts" of idle-capacity expense must be followed

Effects on Absorption Costing Income of Denominator-Level Choice for Allocating Fixed Overhead Costs

- The issue: management's ability to *manage (or "smooth") reporting earnings*
- This ability is related to alternative treatments (dispositions) of the production volume variance
- The amount of fixed overhead cost absorbed into inventory or released as an expense on the income statement is affected by the denominator chosen for the fixed overhead application rate
- Income manipulation can occur if the production-volume variance is written off entirely to CGS

Standard Costs Applied to Service Organizations

- Jobs with repetitive tasks lend themselves to efficiency measures
- Computing non-manufacturing efficiency variances requires some assumed relationship between input and output activity



Examples

Service Applications

Department	Input	Output
Mailing	Labor hours	Number of pieces mailed
Personnel	Labor hours	Number of personnel changes processed
Food service	Labor hours	Number of meals served
Consulting	Billable hours	Customer revenues
Nursing	Labor hours	Number of patients and/or procedures
Check Processing	Computer hours	Number of checks processed

Overhead Cost Variances in ABC Systems

Traditional Approach to Product Costing :

Cost Item	Variable	Per	Fixed
Direct materials	$20	Unit	
Direct labor	30	DLH	
Indirect materials	2	DLH	
Repair and Maintenance	5	DLH	
Receiving			$5,000
Engineering Support			30,000
Setup			75,000

Traditional Financial-Performance Report

Cost Item	Actual Cost	Flexible Budget Based on Output	Flexible Budget Variance	
Direct materials	$50,000	$40,000	$10,000	U
Direct labor	36,000	30,000	6,000	U
Indirect materials	3,000	2,000	1,000	U
Repair and Maintenance	6,500	5,000	1,500	U
Receiving	3,000	5,000	2,000	F
Engineering Support	30,000	30,000	30,000	
Setup	50,000	75,000	25,000	F
Total	$178,500	$187,000	$8,500	F

Flexible Budget Using ABC

Cost Item	Flexible Budget	
Direct materials	$40,000	(2,000 × $20)
Direct labor	30,000	(2,000 × 0.5 × $30)
Indirect materials	2,000	(1,000 × $2)
Repair and Maintenance	6,000	(300,000 × $0.01) + $3,000
Receiving	3,500	(2 × $1,500) + $500
Engineering Support	30,000	($30,000 per period)
Setup	50,000	(2 × $25,000)
Total	$161,500	

Financial-Performance Report Using ABC

Cost Item	Actual Cost	Flexible Budget	Variance	
Direct materials	$50,000	$40,000	$10,000	U
Direct labor	36,000	30,000	6,000	U
Indirect materials	3,000	2,000	1,000	U
Repair and Maintenance	6,500	6,000	500	U
Receiving	3,000	3,500	500	F
Engineering Support	30,000	30,000		
Setup	50,000	50,000		
Total	$178,500	$161,500	$17,000	U

Flexible-Budget Analysis under ABC When There is a Standard Batch Size for Production Activity

- this situation provides the opportunity for a more detailed analysis

- variable setup costs under ABC:
  - convert actual output to standard # of batches
  - convert the above to standard setup hours

Flexible-Budget Analysis under ABC When There is a Standard Batch Size for Production Activity

- flexible budget cost for variable overhead = standard allowed hours × standard variable overhead cost per setup hour
- calculate flexible-budget variance for variable setup cost
- decompose flexible-budget variance into *spending* and *efficiency* components

Extensions of ABC Analysis: GPK and Resource Consumption Accounting (RCA)

- GPK (~ flexible standard costing) is a detailed German cost-accounting system
- RCA = comprehensive cost-management system represented (approximately) as a cross between GPK and ABC
- These systems rely on a large number of cost centers and cost pools
- Most appropriate with highly routine and repetitive operations

The Variance-Investigation Decision



How do I know which variances to investigate?



Larger variances, in dollar amount or as a percentage of the standard, are investigated first.

The Variance Investigation Decision

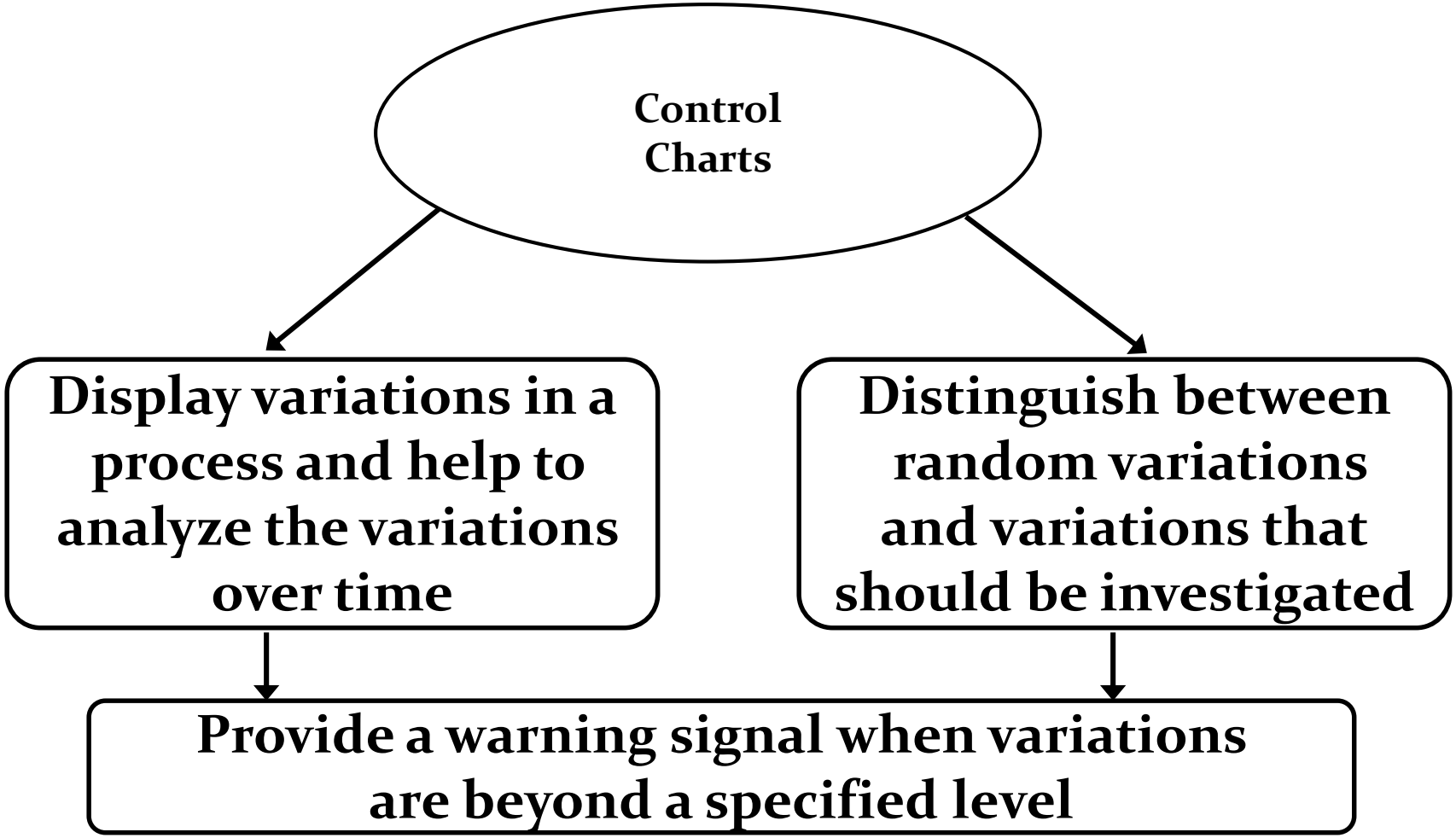
Uncontrollable (random) variances:

- Random Error

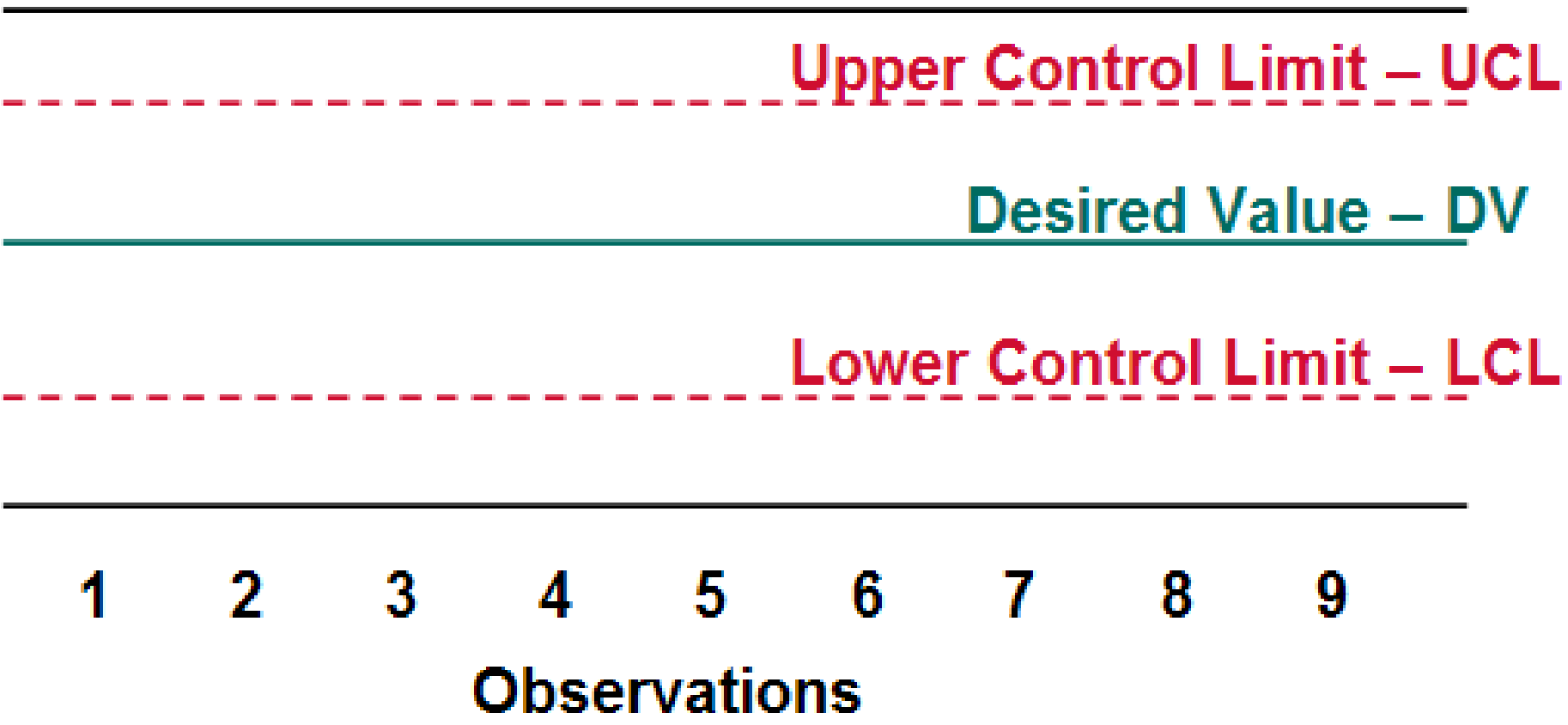
Controllable (systematic) variances:

- Prediction error
- Modeling error
- Measurement error
- Implementation error

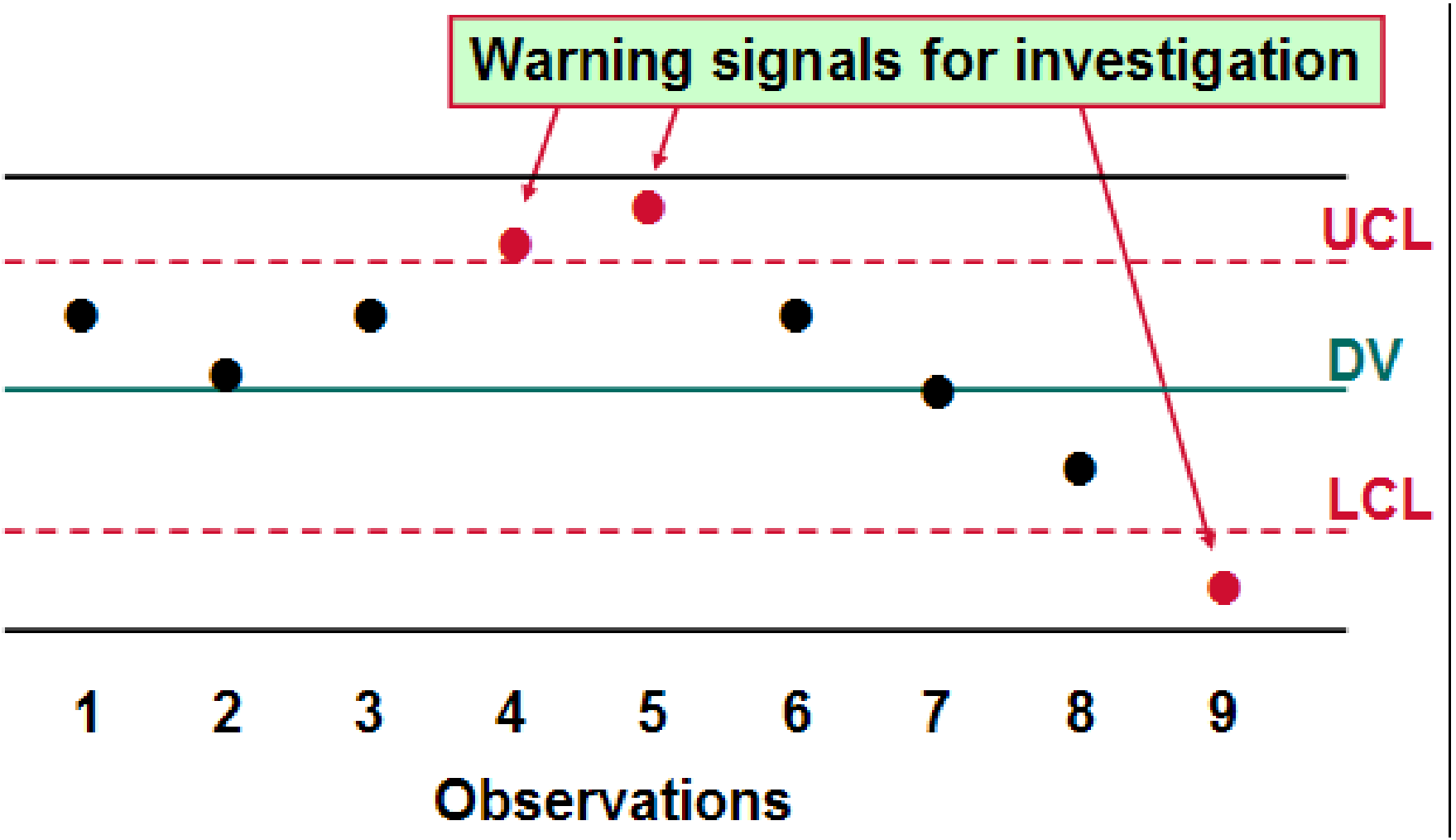
Role of Control Charts to Help Distinguish Random vs. Systematic Cost Variances



Control Charts



Control Charts



Appendix: Variance Investigation Decisions Under Uncertainty

	States of Nature	
Action	**Random**	**Nonrandom**
Investigate	I	$I + C$
Do not investigate	none	L

Where: I = cost of an investigation

C = the cost to correct a variance

L = present value of losses by not correcting the variance

Appendix: Variance Investigation Decisions—Indifference Probability

$$E(\text{Investigate}) = [(\text{I} + (1 - p)] + [(\text{I} + \text{C}) \times p]$$

$$E(\text{Do not investigate}) = \text{L} \times p$$

Set the above two equations equal, solve for p, the indifference probability:

$$p = \text{I} \div (\text{L} - \text{C})$$

Appendix: Variance Investigation Decisions—Expected Value of Perfect Information

EVPI = Expected cost with perfect information – Expected cost without perfect information

EVPI = Expected cost with perfect information – Expected value of cost-minimizing choice under uncertainty

EVPI = Maximum amount a rational manager would pay for perfect information

Summary

We distinguished between the *product-costing* and *control* purposes of standard costs for manufacturing (factory) overhead costs:

- For *variable* overhead costs, we saw that these two purposes are the same
- For *fixed* overhead costs, these purposes are different

Summary

For product-costing purposes, we defined the total overhead variance for the period as the difference between the *actual overhead costs incurred* and the *overhead costs applied to production* using the overhead application rate

- We saw that this total variance is also referred to as the “total over- or under-applied” overhead for the period

Summary

The total overhead variance for the period can be decomposed using a four-way, three-way, or two-way analysis:

- *Four-way analysis* = variable overhead spending variance + variable overhead efficiency variance + fixed overhead spending (budget) variance + fixed overhead production volume variance
- *Three-way analysis* = total overhead spending variance + variable overhead efficiency variance + fixed overhead production volume variance
- *Two-way analysis* = flexible (controllable) budget variance + fixed overhead production volume variance

Summary

- We discussed how to record standard overhead costs in the accounting records and how standard cost variances for product-costing purposes are disposed of at the end of the accounting period

- We learned how traditional and ABC approaches to overhead cost analysis differ in terms of insights provided to management; further, we learned about additional insights into cost control are possible when production is characterized by a standard lot size

- We briefly discussed alternative comprehensive costing systems (viz., GPK and RCA) that, under certain circumstances can yield more relevant information for short-term cost-control purposes

Summary

- We discussed different types of standard-cost variances as well as the indicated managerial action associated with each type
- We covered the use of control charts, including statistical control charts, for monitoring activities and ensuring financial control
- Finally, we presented in the Appendix a formal decision approach to the variance-investigation decision under uncertainty; this decision model involved the use of “pay-off” tables and included the calculation of an “indifference probability” and the expected value of perfect information (EVPI)

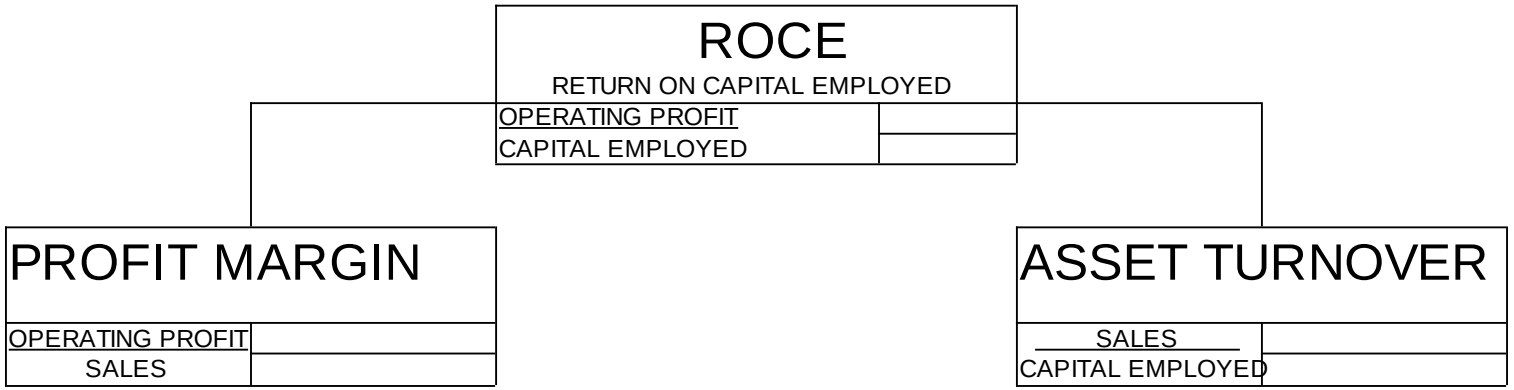
Budgeting for non-financial measures - introducing the Balanced Scorecard

Broadening performance measurement systems

- Why do we need to measure performance?

Traditional View of Performance

A HIERARCHY OF FINANCIAL RATIOS - DUPONT ANALYSIS



CAPITAL EMPLOYED = FIXED ASSETS + WORKING CAPITAL

FIXED ASSETS
WORKING CAPITAL

The Drive toward Shareholder Value (EVA®)

EVA – Economic Value Added



NOPLAT – Capital Charge

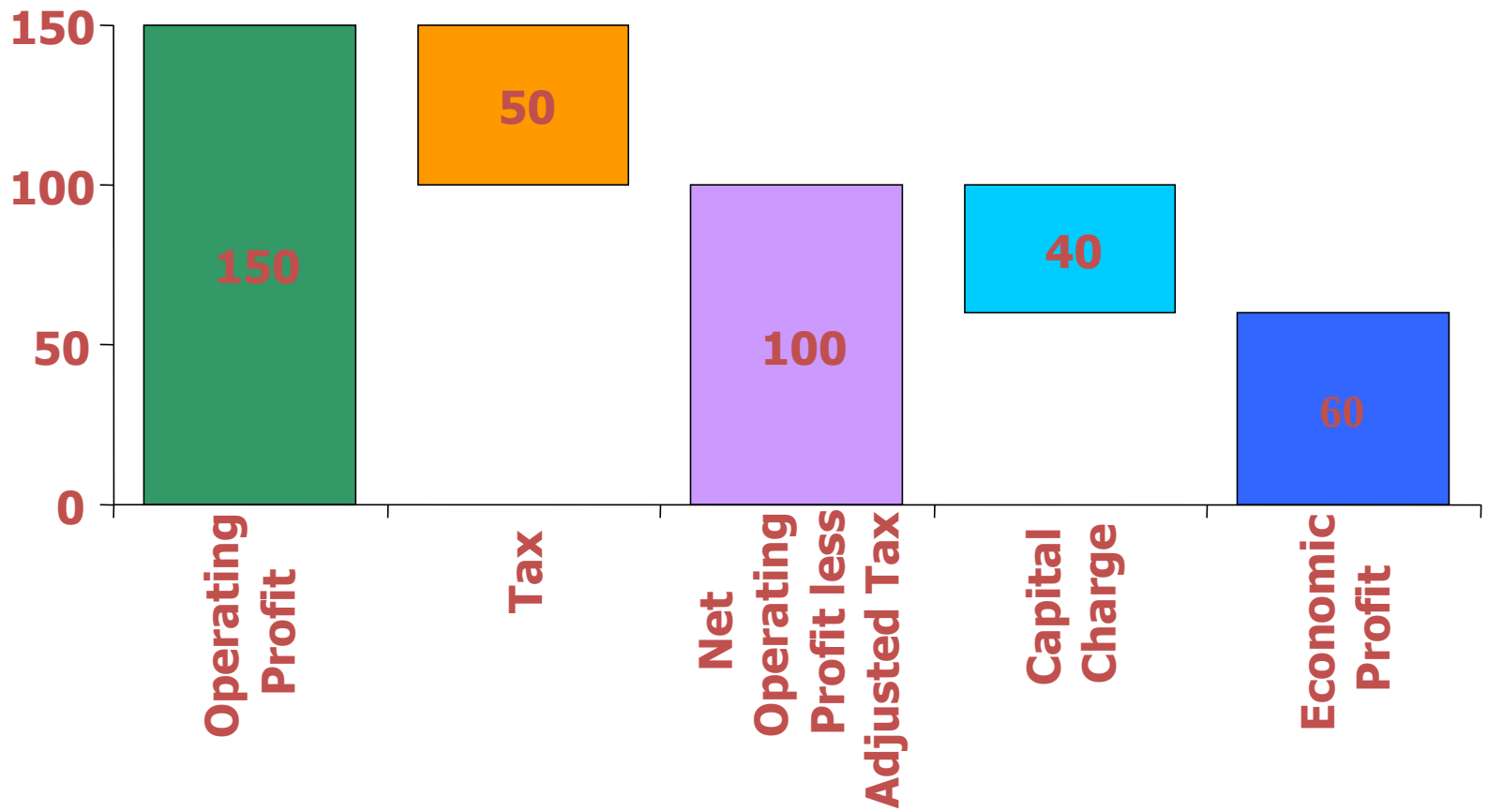
NOPLAT = Net Operating Profit After Tax
(Calculated with adjustments)

System goes beyond measurement also
includes rewards

Economic profit

- Re-branding of 'residual income'
- Surplus operating profit after tax & after deducting a charge for capital employed
- EVA® = EP with up to 164 adjustments (trademarked by Stern Stewart & Co.)
- Diageo & Siemens

Economic profit



Economic profit illustration: Royal Mail Holdings plc year ending March 2004

	£m
Operating profit	51
Tax on operating profit at 30%	(15)
NOPLAT	36
Capital Charge (£1,165m x 9.5%)	(111)
Economic Profit	(75)

Source: Shareholder Executive Annual Report 2004/5

Economic profit – the interpretation

- Although successful from an accounting profit perspective, the cost of using investors' funds is ignored by just focusing on operating profit
- Once the full cost of investors' funds is included (the capital charge) then we have a true indication of the underlying economic profit of an entity

Economic profit – the inputs

- Operating profit – excluding gains and losses arising from non-operating assets
- Capital charge, being:
  - Invested capital – being equity plus net debt, multiplied by…
  - Cost of capital – calculated using quoted comparables from relevant sectors

Economic profit insights – lessons from Diageo

Scotch Whisky	
Revenues	£100m
Costs	£50m
Invested capital	£400m
Cost of capital	10%

Vodka	
Revenues	£90m
Costs	£60m
Invested capital	£100m
Cost of capital	10%

Economic profit insights – lessons from Diageo

Scotch Whisky	
Operating profit	
Margin	
Economic profit	

Vodka	
Operating profit	
Margin	
Economic profit	

As a result of analysis like this, the business switched funds from lower value-added brands (whisky) to the higher ones (vodka) and diverted advertising expenditure accordingly

Cascading the measures

- The ultimate objective
- The stock market measure used at corporate level
- The internal short-term performance measure
- Generic financial value drivers
- Operational measures

- Maximise shareholder value
- Total Shareholder Returns (TSR)
- Economic profit
- Growth, margins, efficiency, cost of capital
- Financial and non-financial kpi's

Financial ratios	A	B	C	D	E
Performance					
ROCE	42.69%	18.96%	7.67%	8.96%	8.66%
Profit Margin	33.62%	5.07%	3.40%	15.32%	5.59%
Asset Turnover	1.27	3.74	2.26	0.58	1.55
Working Capital (expressed as 'days of sales')					
Stock	38	47	11	3	47
Trade Debtors	68	76	2	8	46
Trade Creditors	-14	-58	-29	-29	-41
(Finance from) / Invested in WC	93	66	-16	-17	52
Financial status					
Liquidity - Current ratio	1.51	1.74	0.41	0.59	1.43
Gearing - Debt / Equity	25.39%	47.51%	19.66%	84.85%	46.92%
Employee ratios					
Per employee (£000)					
Sales	228	316	106	45	101
Cost	54	31	13	14	31
Operating Profit	77	16	4	7	6
Employment costs to sales	24%	10%	12%	32%	31%

Stock market Ratios & Terms

1. EPS – Earnings Per share $\frac{\text{Profits Attributable to ordinary Shareholders}}{\text{Number of Ordinary Shares}}$

2. P/E ratio $\frac{\text{Share Market Price}}{\text{EPS}}$

3. Dividend Yield $\frac{\text{Dividend}}{\text{Share price}}$

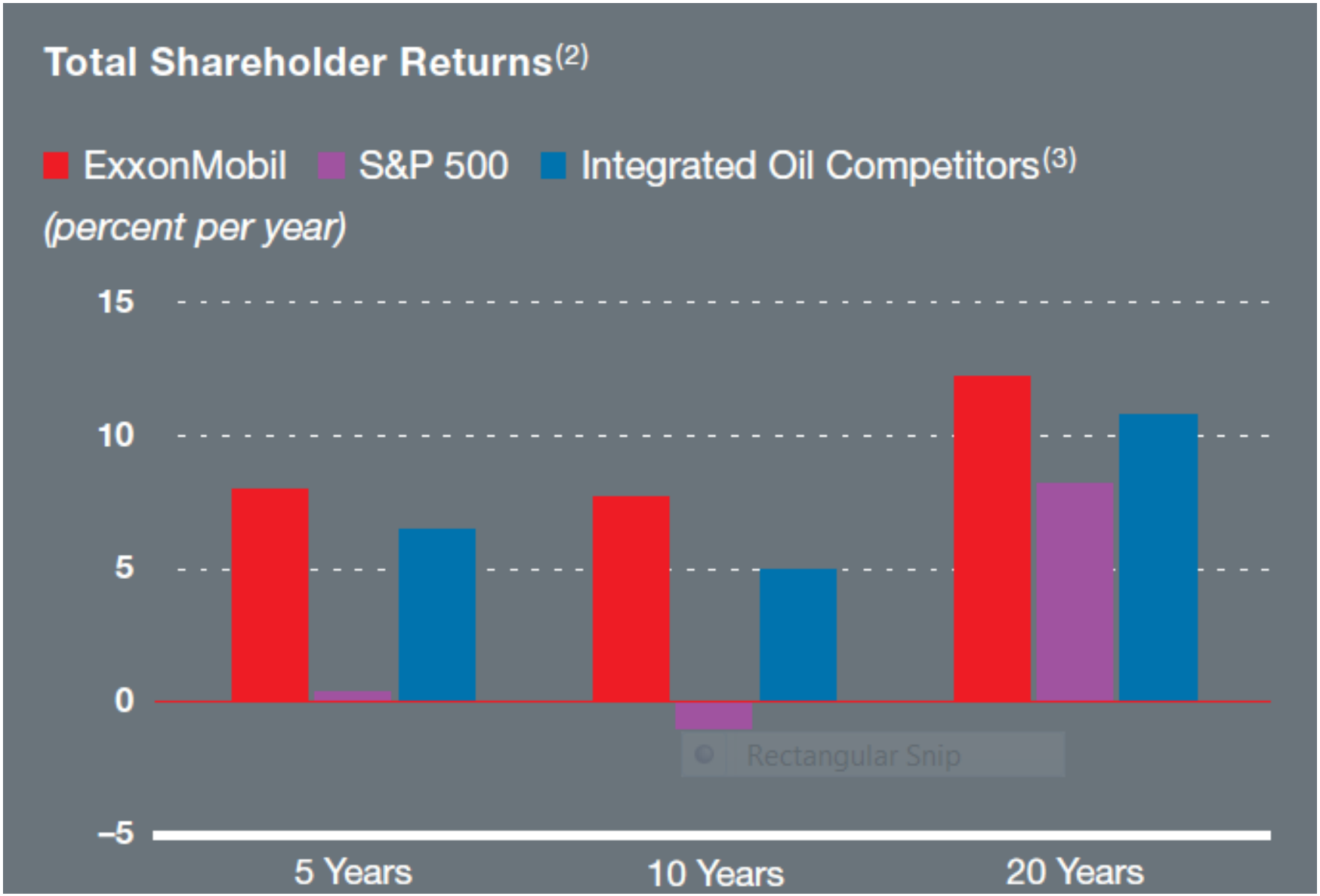
4. Total Shareholder Return (TSR) $\frac{\text{Price Inncrease + Dividend}}{\text{Price (Start)}}$

5. Market Capital = Market value (Share Price x Number of Shares)

6. Enterprise Value = market capitalization plus debt, minority interest and preferred shares, minus total cash and cash equivalents.

Share Prices & Ratios – Times Monday 7th January 2008

Company	Market Cap (£M)	Share Price	Yield %	P/E Ratio
Marks & Spencer	**8, 719.60**	**518**	**3.9**	**13.2**
Next	2,986.50	1464	3.5	10.0
Tesco	35,758.00	456	2.2	19.3
BP	118,736.0	627.5	3.3	11.7
GSK	70,287.10	1276	4.0	13.4
AstraZeneca	30,742.70	2110	4.2	12.4
Smith & Nephew	5,167.30	577	1.0	14.4
BSkyB	10,150.10	576.5	2.7	20.3
ITV	3,037.40	78	4.0	14.2


Total Shareholder Returns(2)
ExxonMobil
S&P 500
Integrated Oil Competitors(3)
(percent per year)
15
10
5
0
–5
5 Years
10 Years
20 Years
Rectangular Snip

Top Tip

- Strive for more relative measures rather than internally focused measures
- Focus on Customers and Customer Value to Deliver Shareholder or Stakeholder Value
- "Beat the Competition" not the internal measure

- How do these ideas apply to you? / What can you do now?

Cost control and reduction

Cost behaviour and modelling

Cost Models for Management Decision Making

Activity Based Cost management

"Lean" and Cost management

Managing and costing constraints - what holds back your organisation? What do these constraints cost you and how could they be overcome?

Mini Case Study / Exercise – The Nature of Costs

Exercise / Toolbox 3 – Reducing Complexity and Variety to reduce needless cost

Understanding & working with costs

Cost	v	Value
Relevant	v	Irrelevant
Controllable	v	Uncontrollable
Capital	v	Revenue
Planned	v	Unplanned
Essential	v	Discretionary
Direct	v	Indirect/overhead
Fixed	v	Variable

Standard Cost

Opportunity Costs (Cost of Lost Opportunity)

Sunk Costs (Irrecoverable Costs)

Failure Costs (Cost of errors)

Activity Costs (Costing Complexity & Variety)

Activity Analysis (*Time is money* – What are our people spending our time or cost on? Is it the best use of their time?)

Resource costing and comparison

Benchmarking

Resource Substitution

Resource Sharing – Strategic Alliances

Value Based Pricing v Cost Plus Based Pricing

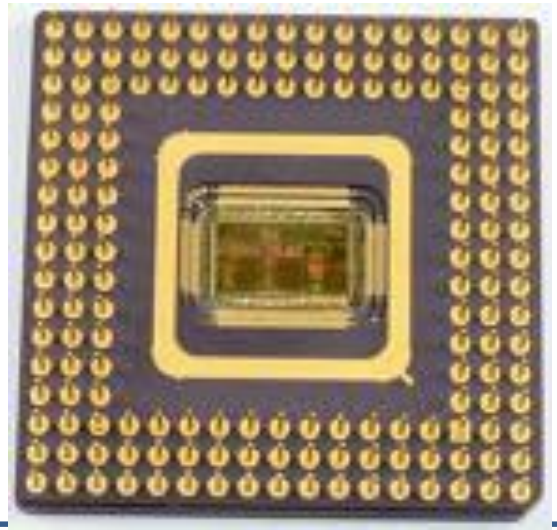
Cost Based	Value Based
Internal Focus	Customer / Market Focus
Inputs	Results
	Target Costing?

Price, Cost & Value

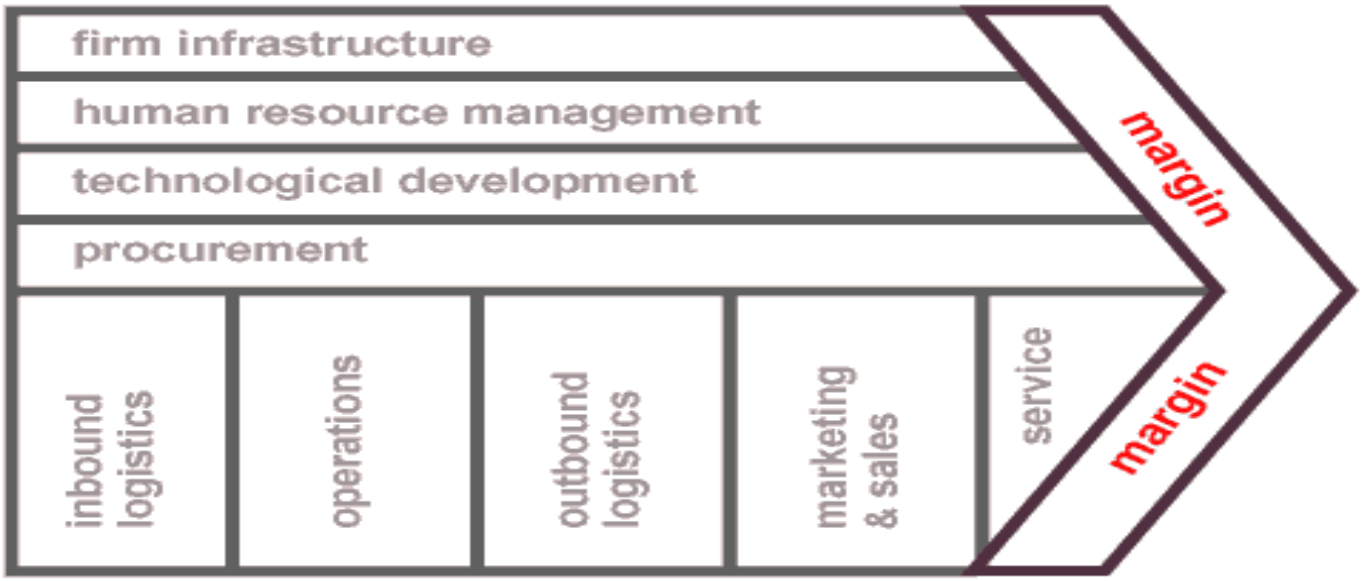
Coffee & Chips

- Cost is not Value
- Price can be used to gauge value
- Pricing can influence perceived “Value”





Value Chain – Michael Porter



Value Analysis / Engineering

Taking out cost without destroying value.

"Discovered" by GE in WWII – when searching for substitute materials



Beyond Budgeting

- Throw the budget in the bin.

Shortcomings of traditional approaches to measurement

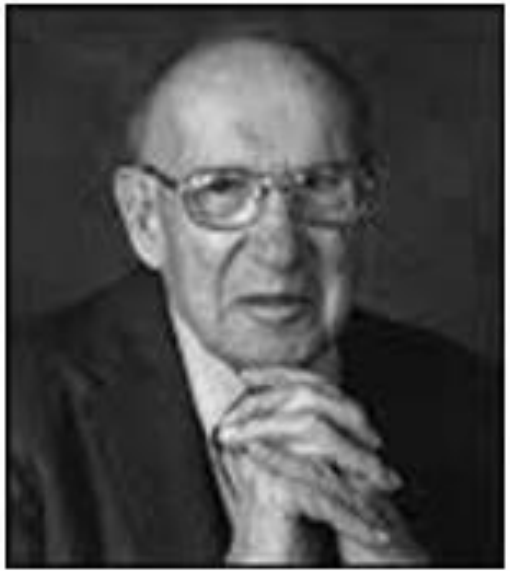
– Budgeting is the bane of corporate America'
–
  - Jack Welch, ex-CEO, General Electric



– 'The process of management is not about administering fixed budgets, it is about the dynamic allocation of resources'
–
  - Lord Browne, ex-CEO, BP



- 'Uncertainty…has become so great as to render futile, if not counterproductive, the kind of planning most companies still practice; forecasting based on probabilities'
-
  - Peter Drucker



The smallest problem…



73% of companies need more than 3 months to complete the annual budget.

Hackett Group 2008

Budgets are bad for business?

Main criticisms of budgets are

- *Too resource and time consuming*
- *Slow to detect problems*
- *Not reliable for performance evaluation*
- *Quickly out of date*
- *Game Playing (Agency Problem)*
- *Financial targets overwhelming what is good for the business and ultimately shareholders*
- *Over emphasis on short term financial measures*
- *Departmental budgets may encourage "silo" thinking*
- *Disrupts cooperation*
- *Discourages innovation and adaption to changing conditions and opportunities*
- *Process lacks rigor*

VALUE FOR MONEY

ECONOMY

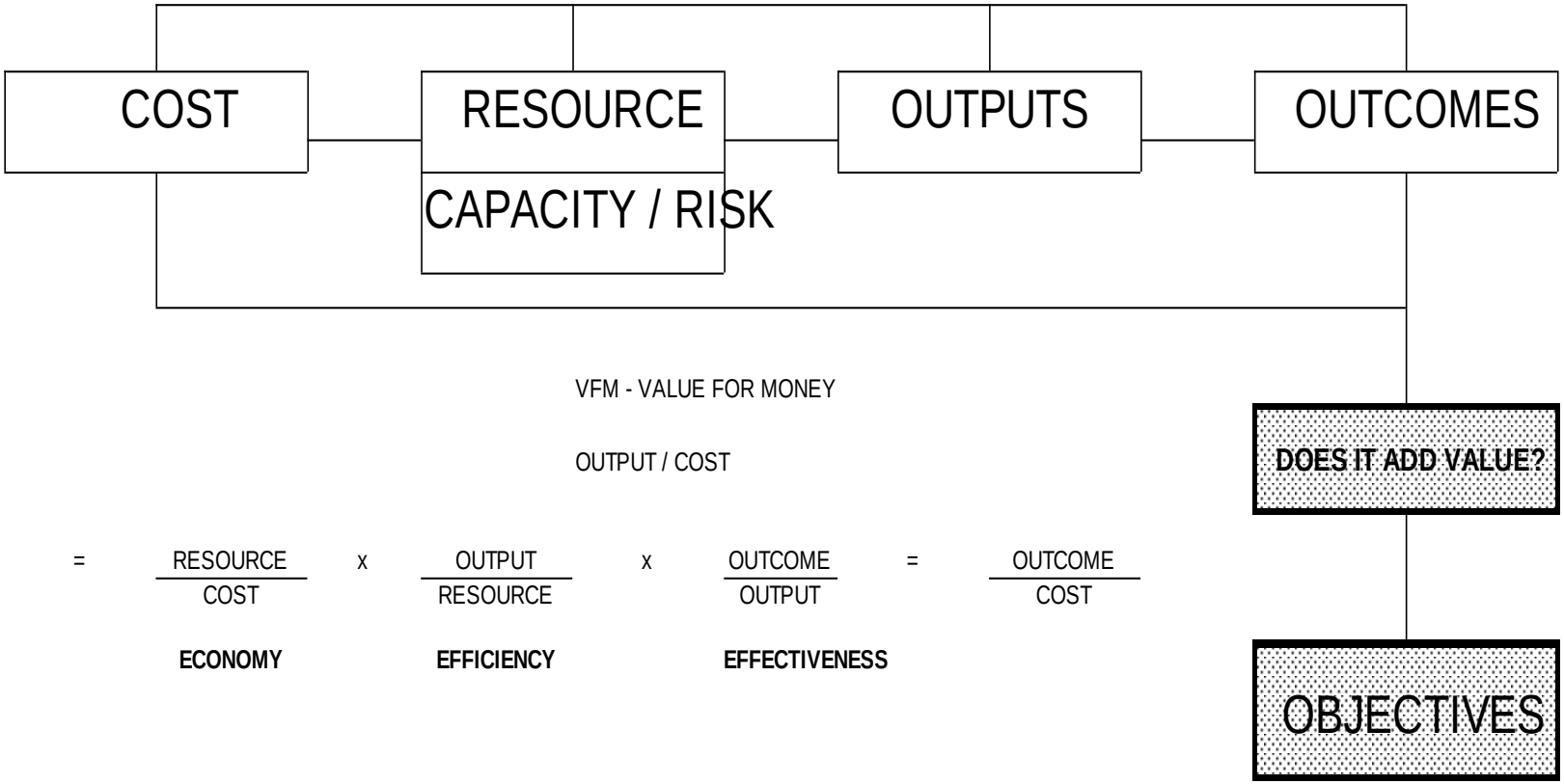
RESOURCE / COST

EFFICIENCY

OUTPUT / RESOURCE

EFFECTIVENESS

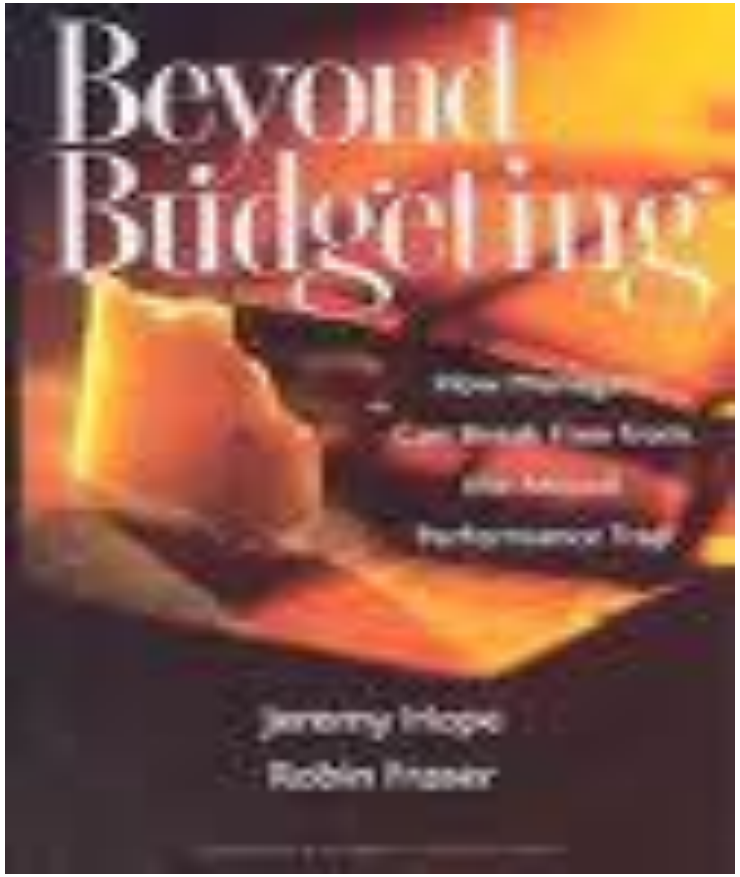
OUTCOME / OUTPUT



$$VFM = \frac{RESOURCE}{COST} \times \frac{OUTPUT}{RESOURCE} \times \frac{OUTCOME}{OUTPUT} = \frac{OUTCOME}{COST}$$

ECONOMY **EFFICIENCY** **EFFECTIVENESS**

Beyond Budgeting



Beyond Budgeting – Key Cases



Svenska Handelsbanken 1972

Statoil

BOREALIS

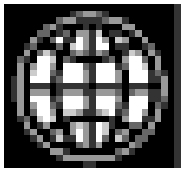
Borealis 1995

Beyond Budgeters?



































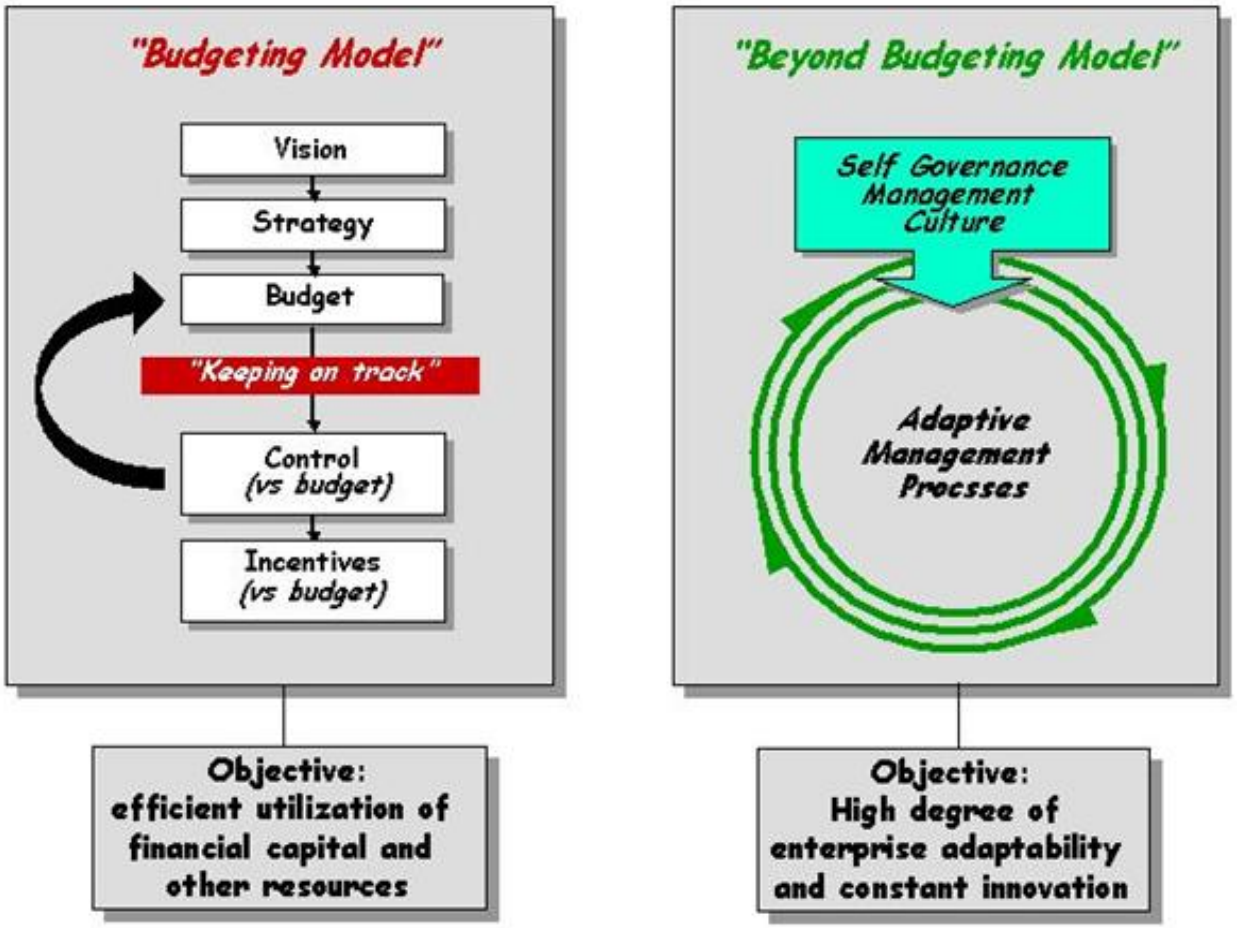






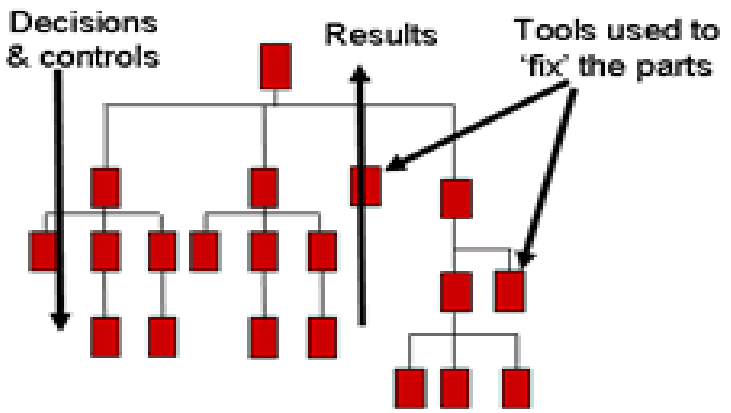


Traditional v Beyond Budgeting



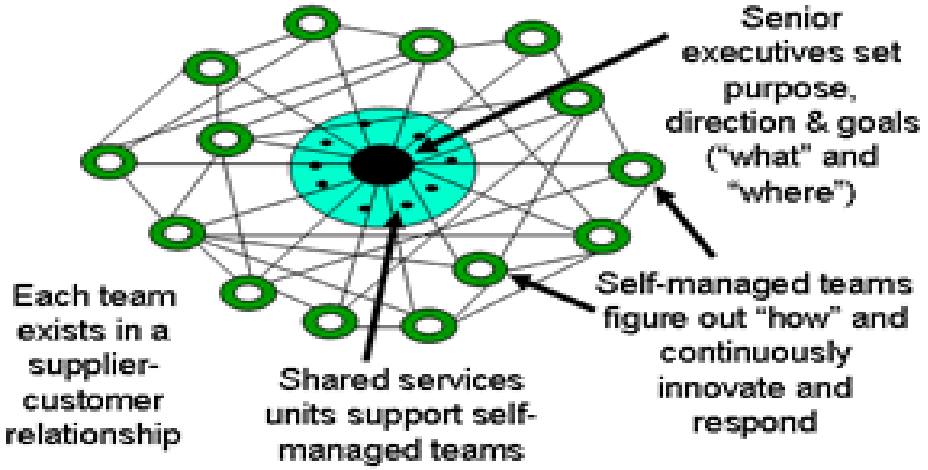
Alternative Management Models

The 'Command and Control' Model



- Organizations are obedient machines
- Organizations are a collection of replaceable parts (parts determine performance of the whole)
- Organizations comprise of 'cause-and-effect' relationships that are predictable
- Organization need central planning, coordination and control
- Change is reactive and project-driven

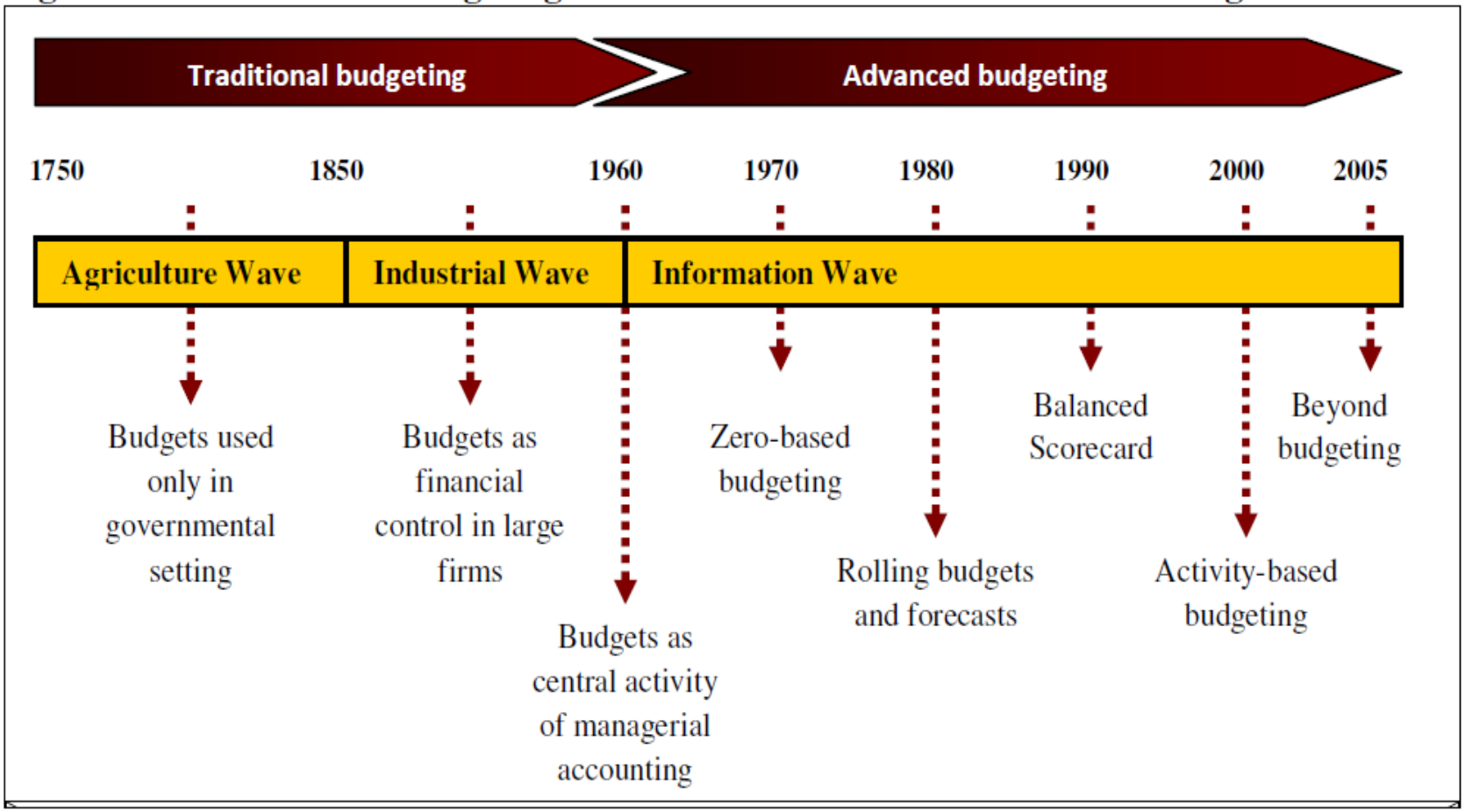
The 'Beyond Budgeting' Model



- Organizations are adaptive systems
- Organizations are holistic systems (whole system determines performance)
- Organizations are webs of relationships that are unpredictable
- Organization are self-organizing and self-regulating
- Change is integrative and adaptive

The 12 'beyond budgeting' (or 'adaptive') model principles	
Process principles	
1. Goals	Set aspirational goals aimed at continuous relative improvement, ***not*** *fixed annual targets*
2. Rewards	Reward shared success based on relative performance, ***not*** *on meeting fixed targets*
3. Planning	Make planning a continuous and inclusive process, ***not*** *an annual event*
4. Controls	Base controls on relative KPIs and performance trends, ***not*** *variances against plan*
5. Resources	Make resources available as needed, ***not*** *through annual budget allocations*
6. Coordination	Coordinate cross organisation interactions dynamically, ***not*** *through annual planning cycles*
Leadership principles	
1. Customers	Focus everyone on improving customer outcomes, ***not*** *on meeting internal targets*
2. Accountability	Create a network of teams accountable for results, ***not*** *centralized hierarchies*
3. Performance	Champion success as winning in the marketplace, ***not*** *on meeting internal targets*
4. Freedom to act	Give teams the freedom and capability to act, ***don't*** *merely require adherence to plan*
5. Governance	Base governance on clear values and boundaries, ***not*** *detailed rules and budgets*
6. Information	Promote open and shared information, ***don't*** *restrict it to those who 'need to know'*

Figure 3.1: Evolution of budgeting within the three waves of economic change



Source: Hope and Hope, 1997; Banovic, 2005.



Central Budgets & Plans	Delegate Budgets to Control	Delegate Budgets to Delegate Management	Beyond Budgeting?
No Delegation of Budgets	Delegated Budgets With constraints	Delegated Budgets With Flexibility	No Budgets Non constraints?

"Managing the Numbers"

"Managing the Drivers of Business Performance"

But are - Are all decentralised organisations necessarily successful?

	Traditional (budget based) Mgmt. Model	BBM Model
Target & rewards	• Incremental targets • Fixed incentives	• Stretch goals • Relative rewards
Planning & controls	• Fixed annual plans • Variance controls	• Cont. planning • KPI's & rolling forecasts
Resources & coordination	• Pre-allocated resources • Central coordination	• Resources on demand • Dynamic coordination
Organ. & culture	• Central control • Focus on managing #s	• Local control of goals/plans • Focus on value creation

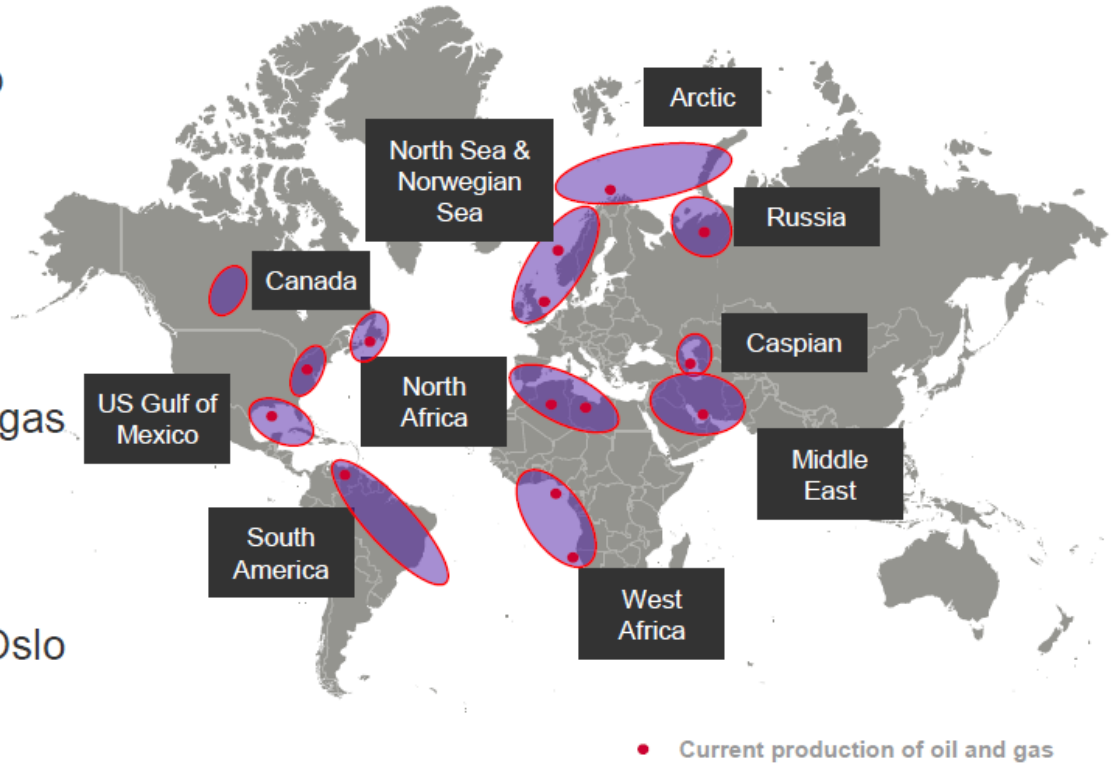
Beyond Budgeting
Example - StatOil

- Model about people and behaviour more than P & L?

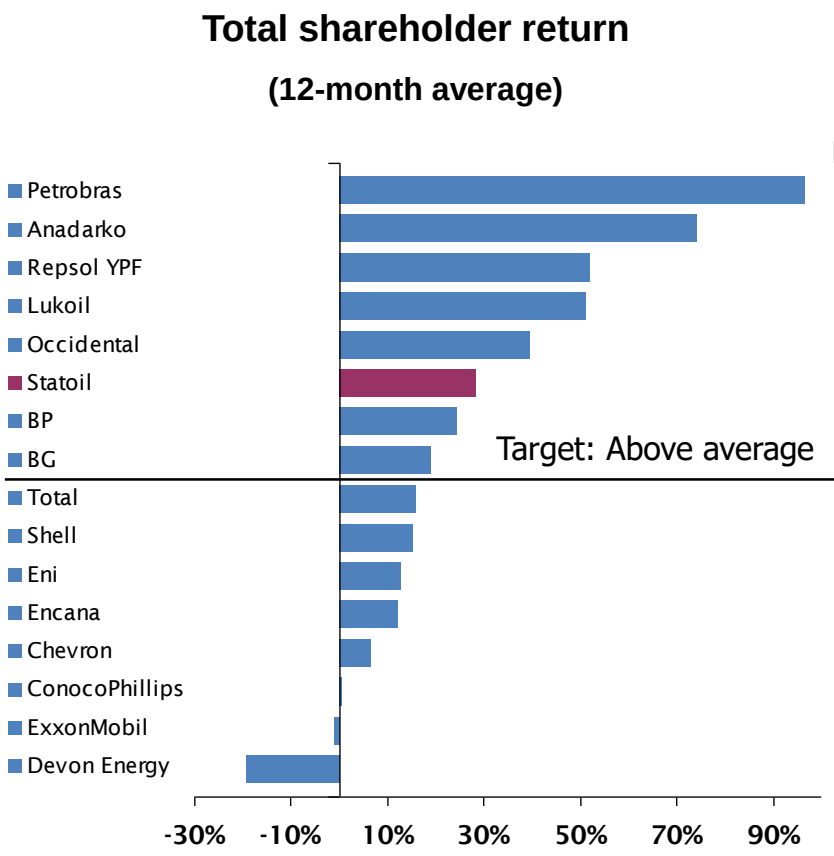
Stat Oil

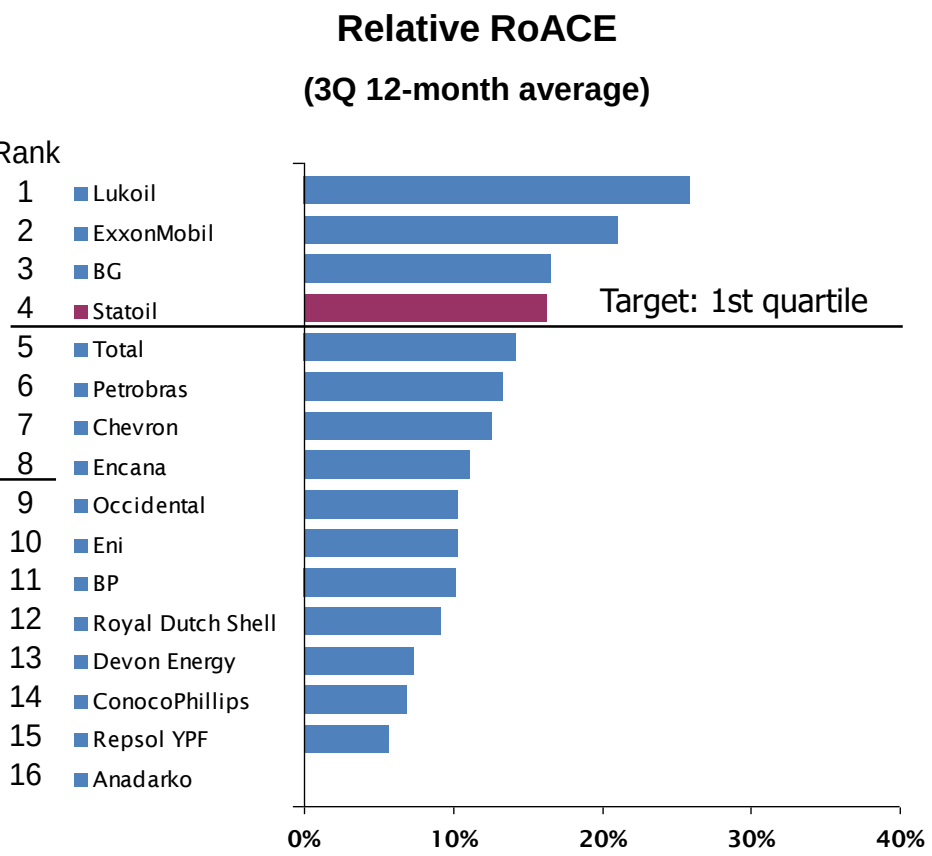
Statoil in brief

- Turnover and market cap approx. 80 bn. USD
- 20.000 employees in 34 countries
- World's largest offshore operator
- Europe's second largest gas supplier
- The world's third largest crude oil seller
- Listed in New York and Oslo

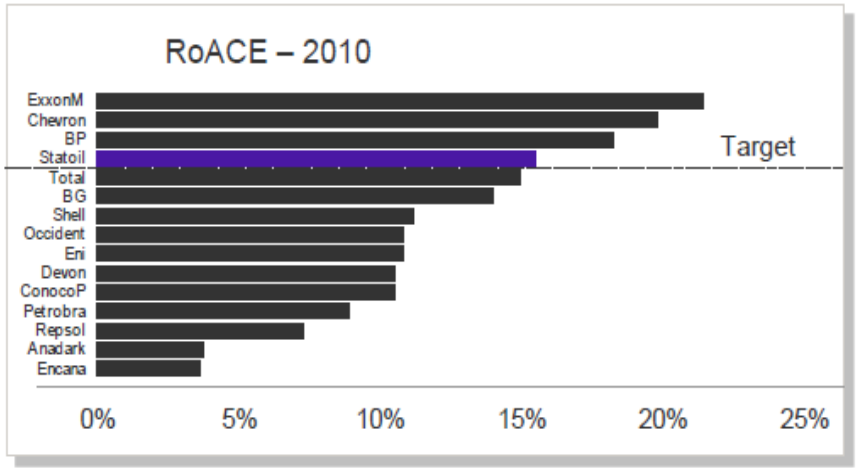


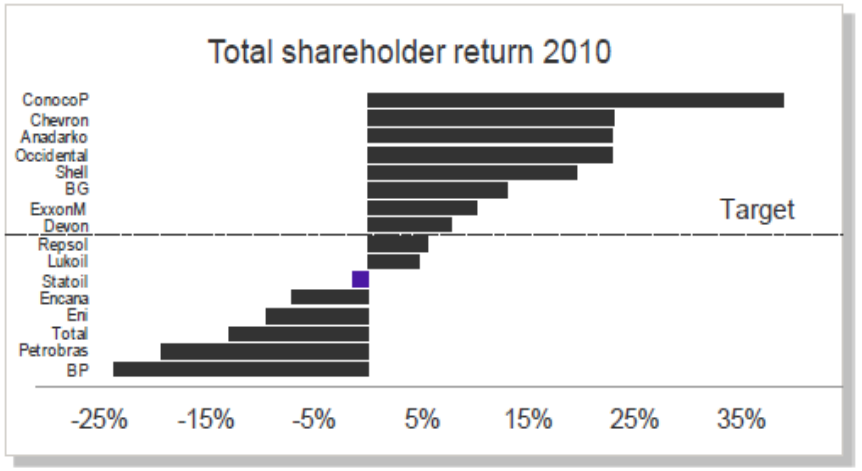
Relative Statoil performance

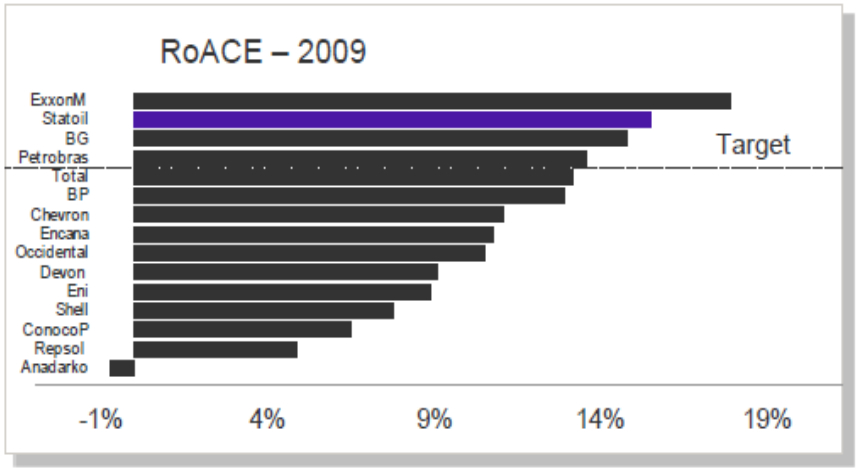


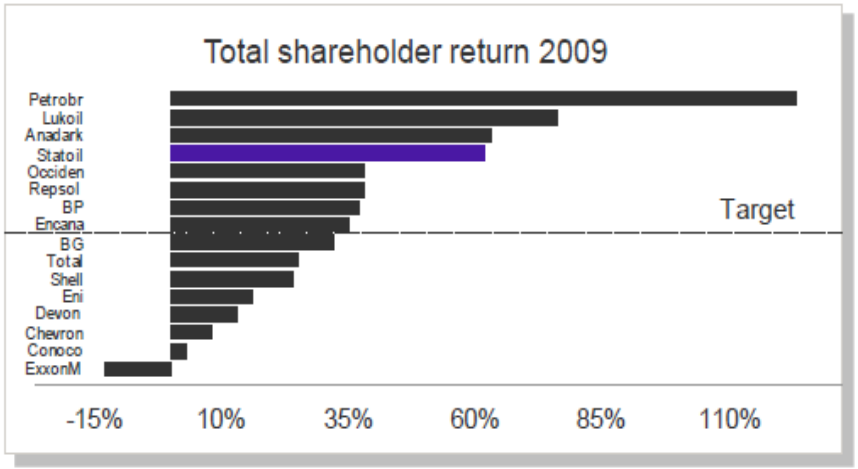


Relative Statoil performance









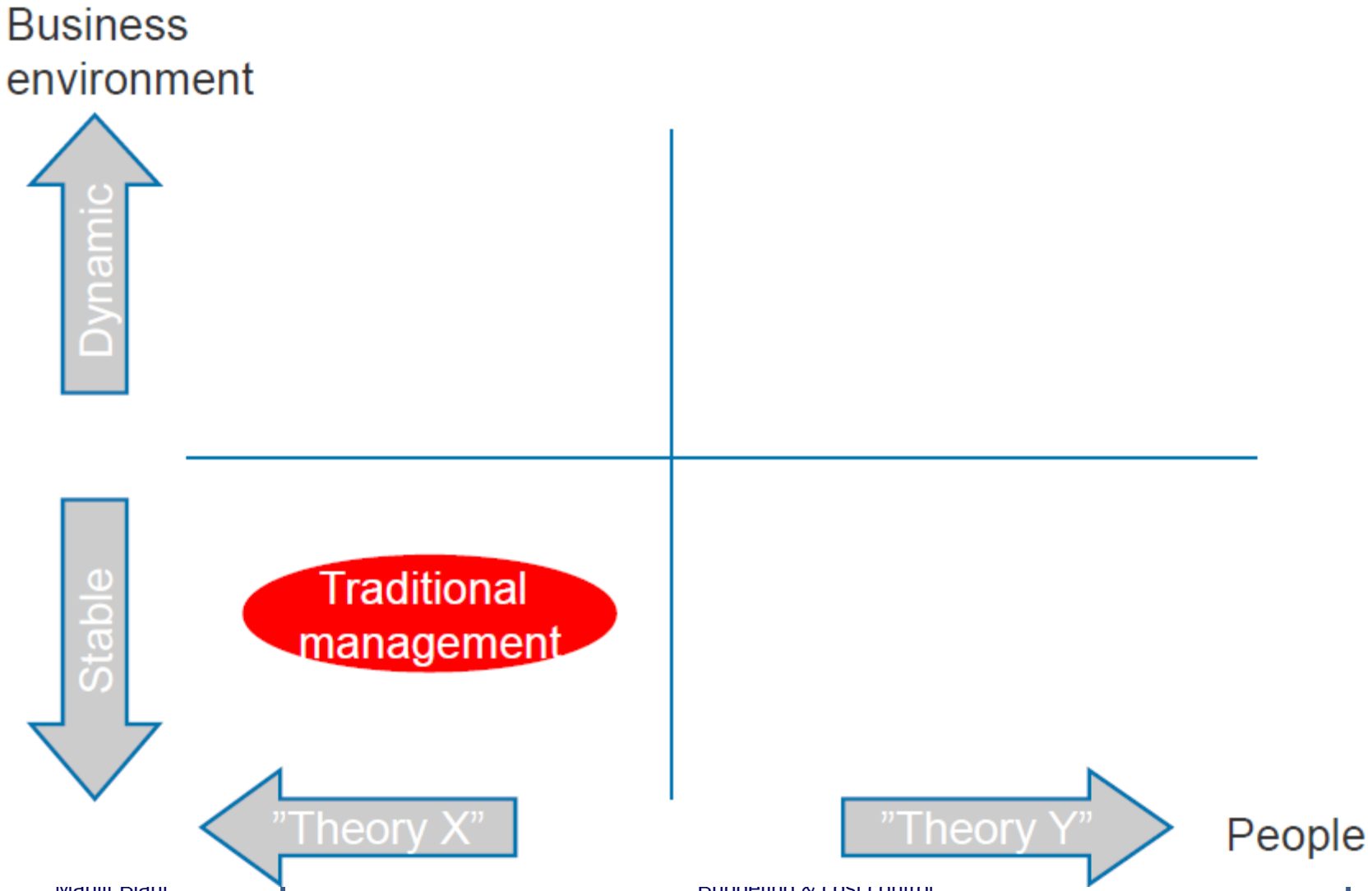
What is your view on people?

- **Theory X?**
- People prefer to be directed, do not want responsibility, and have little or no ambition.
- People have an inherent dislike for work and will avoid it whenever possible.
- People must be coerced, controlled, directed, or threatened with punishment in order to get them to achieve the organizational objectives.
- People seek security above all else.

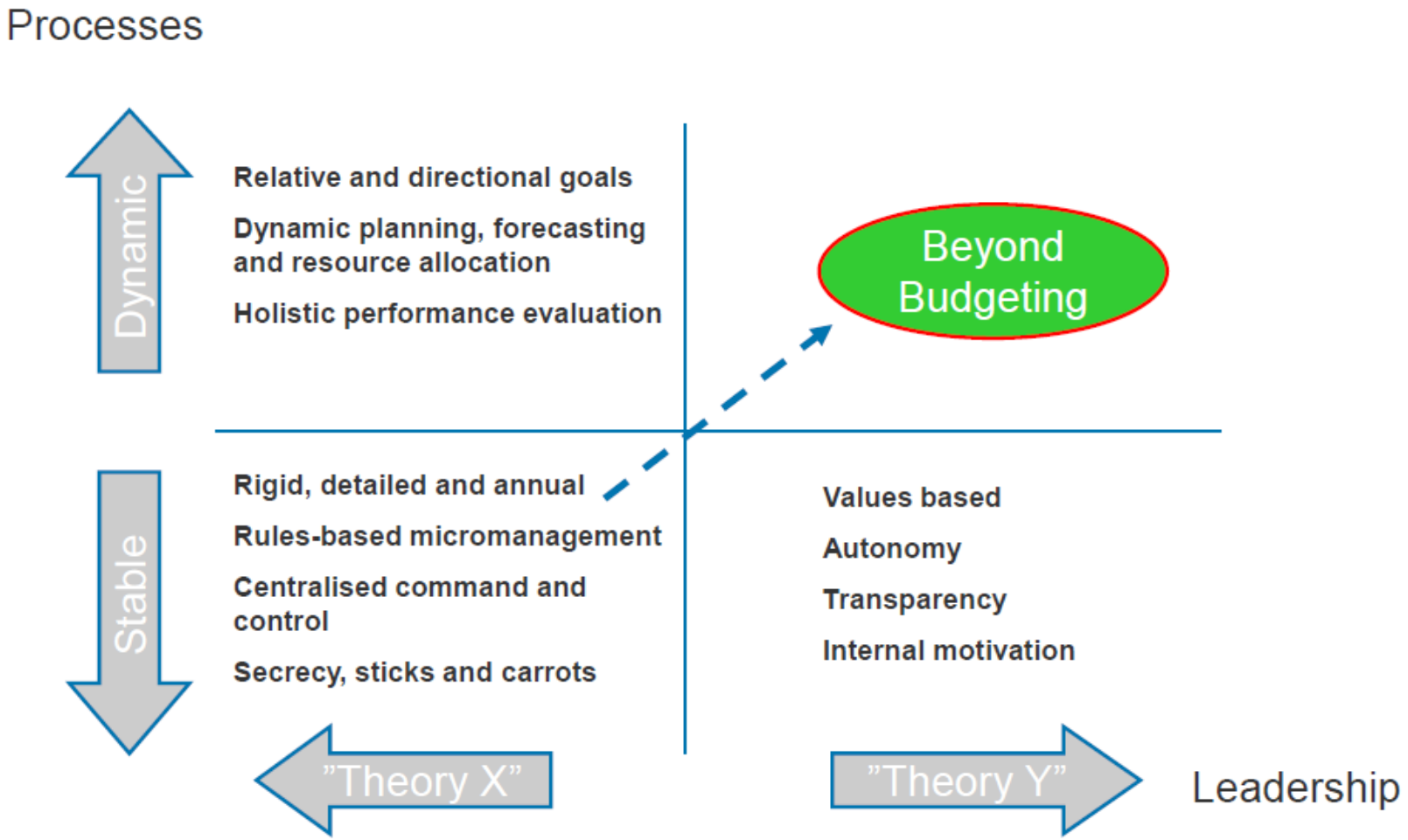
- **Theory Y?**
- Work is as natural as play and rest.
- People will exercise self-direction if they are committed to the objectives (they are not lazy).
- Creativity, ingenuity, and imagination are widely distributed among the population. People are capable of using these abilities to solve an organizational problem.
- People learn to accept and seek responsibility
- People have potential.

Douglas McGregor – ”The human side of enterprise” (1960)

The world has changed
- what about the way we lead and manage?



We must address both processes and leadership



The Beyond Budgeting principles

Change in *leadership*

1. Values - Govern through a few clear values, goals and boundaries, **not** detailed rules and budgets
2. Performance - Create a high performance climate based on relative success, **not** on meeting fixed targets
3. Transparency - Promote open information for self management, **don't** restrict it hierarchically
4. Organization - Organize as a network of lean, accountable teams, **not** around centralized functions
5. Autonomy - Give teams the freedom and capability to act; **don't** micro-manage them
6. Customers - Focus everyone on improving customer outcomes, **not** on hierarchical relationships

Change in *processes*

7. Goals - Set relative goals for continuous improvement, **don't** negotiate fixed performance contracts
8. Rewards - Reward shared success based on relative performance, **not** on meeting fixed targets
9. Planning - Make planning a continuous and inclusive process, **not** a top-down annual event
10. Coordination - Coordinate interactions dynamically, **not** through annual planning cycles
11. Resources - Make resources available as needed, **not** through annual budget allocations
12. Controls - Base controls on relative indicators and trends, **not** on variances against plan

StatOil Model – “Ambition to Action

Key principles – Ambition to action

- Performance is ultimately about **performing better** than those we **compare** ourselves with
- **Do the right thing** in the actual situation, guided by the Statoil Book, your Ambition to action, decision criteria & authorities and sound business judgement
- Within this framework, **resources** are made available or allocated case-by-case
- Business follow up is **forward looking** and **action** oriented
- Performance evaluation is a **holistic** assessment of delivery and behaviour

The CEO on Ambition to action



CEO Helge Lund

"We have a management model which is very well-suited to dealing with turbulence and rapid change. It enables us to act and reprioritise quickly so that we can fend off threats or seize opportunities. This is much more difficult in a traditional «budget world».

"One of the main principles in our Ambition to action concept is that Statoil consists of mature, professional and able people who both can and want to accept responsibility."

Ambition to action - a process which…

…is integrated - from strategy to people

…but provides sufficient freedom and flexibility

…and activates our values and leadership principles

Strong performance

Sustainable results

Strategic objectives → KPIs → Actions & forecasts → Individual goals

Where are we going - what does success look like?

- Most important strategic change areas
- Medium term horizon

How do we measure progress?

- Indicative measure of strategic delivery
- 10-12 KPIs, annual/ longer term targets

How do we get there?

- Concrete actions and expected delivery (forecast)
- Clear deadlines and accountabilities

What is my contribution?

- **My Performance Goals (MPG)**
- Delivery
- Behaviour

Classification: Internal

Ambition to action example



Globally competitive – an exceptional place to perform and develop

Strategic objectives	Performance indicators	Actions (top 5)
People and organisation		
A value based and performance driven organisation.	Living the values Progress PO action plan	Complete the integration and ensure a successful post-merger process (31.12.2010) Ensure right capacity and competence (31.12.2010) Consistent execution of the Statoil Hydro book ensuring alignment and compliance (31.12.2010) Simplify and improve the People@StatoilHydro process and strengthen [illegible] people development Strengthen capability and diversity in leadership pipeline, and build strong leadership teams (31.12.2010)
Health, safety and environment		
Industry leader in HSE No integrity violations Remain an industry leader in terms of having a low climate impact [illegible] we are engaged	Serious incident frequency Clima[illegible] TTS Observations and actions	Improve HSE leadership and compliance to our management system (31.12.2010) Increased focus on technical integrity and barriers (31.01.2010) Implement op[illegible]isation of HSE requirements (31.12.2010) Operationalise clim[illegible]y and technology (31.12.2010)
Operation		
Op[illegible] the value chains	PE EPN Product[illegible] Product[illegible] Finding cost exploration (USD/boe)	Secure optimal scope of CCS and handle communication challenge (20.12.2009) Ensure successful deliveries from corporate initiatives on IOR, IO and exploration (20.12.2009) Forcefully execute programs to improve production efficiency and drilling performance (20.12.2009) Improve execution abilities through quality in the CVP decision process (20.12.2009)
Market		
Exploration success outperforming peers Maximise value creation through our value chains A balanced portfolio set to grow long-term value in line with the first quartile of our peers	N[illegible] R[illegible] Downstream NOI (NOK bn)	Secure access to quality acreage on NCS (20.12.2009) Improve downstream profitability and portfolio robustness (31.12.2009) Optimise strategic rig capacity (20.12.2009) Execute the technology strategy (20/12/2009) Utilize market conditions to continuously secure StatoilHydro competitive prices from our suppliers (20.12.2009)
Finance		
Competitive shareholder return Realise the full potential from the merger Maintain financial robustness through cycles	Relative RoACE Relative Shareholder Return Merger value capture (NOK bn)	Continuously monitor and build flexibility in the portfolio (20.12.2009) Improve compliance within intellectual service and maintain focus on SOX (20.12.2009) Improve the cost mindset in the organisation and deliver on cost improvements (20.12.2009)

Where are we going?

”Strategic objectives”

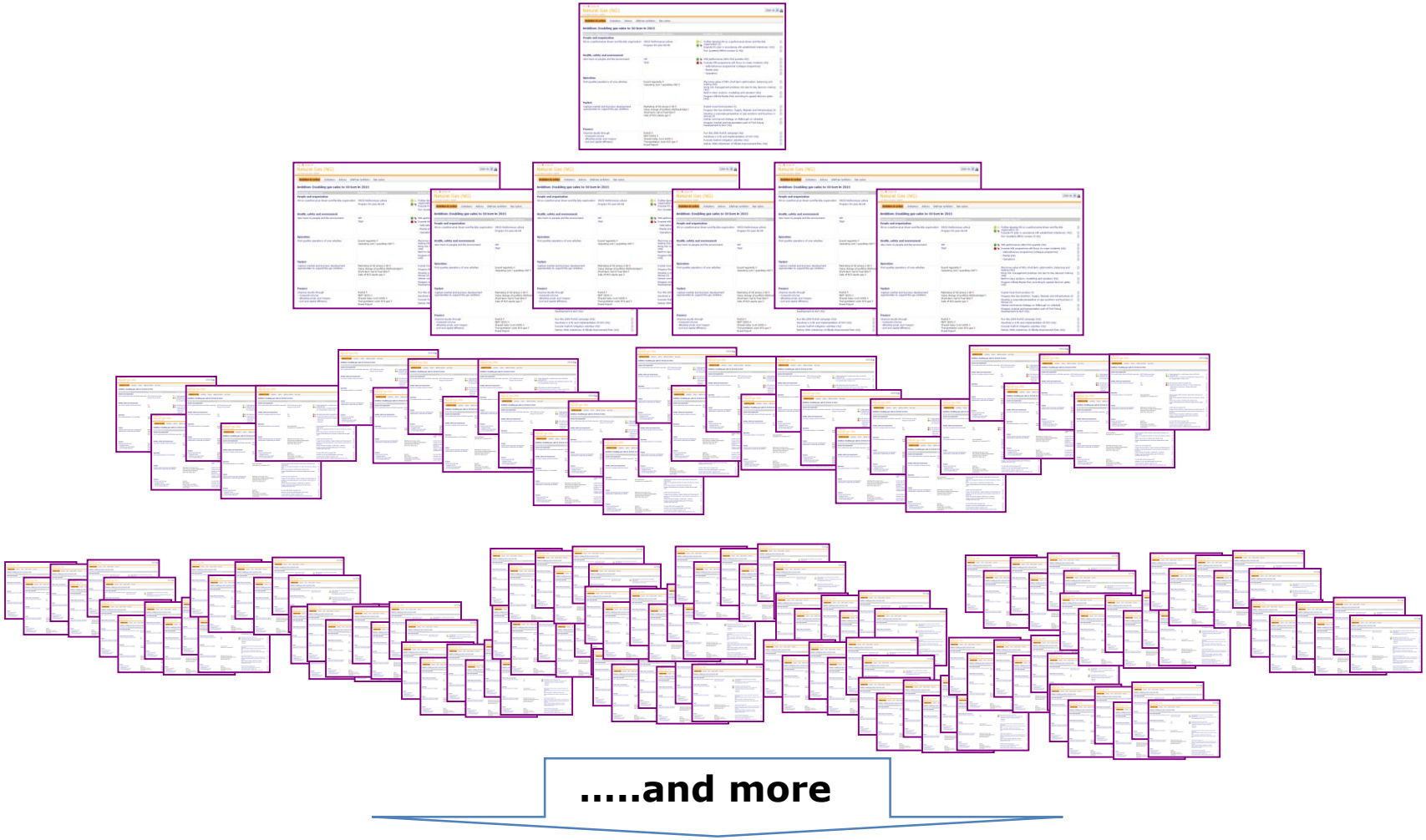
How do we measure progress?

”Key Performance Indicators”

How do we get there?

”Actions”

More than 1100 ”Ambition to actions” across the company



.....and more

Solving a serious budget conflict

Traditional budget / plan

Step 1: Separate

Step 2: Improve

Budget / plan =
- Target
- Forecast
- Resource allocation

"Same number – conflicting purposes"



Target
- Front-loaded
- Ambitious
- Relative if possible



Forecast
- Business driven not calendar driven
- Expected outcome – early warning
- Frequency and time horizon – lead time and target horizon driven
- Limited detail



Resource allocation
- Dynamic - no pre-allocation
- Projects - decision gates & criteria
- Operations - relative KPIs etc.
- Monitoring - intervention if needed only

"Different numbers"

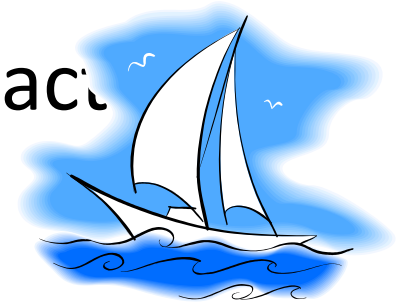
A forecast is not a promise or a target …





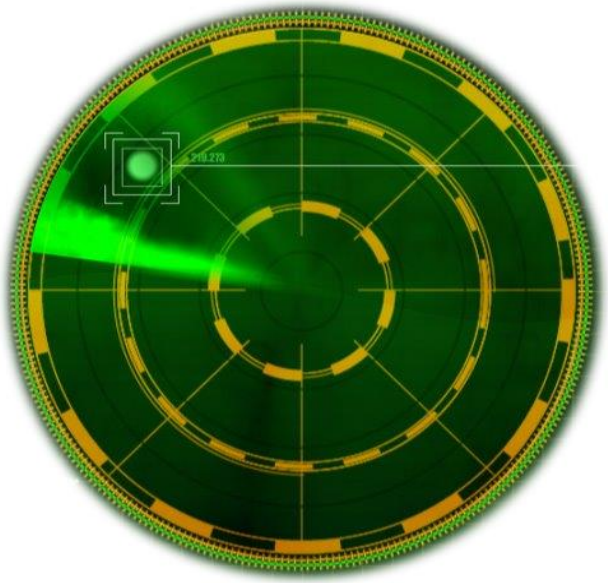
…nor is it an application for resources

A forecast is a call to act



Get issues on the radar screen early enough…

…..to be able to take corrective actions



A forecast should:

- be brutally honest and unbiased
- be done for yourself more than for others
- be actionable
- have the right time horizon and detail level
- include an uncertainty analysis where relevant

Relative performance

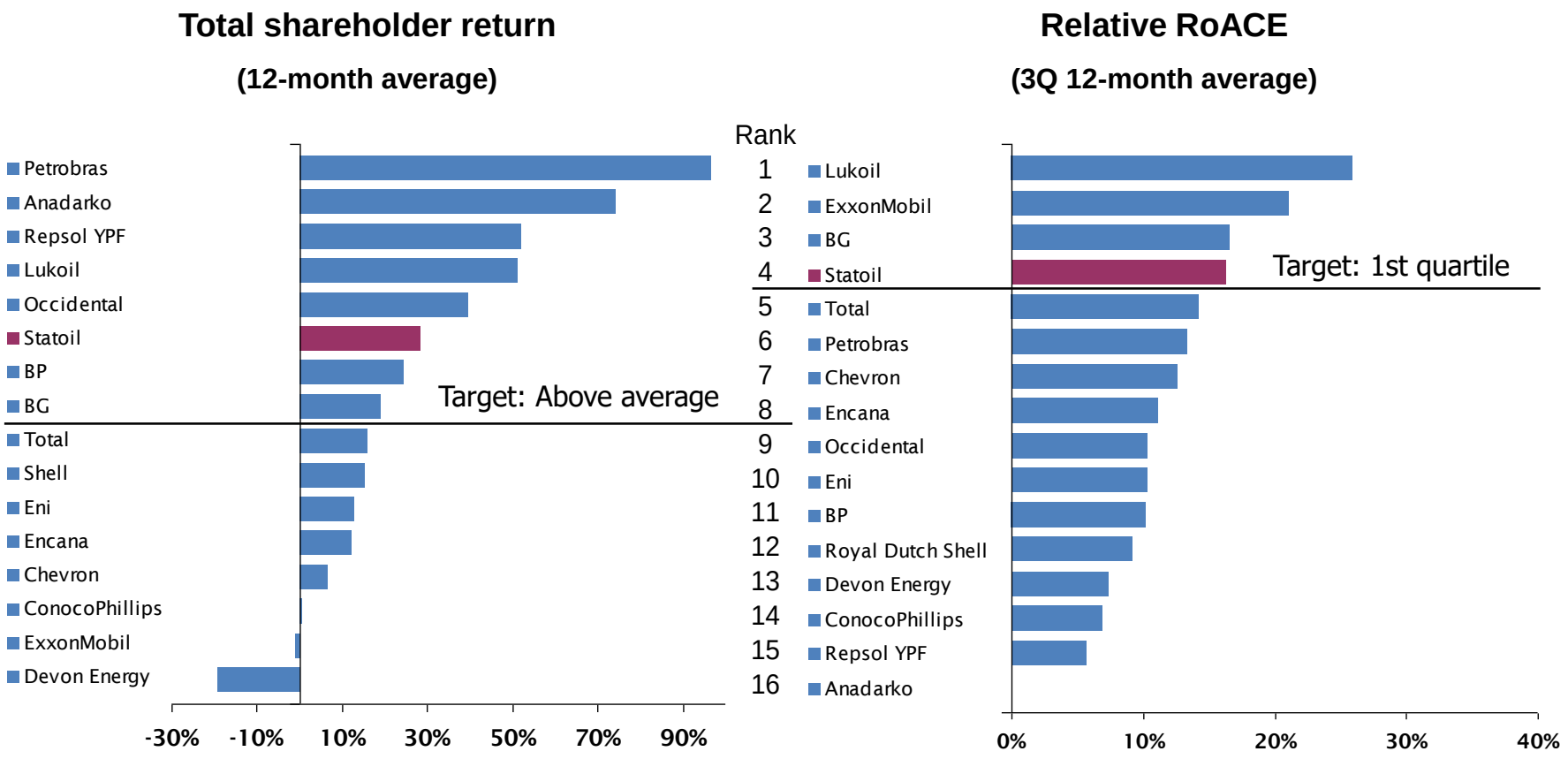
- Connect input with output



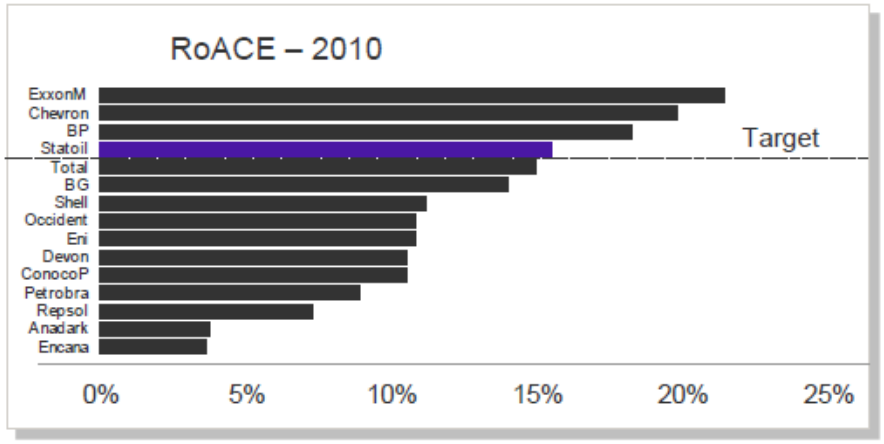
- Compare with others

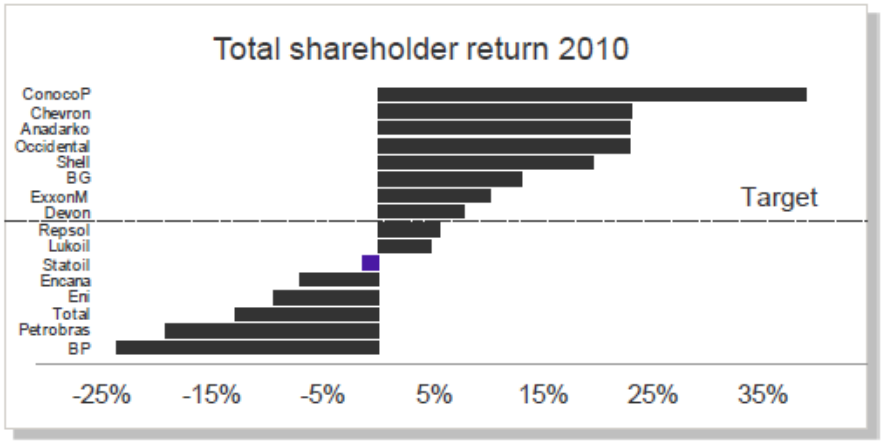


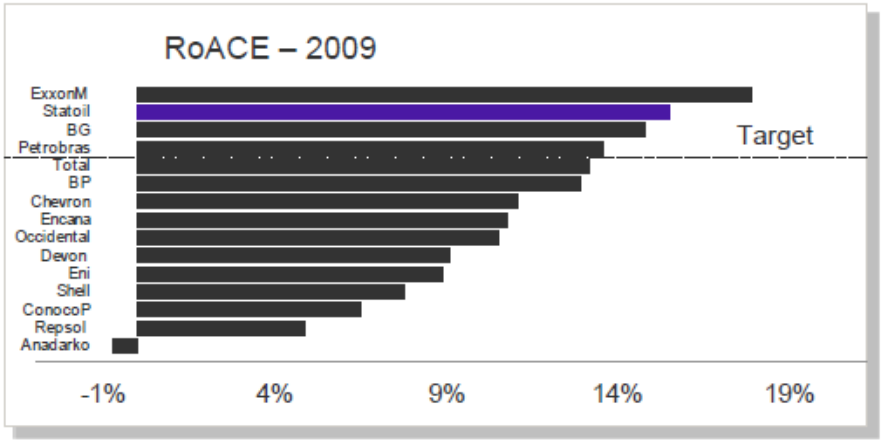
Relative Statoil performance

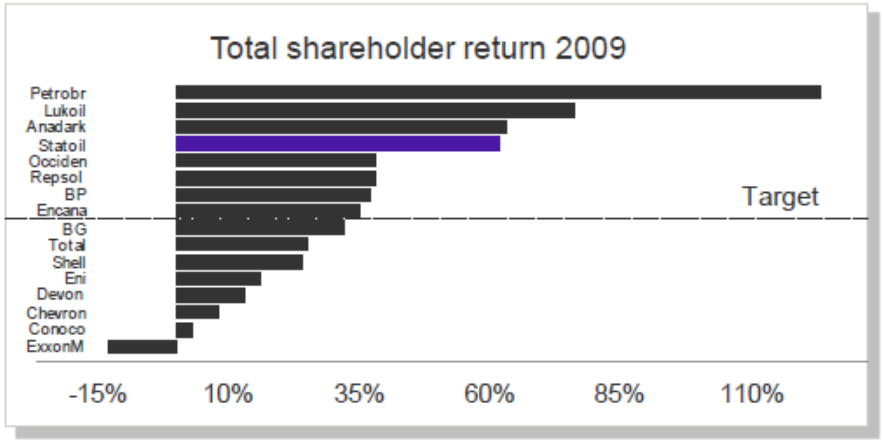


Relative Statoil performance









Dynamic resource allocation:
A different mindset - cost conscious from the first penny

Do I have a budget for this?



Budget

Not OK

OK

Is this the right thing to do?

- Supports Ambition to action?
- Within decision criteria & decision authority?
- Can I justify this?



OK?

OK?

OK?

OK?

OK?

Dynamic resource allocation – other costs

Absolute KPIs		Relative KPIs			No KPIs
Traditional cost budget	Absolute cost KPI	Unit cost input/output	Unit cost vs peers	Bottom line focus only	Strategic objectives or actions only
Xx Xx Xx Xx Xx Xx Xx Xx 1000	1000	 "USD/bbl" "USD/customer" "USD/employee"	 "1. quartile" "Above average"	EBIT ROCE (abs/rel)	"Cost effective and competitive operations" "More video –less travel" "Reduce consultancy spending"

Increasing freedom and flexibility

Increasing need for strong values and clear direction

Monitoring of actual development, intervention if needed only

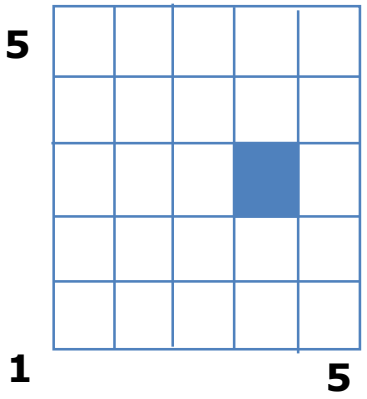
Select based on what is right and works for your organisation

A new performance language
- from mechanical measurement to a holistic assessment

(Previously only KPI targets)

"Ambition to Action"
- Strategic objectives
- KPI targets
- Actions

Delivery



50/50

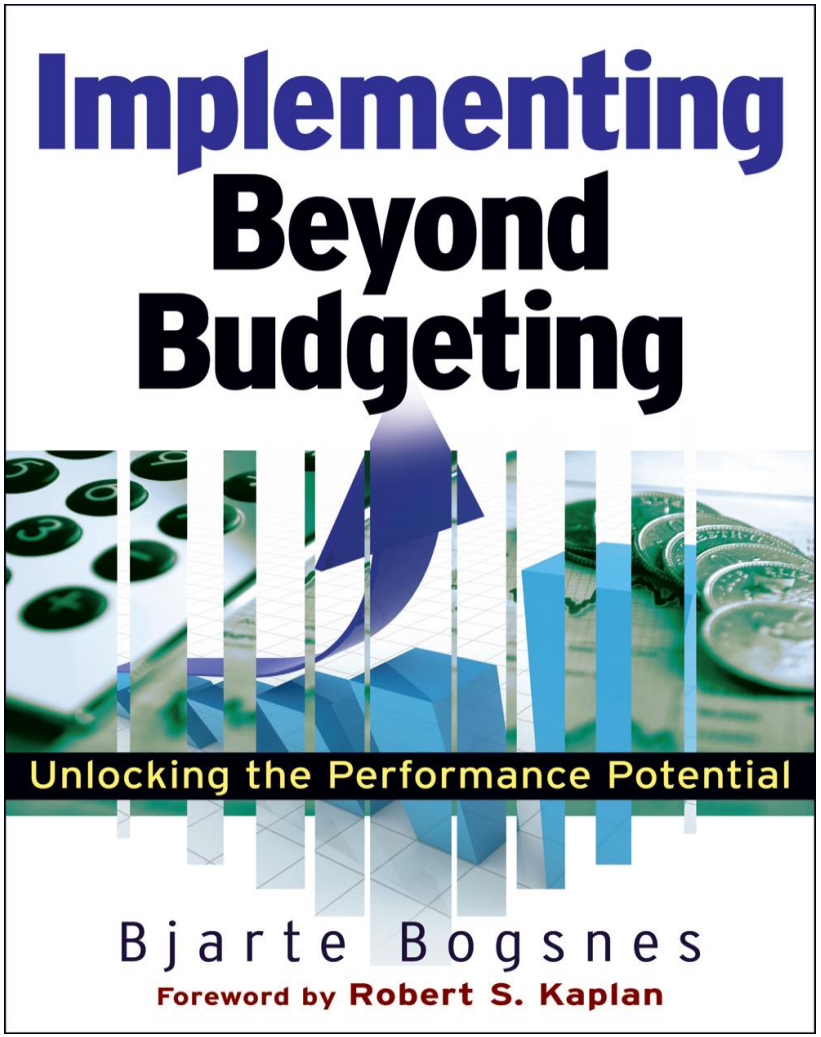
Behaviour

Pressure testing KPI results:
- Deliver towards the strategic objectives?
- How ambitious KPI targets?
- Changed assumptions, with positive or negative effect?
- Agreed actions implemented, or corrective actions initiated as needed?
- Delivered results sustainable?

Living the values
- Day-to day-observations
- 360°/ 180°/ 90° surveys
- People survey
- Individual development plan

A systematic change of the whole process

	”Annual command and control”	More dynamic & flexible A new performance language
Target setting	· Equal to plan – ”what we can deliver” · KPI targets · Absolute targets	· Aspiration driven –”what we must deliver”. Targets before plan. · ” Ambition to action” · Relative targets
Planning	· Plan = target, forecast and resource allocation · Gaps vs targets hidden · One outcome only · Very detailed	· Plan = forecast only (actions and expected performance) · Gaps vs. targets visible · Main uncertainty spans · Less detailed
Resource allocation	· Annual pre-allocation through budgets · Budgets ”an entitlement – my money”	· Resources available when needed, but within KPI targets + mandates + decision criteria. Monitoring of development
Business reporting	· Backward looking · Variance vs. YTD budget	· Forward looking · Forecast vs. targets, and actions to close gaps
Evaluation/ rewards	· Only based on budgets and KPIs	· A broader evaluation: ”Ambition to action” + Behaviour

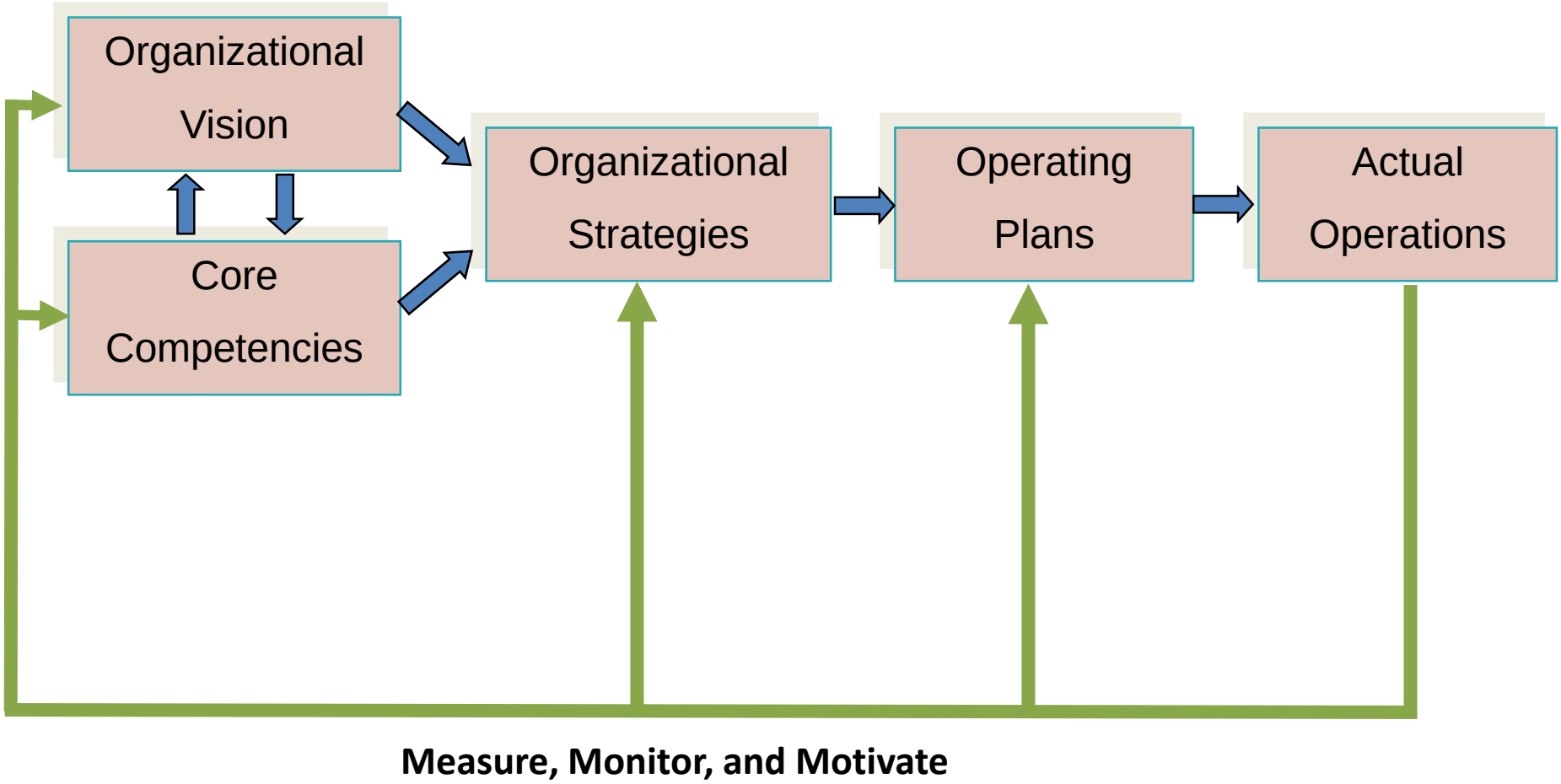

Implementing
Beyond
Budgeting
Unlocking the Performance Potential
Bjarte Bogsnes
Foreword by Robert S. Kaplan

Beyond Budgeting Tools



Balanced Scorecards
KPIs
Activity Based Management
Rolling Forecasts
"Real" costs v Standard cost
Relative (and continuous) improvement
External comparison & benchmarking
Delegation of Ownership of OUTCOMES not just INPUTS
Understand how the organisation is going to be successful
Understanding of people and motivation

Overview of Management Decision Making



Strategic Decision Making

- Managers determine performance objectives to monitor the results of actual operations.
- Performance objectives are specific goals.
- Measurements of the performance objectives are compared to management's expectations.
- Adjustments are made to either change operations or adjust the long-term strategies.

Performance Measures

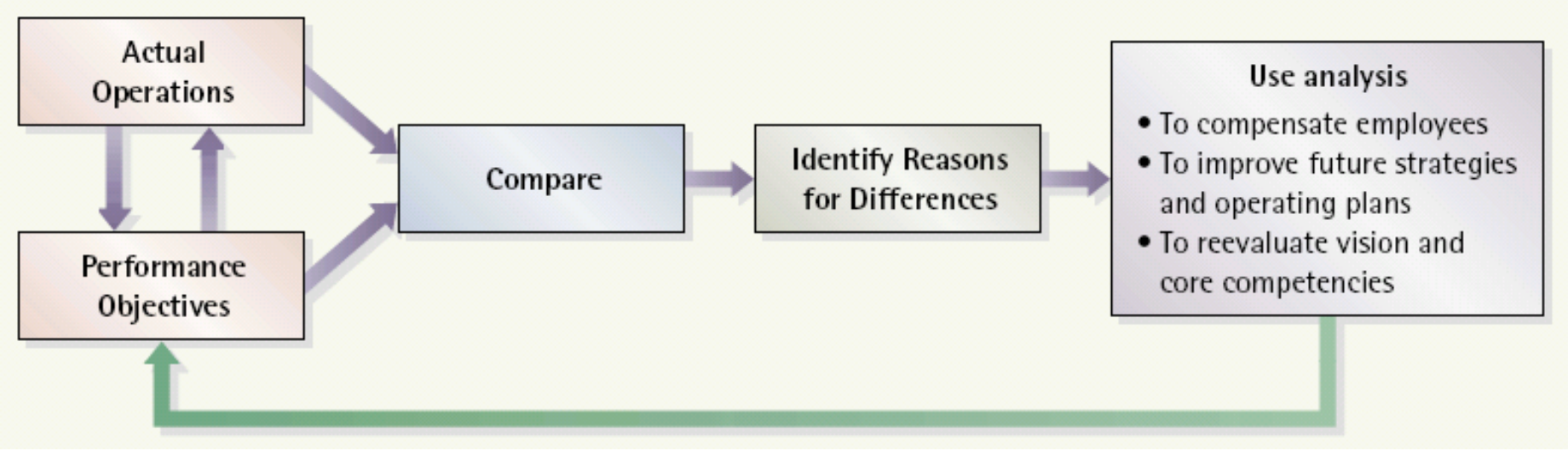
Financial Measures

Information measured in dollars or ratios of dollars

Nonfinancial Measures

Information that cannot be measured in dollars

Monitoring Measurable Performance Objectives



Financial Performance Measures

- Financial measures provide information in dollars or ratios of dollars.
  - These measures come from the accounting information system.
  - Traditionally these often were the only measures used.
- Examples include:
  - division revenue,
  - division profit margin or return on sales, and
  - variances of actual operating results from the budget.

Nonfinancial Performance Measures

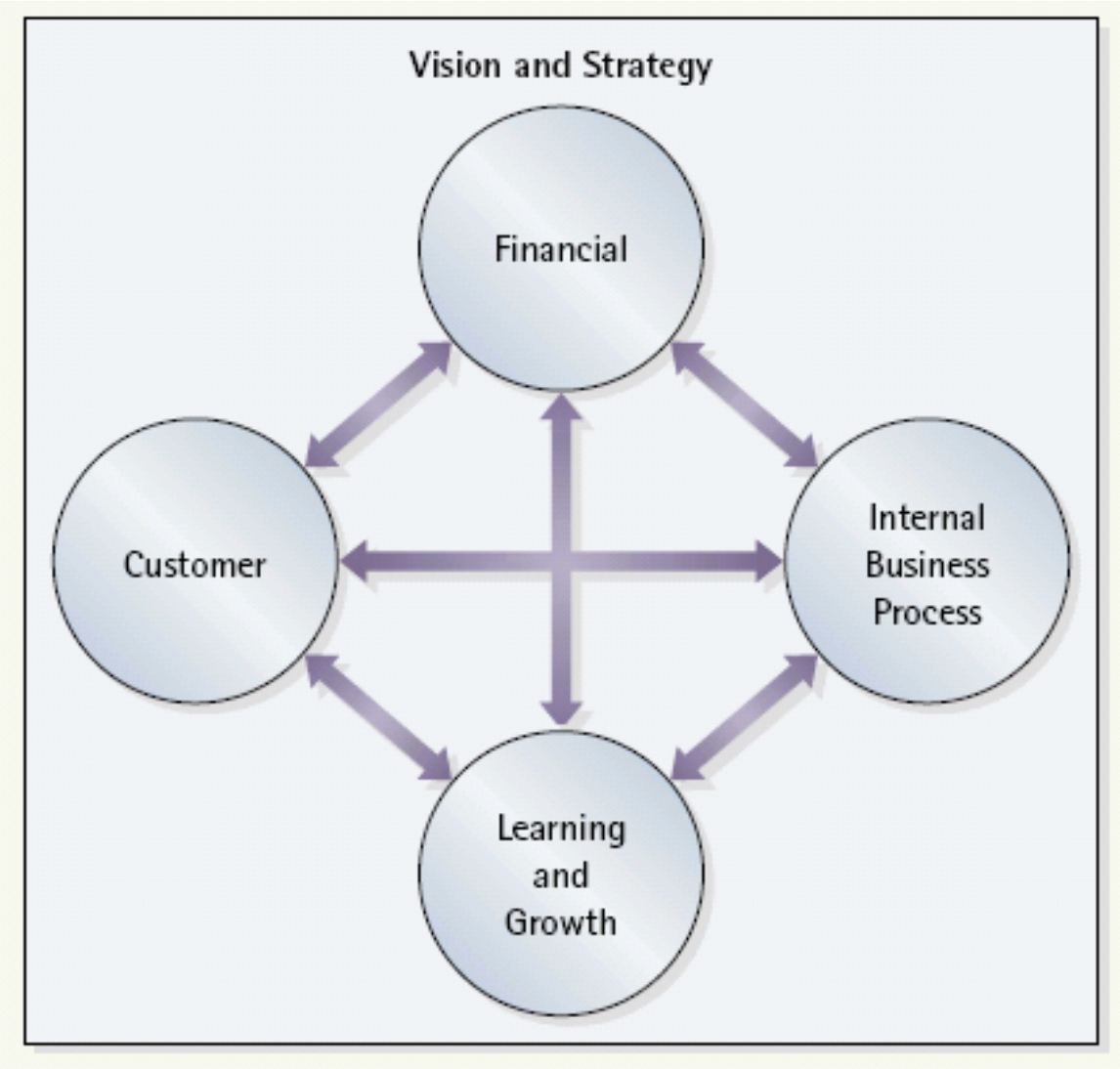
- Nonfinancial measures cannot be measured in dollars.

- Examples include:
  - Defect rates,
  - Customer satisfaction levels,
  - Number of days from a candidate's interview to his or her start date,
  - Average service time, and
  - Employee satisfaction levels.

Balanced Scorecard

- The balanced scorecard is a method of organizing the financial and nonfinancial performance measures used to monitor operations.
- The chosen measures are carefully related to the organization's vision and long-term strategies.
- The balanced scorecard serves as a means of communicating the organization's strategies throughout the organization.

Balanced Scorecard

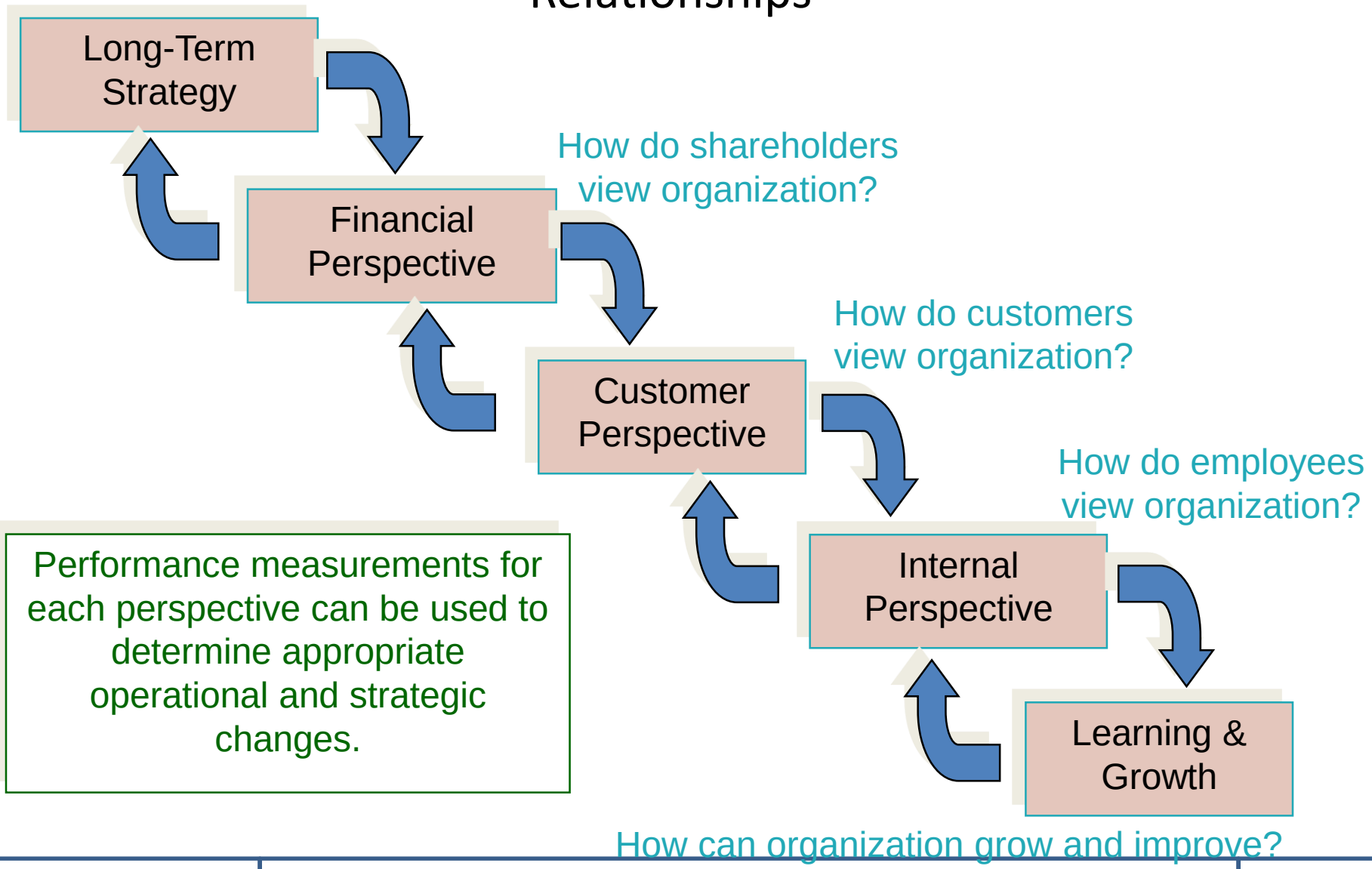


Balanced Scorecard (BSC) Perspectives

- A balanced scorecard usually consists of four categories of measures, with 4 ~ 5 specific measures per category.
- The four common categories are called the balanced scorecard perspectives.

1. The financial perspective measures progress towards the organization's financial goals.
2. The customer perspective evaluates the organization's performance from the viewpoint of customers.
3. The internal business process perspective assesses the organization's ability to produce and deliver goods and services.
4. The learning and growth perspective measures the organization's ability to change and develop improved strategies.

The BSC Translates Strategy to a Series of Cause and Effect Relationships



Performance measurements for each perspective can be used to determine appropriate operational and strategic changes.

BSC Example

The School for Future Artists is a private, for-profit, high school for students that are gifted in painting, drawing, and sculpture. Its mission is to train students in techniques and give them the confidence to be innovative, while at the same time preparing them to earn a living. Students are admitted to the school after a review of their portfolios. Half of the students are given full scholarships and the parents of the other half pay the expensive tuition. Parents who are paying tuition are given the opportunity to pay reduce tuition if they become shareholders. The School also receives donations from successful alumni. Identify some performance measures the School might use for the financial perspective on its balanced scorecard.

- Operating income
- Return on equity
- Donations as a percent of total revenues
- Variances between actual and budgeted expenditures
- Dollar amount of state and federal grant money received this year

BSC Example

Identify some performance measures the School for Future Artists might use for the customer perspective on its balanced scorecard.

- Percent of graduates who eventually complete masters degrees in fine arts or related fields
- Percent of graduates who eventually become art professors
- Number of graduates who were involved in art expositions this year
- Number of graduates who received federal or state grants this year
- Number of families with 2 or more children at the school
- Responses to satisfaction surveys given to students and parents

BSC Example

Identify some performance measures the School for Future Artists might use for the 3 categories of the internal business processes perspective on its balanced scorecard.

Innovation cycle

- Number of new courses developed
- Course development time

Operations cycle

- Percent of students who graduate
- Art supply costs per student

Post-sales service cycle

- Accounts receivable turnover ratio
- Results of alumni satisfaction surveys

BSC Example

Identify some performance measures the School for Future Artists might use for the learning and growth perspective on its balanced scorecard.

- Teacher turnover
- Number of training workshops attended by teachers this year
- Results of teacher satisfaction surveys
- Teacher and student use of newly purchased kiln equipment
- Number of management efficiency and leadership conferences attended by administrators this year

Balanced Scorecard Implementation

- A BSC implementation includes the following stages:
  - Clarify vision, competencies, and strategies.
  - Analyze the four BSC perspectives to develop objectives and measures.
  - Communicate the components of the BSC throughout the organization.
  - Establish performance targets and action plans.
  - Collect and analyze scorecard data.
  - Investigate variances and reward employees.
  - Provide feedback and refine the scorecard.

Barriers to Implementing Strategies

Vision Barrier

- People in the organization do not understand the strategy
- BSC helps engage people throughout the organization

People Barrier

- Employee incentives are not linked to strategy
- BSC can integrate operating plans and employee performance evaluation

Resource Barrier

- Organization resources are not linked to strategy
- BSC can focus resource allocations to areas that align with strategy

Mgmt Barrier

- Top managers do not spend enough time discussing strategy
- BSC engages managers in discussion on strategy and the interactions between financial and non financial measurements

Balanced Scorecard Strengths

- The greatest strength of the BSC is the communication of strategies throughout the organization.
- The BSC forces top management to clarify the vision and strategies of the organization.
- The BSC links employee rewards to performance objectives that are linked to the organization's vision and strategies, so short-term and long-term strategies are more likely to be in alignment.

Balanced Scorecard Potential Weaknesses

- If based on inappropriately defined visions and strategies, the BSC provides the wrong incentives for managers.
- Sometimes performance measures are chosen because the data is easy to obtain and familiar, rather than because they are linked to the vision and strategies.
- Managers may focus on measurements that are already successful rather than areas that need improvement.
- If performance measure targets are unattainable, employees may not buy in to the BSC initiative.

Future Direction of Cost Accounting

- Information technology advances free accountants from preparing detailed reports.
- More time is available to concentrate on providing the best information possible to support management decision making.
- Accountants increasingly need to become aware of and understand emerging management tools (such as the balanced scorecard).

Management Compensation

- **Recruiting, motivating, rewarding, and retaining effective managers is critical to the success of all firms**

- ***Management compensation* = policies and procedures for compensating managers; they include one or more of the following:**

  - A fixed payment (called *salary)*
  - A *bonus* (based on the achievement of performance goals for the period)
  - *Benefits* (also referred to as *perks,* such as travel, membership in a fitness club, medical benefits, and other extras paid for by the firm)

The Strategic Role of Management Compensation

- Top management should consider the specific strategic conditions facing the firm as a basic consideration in developing the compensation plan and making changes as strategic conditions change

- Top management can manage risk aversion effectively by carefully choosing the mix of salary and bonus in total compensation

- There is concern that executive pay is high compared to that of lower-level employees

Management Compensation and the Sales Life Cycle

Sales Life Cycle Phase	Salary	Bonus	Benefits
Product Introduction	High	Low	Low
Growth	Low	High	Competitive
Maturity	Competitive	Competitive	Competitive
Decline	High	Low	Competitive

The Objectives of Management Compensation

... are consistent with the three objectives of management control :

- To *motivate* managers to exert a high level of effort to achieve the goals set by top management (bonuses)
- To provide the *incentive* for managers, acting autonomously, to make decisions consistent with the goals set by top management
- To develop fairly the rewards earned by managers for their effort and skill and the effectiveness of their decision-making

Bonus Plans

- **Bonus compensation is the fastest growing element of total compensation and is often the largest part**

- **Bonus plans can be categorized according to three aspects:**

  - The *base of compensation*, that is, how the bonus pay is determined
  - *Compensation pools*, that is, the source from which the bonus pay is funded
  - *Payment options*, that is, how the bonus is to be awarded

Base of Compensation

- **Bonus compensation can be determined on the basis of (among other bases):**
  - Stock price
  - Strategic performance measures (cost, revenue, profit, or investment centers)
  - Performance measured by the balanced scorecard (CSFs)
- The choice of a base comes from a consideration of the compensation objectives of the firm
- Once the base is chosen, the firm must choose a method for calculating the amount of the bonus based on the actual level of performance relative to the target

Bonus Compensation Pools

Bonus compensation pools are either unit-based or firm-wide:

- A *unit-based pool* is based on the performance of the manager's unit; the amount of the bonus for any one manager is independent of the performance of other managers
- A *firm-wide pool* contains the amount of bonus available to all managers; bonuses depend on the firm's performance as a whole

Bonus Payment Options

The four most common *payment options* are as follows:

- *Current bonus* (cash and/or stock) based on current performance—the most common form of bonus payment
- *Deferred bonus* (cash and/or stock) earned currently but not paid for two or more years
- *Stock options* confer the right to purchase stock at some future date at a predetermined price
- *Performance shares* grant stock for achieving certain performance goals over two years or more

Tax Planning and Financial Reporting

- In addition to achieving the three main objectives of compensation plans, firms attempt to choose plans that reduce taxes for both the firm and the manager

- Many perks are deductible by the firm but are not considered income to the manager (e.g., club memberships, company cars, and entertainment)

- Firms also attempt to design compensation plans to have a favorable effect on the firm's financial reports

Business Analysis

- ***Business analysis*** **includes a set of tools used to evaluate the firm's competitiveness and financial performance**

- **Three tools for business analysis:**
  - The balanced scorecard (BSC)
  - Ratios to measure the performance of individual SBU managers and of the entire company
  - Economic Value Added (EVA®)

The Balanced Scorecard (BSC)

- The use of the BSC to evaluate a firm is similar to the use of CSFs in evaluating and compensating an individual manager
- A favorable evaluation results when the CSFs are superior to the benchmarks and to prior years' performance
- For example, assume EasyKleen, a manufacturer of cleaning products, sets its benchmark at 90% of the best performance in the industry (see next slide for company data)

EasyKleen Company Financial Statements

EASYKLEEN COMPANY
Summary of Selected Financial Information
For the Year Ended December 31, 2013

Financial Statements	2013		2012
Current assets			
Cash	$ 50,000		$ 70,000
Accounts receivable	100,000		80,000
Inventory	50,000		60,000
Total current assets	$ 200,000		$210,000
Long-lived assets	200,000		180,000
Total assets	$ 400,000		$390,000
Current liabilities	$ 50,000		$ 60,000
Long-term debt	150,000		200,000
Total liabilities	$ 200,000		$260,000
Shareholders' equity	200,000		130,000
Total liabilities and equity	$ 400,000		$390,000
Sales	$1,000,000	(50% are credit sales)	
Cost of sales	500,000		
Gross margin	$ 500,000		
Operating expense	300,000		
Operating income	$ 200,000		
Income tax (50%)	100,000		
Net income	$ 100,000		

EasyKleen: Additional Performance Data

Additional Financial Information		
Depreciation expense	$30,000	
Capital expenditures	$50,000	
Dividends	$30,000	
Year-end share price	$ 16.25	
Number of outstanding shares	50,000	
Interest expense	$10,000	($5,000 after-tax)
Training expenses	$30,000	($15,000 after-tax; 26 hours per employee)
Quality defects	350	ppm (parts per million)
Weighted-average cost of capital (WACC)	6%	
Cash Flow from Operations		
Net income	$100,000	
Depreciation expense	30,000	
Decrease (increase) in accounts receivable	(20,000)	
Decrease (increase) in inventory	10,000	
Increase (decrease) in current liabilities	(10,000)	
Total cash flow from operations	$110,000	
Free Cash Flow		
Cash flow from operations	$110,000	
Less: Capital expenditures	50,000	
Less: Dividends	30,000	
Free cash flow	$ 30,000	

EasyKleen has three CSFs:

1) **Return on total assets** (financial performance)
2) **Number of quality defects** (business processes)
3) **Number of training hours for plant workers** (human resources)

BSC Performance Analysis for EasyKleen

EasyKleen Company
Balanced Scorecard
For the Year Ended December 31, 2013

Category	CSF	Target Perf.	Actual Performance	Variance	
Financial Operations	Return on total assets	22%	25.3%	3.3%	exceeded
Operations	Quality defects	300 ppm	350 ppm	50 ppm	unmet
Human Resources	Training hours	32 hrs/employee	26 hours per employee	6 hours	unmet

Financial Ratio Analysis

Financial ratio analysis uses financial statement data to evaluate performance, often in the areas of *liquidity* and *profitability:*

- *Liquidity* refers to the firm's ability to pay its current operating expenses and maturing debt (one year or less); liquidity ratios include selected cash flow ratios
- Key liquidity and cash flow measures:
  - Accounts receivable turnover
  - Inventory turnover
  - Current ratio
  - Quick ratio
  - Cash-flow ratios for operating cash flows and free cash flow

Financial Ratio Analysis

Key *profitability* ratios are:

- Gross margin percent
- Return on assets
- Return on equity
- Earnings per share



Financial Ratio Analysis for EasyKleen

For the Year Ended December 31, 2013

Ratio	Benchmark	Actual	Percent Achievement	
Liquidity Ratios				
A/R turnover	7	5.56	79%	unmet
Inventory turnover	8	9.09	114%	met
Current ratio	2	4	200%	met
Quick ratio	1	3	300%	met
Cash Flow Ratios				
Cash flow ratio	2.5	2.2	88%	unmet
Free cash flow ratio	0.5	0.6	120%	met
Profitability Ratios				
Gross margin %	35%	50%	143%	met
Return on assets	22%	25.3%	115%	met
Return on equity	44%	60.6%	138%	met
Earnings per share	$2.15	$2.00	93%	unmet

Economic Value Added (EVA®)

- EVA® is a business unit's income after taxes and after deducting the cost of capital
- EVA® approximates a firm's "economic profits"
- EVA® requires adjustments to financial accounting data to "correct" for accounting "distortions"
- EVA® focuses managers' attention on creating value for shareholders
- By earning higher profits than the firm's cost of capital, the firm increases its internal resources available for dividends and/or to finance its continued growth

EVA® for EasyKleen Company

EVA® for EasyKleen is determined as follows, with *invested capital* defined as total assets less current liabilities(CL)

EVA® = EVA® net income - (Cost of capital x Invested capital)
= Net income + Training and interest expenses after tax
- .06 x (Average total assets + Training expenses - CL)
= $100,000 + $15,000 + $5,000 - 0.06 x
[($400,000 + $390,000)/2 + $30,000 - $50,000]
= $97,500

Note: Training expenses are added to total assets and to net income for EVA® calculations since training expenses are considered an investment for EVA® purposes

Business Valuation

- ***Business valuation*** **examines the value of a company, to come up with a dollar amount to represent the company's worth**

- **The value of a business can be approached in two different ways**

  - **From the viewpoint of the owner, shareholder, or interested investor,** i.e., the value of the firm's shareholder equity
  - **From the viewpoint of a potential buyer** – what one would one pay to purchase the entire company--debt, equity, and assets

Business Valuation

Four approaches to measuring the value of shareholders' equity:

- The ***book value method*** is the quickest and easiest method and is equivalent to the value that appears on the balance sheet for stockholders' equity
- The ***market value method*** is the market value of the firm's common equity, directly from the current market value of the firm's shares (market capitalization)
- The ***discounted cash flow method*** measures the firm's equity value as the discounted present value of its estimated future cash flows
- The ***multiples-based approach*** uses a ratio of stock price to some financial measure to determine the value of the firm's equity

The Discounted Cash Flow (DCF) Method

Four steps in the application of the DCF method:

❶ Forecast *free cash flows* (operating cash flow less capital expenditures and less dividends paid) over a finite horizon (usually 5 to 10 years)

❷ Forecast free cash flows beyond the finite horizon, using some simplifying assumption (e.g., cash flows will continue on indefinitely)

❸ Discount free cash flows at the firm's weighted-average cost of capital (WACC)

❹ Calculate the value of equity by adding the values calculated in step 3 to current nonoperating investments and then subtracting the market value of long-term debt

Using Multiples for Valuation

- The multiples-based valuation uses the ratio of stock price to a key financial measure to determine a multiple that is used in valuation

- Key financial measures used in multiples-based valuation include

  – Earnings
  – Sales
  – Cash Flow

Enterprise Value (EV)

- **Enterprise value (EV)** is another measure of what the market says a company is worth, but this time in an acquisition

- EV is measured as the market value of the firm's equity (market capitalization) plus debt, and less cash (cash is available after the acquisition to pay off debt or for other uses)

- EV is used by investors and shareholders when an acquisition is being considered

Financial and Nonfinancial performance Measures

- Many organizations record financial and nonfinancial performance measures for their subunits on a balanced scorecard. The scorecards of different organizations emphasize different measures but the measures are always derived from a company's strategy. In a balanced scorecard, the four perspectives are:
  1. Financial
  2. Customer
  3. Internal business process
  4. Learning and growth

Accounting-Based Performance Measures

- Requires several steps:
  1. Choose performance measures that align with the firm's financial goals.
  2. Choose the details of each performance measure.
  3. Choose a target level of performance and a feedback mechanism for each performance measure.

Four common measures of economic performance:

1. Return on investment
2. Residual income
3. Economic value added
4. Return on sales (this measure does not account for investment)

Return on Investment (ROI)

- ROI is an accounting measure of income divided by an accounting measure of investment.

$$ROI = \frac{\text{Income}}{\text{Investment}}$$

ROI

- Most popular metric for two reasons:
  1. Blends all the ingredients of profitability (revenues, costs, and investment) into a single percentage
  2. May be compared to other ROI's both inside and outside the firm
- Also called the accounting rate of return (ARR) or the accrual accounting rate of return (AARR)

ROI

- ROI may be decomposed into its two components as follows:

$$\frac{\text{Income}}{\text{Investment}} = \frac{\text{Income}}{\text{Revenues}} \times \frac{\text{Revenues}}{\text{Investment}}$$

- ROI = Return on Sales X Investment Turnover.
- This approach is known as the DuPont Method of Profitability Analysis. It recognizes the two basic ingredients in profit making: increasing income per dollar of revenue and using assets to generate more revenues. An improvement to either with no change in the other will increase ROI.

Residual Income

- Residual income (RI) is an accounting measure of income minus a dollar amount for required return on an accounting measure of investment.
- RI = Income – (RRR X Investment)
  - RRR = Required Rate of Return
- Required rate of return times the investment is the imputed cost of the investment.
  - Imputed costs are costs recognized in some situations, but not in the financial accounting records.

Economic Value Added (EVA)

- EVA is a variation of RI used by many companies. It is calculated as follows:

$$\text{EVA} = \text{After-tax Operating Income} - \{\text{Weighted-Average Cost of Capital} \times (\text{Total Assets} - \text{Current Liabilities})\}$$

- Weighted average cost of capital equals the after-tax average cost of all long-term funds in use.

Return on Sales (ROS)

- Return on sales is also known as the income-to-revenues ratio or the sales ratio
- It is frequently used, simple to compute, and widely understood.
- It does not take into account investment.
- It measures how effectively costs are managed

It is calculated by taking Operating Income / Revenues and is expressed as a percentage.

Comparing performance measures

- Using the example of the hotels from our textbook, we see the results using each of our methods: (in parentheses are the ranks)

Hotel	ROI	RI	EVA	ROS
SF	24% (1)	$120,000 (2)	$68,250 (2)	20% (2)
Chicago	15% (3)	$ 60,000 (3)	$15,750 (3)	21% (1)
New Orleans	17% 92)	$150,000 (1)	$73,500 (1)	16% (3)

Choosing details of the measure

How should each measure be computed?
Several questions should be answered to begin:

- What is the time horizon?
- Which definition of investment will be used?
- How shall we calculate various components of each performance measure such as the measurement of assets.
- Let's now discuss each of these measurement details.

Alternative Time Horizons

An important element in designing accounting-based performance measures is choosing the time horizon of the performance measures.

- Multiple periods of evaluation are sometimes appropriate.
- ROI, RI, EVA, and ROS all basically evaluate one period of time.
- ROI, RI, EVA, and ROS may all be adapted to evaluate multiple periods of time.

Benefits of multiyear analysis

There are several benefits to multiyear analysis:

- Benefits of actions taken in the current period may not show up in short-run performance measures.
- If managers use NPV for investment decisions, then using a multiyear RI for performance achieves goal congruence.
- Motivates managers to take a long-run perspective by compensating them on changes in market price.

Choosing Alternative Definitions for Performance Measures

- Four common alternative definitions of investment:
  1. Total assets available – all assets.
  2. Total assets employed – all assets less idle assets and assets purchased for future expansion.
  3. Total assets employed minus current liabilities – total assets employed less assets financed by short-term creditors.
  4. Stockholder's equity – assign liabilities to subunits and deduct from total assets.

Alternative asset measurements

- Possible alternative asset measurements include:
  1. Current cost – cost of purchasing an asset today identical to the one currently held.
  2. Gross value of fixed assets – historical cost.
  3. Net book value(NBV) of fixed assets – historical cost.

  (Historical cost is used to calculate ROI and there is always a question whether to use gross or net book value. NBV is the measure most commonly used by companies for internal performance evaluation.)

Target levels of performance and feedback

- Choosing target levels of performance:
  - Establish target ROIs using historical-cost-based measures.
  - Set continuous improvement targets.
  - Use balanced scorecards to establish targets.
- Choosing the timing of feedback (depends on):
  - How critical the information is for the success of the organization.
  - The management level receiving feedback.
  - The sophistication of the organization's information technology.

Performance Measurement in Multinational Companies

- Additional difficulties faced by multinational companies:
  - The economic, legal, political, social, and cultural environments differ significantly across countries.
  - Import quotas and tariffs range widely from country to country.
  - Availability of materials and skilled labor, as well as costs of materials, labor, and infrastructure also differ significantly across countries.
  - Divisions operating in different countries account for their performance in different currencies and inflation and fluctuation in foreign-currency exchange rates affect performance measurement.

Distinguishing Between performance of Managers and their subUnits

- The performance evaluation of a manager should be distinguished from the performance evaluation of that manager's subunit, such as a division of the company.
- The reason for this is to recognize that a company may put the most skilled division manager in charge of the division with the poorest return in an effort to improve that division and that may take years.

The Trade-Off: Creating Incentives vs. Imposing Risk

- An inherent trade-off exists between creating incentives and imposing risk.
  - An incentive should be some reward for performance.
  - An incentive may create an environment in which suboptimal behavior may occur: the goals of the firm are sacrificed in order to meet a manager's personal goals.
  - The motivation for having some salary and some performance-based compensation is to balance the benefit of incentives against the extra cost of imposing risk on a manager.

Moral Hazard

- Moral hazard describes a situation in which an employee prefers to exert less effort compared with the effort the owner desires because the owner cannot accurately monitor and enforce the employee's effort.

Intensity of Incentives

- Intensity of incentives—how large the incentive component of a manager's compensation should be relative to their salary component.
- The tradeoff between considerations of sensitivity and risk, on the one hand, and the congruence of goals, on the other, determines the effective intensity of incentives placed on each measure of performance.

Benchmarks and relative performance evaluation

- Benchmarks are metrics that correspond to the best practices of organizations and may be available inside or outside of the organization.

Performance Measures at the Individual Activity Level

- Managers need to do two things when designing the measures used to evaluate performance of individual employees:
  1. Design performance measures for activities that require multiple tasks.
  2. Design performance measures for activities done in teams.

Compensation for Multiple Tasks & team-based

- Employers want employees to allocate their time and effort intelligently among various tasks or aspects of their jobs.
- A team achieves better results than individual employees acting alone.[1] Many companies reward employees on teams based on how well their team performs.

Executive Compensation Plans

- Based on both financial and nonfinancial performance measures, and include a mix of:
  - Base salary.
  - Annual incentives, such as cash bonuses.
  - Long-run incentives, such as stock options.
- Well-designed plans use a compensation mix that balances risk (the effect of uncontrollable factors on the performance measure, and hence compensation) with short-run and long-run incentives to achieve the firm's goals.

Strategy and Levers of Control

Performance evaluation measures help managers track their progress toward achieving a company's strategic goals.

- Because these measures help diagnose whether a company is performing to expectations, they are collectively called Diagnostic Control Systems.
- Companies motivate managers by holding them accountable and rewarding them for meeting goals.

Strategy and Levers of Control

To prevent unethical and outright fraudulent behavior, companies balance the push for performance (resulting from Diagnostic Control Systems) with three other levers of control:

- Boundary systems.
- Belief systems.
- Interactive control systems.

⦿Each lever is important and needs to be monitored.

⦿Levers should be interdependent and collectively represent a living system of business conduct.

Boundary Systems

- Boundary systems describe standards of behavior and codes of conduct expected of all employees.
  - Highlights actions that are “off-limits.”
  - A code of conduct describes appropriate and inappropriate individual behaviors.

Belief Systems

- Belief systems articulate the mission, purpose, and core values of a company.
- They describe the accepted norms and patterns of behavior expected of all managers and other employees when interacting with one another, shareholders, customers, and communities.

Interactive Control Systems

- Interactive control systems are formal information systems that managers use to focus the company's attention and learning on key strategic issues.
- Helps managers create open dialog and eliminate or manage an excessive focus on diagnostic control systems.
- Tracks strategic uncertainties that businesses face.

Summary

- Compensation plans are policies and procedures for compensating managers
  - A *salary* is a fixed (usually monthly) payment
  - A *bonus* is based on the achievement of performance goals for the period
  - *Benefits* (also referred to as perks) include travel, membership in a fitness club, medical benefits, and other extras paid for by the firm
- In addition to achieving the three main objectives, firms attempt to choose compensation plans that reduce or avoid taxes for both the firm and the manager

Summary

A wide variety of bonus plans exists, but can be categorized according to three aspects:

- The *base of compensation*, that is, how the bonus pay is determined (e.g., stock price, strategic performance measures (cost, revenue, profit, or investment center), or the balanced scorecard (CSFs))
- *Compensation pools*, that is, the source from which the bonus pay is funded (unit-based or firm-wide)
- *Payment options*, that is, how the bonus is to be awarded

Summary

In recent years, the use of different payment options for bonus compensation plans has greatly increased, but the four most common payment options are as follows:

- *Current bonus* (cash and/or stock) based on current performance - most common form
- *Deferred bonus* (cash and/or stock) earned currently but not paid for two or more years
- *Stock options* confer the right to purchase stock at some future date at a predetermined price
- *Performance shares* grant stock for achieving certain performance goals over two years or more

Summary

- *Business analysis* includes a set of tools used to evaluate the firm's competitiveness and financial performance

- There are three tools for business analysis:
  - The balanced scorecard (BSC)
  - Financial Ratios to measure the performance of individual SBU managers and of the entire company
  - Economic Value Added (EVA®)

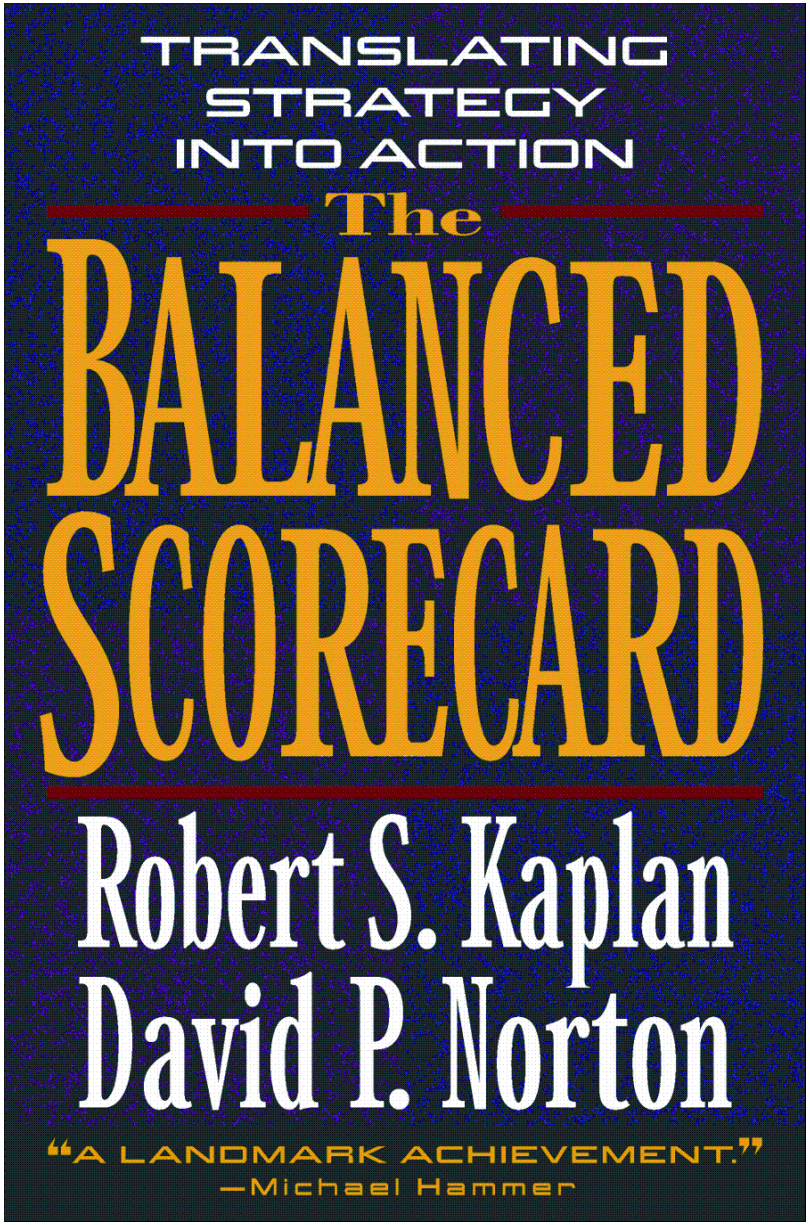
Summary

- Business valuation examines the value of a company, to come up with a single dollar figure of worth

- There are four approaches to equity valuation
  - The *book value method*
  - The *market value method* (market capitalization)
  - The *discounted cash flow method*
  - The *multiples-based approach*

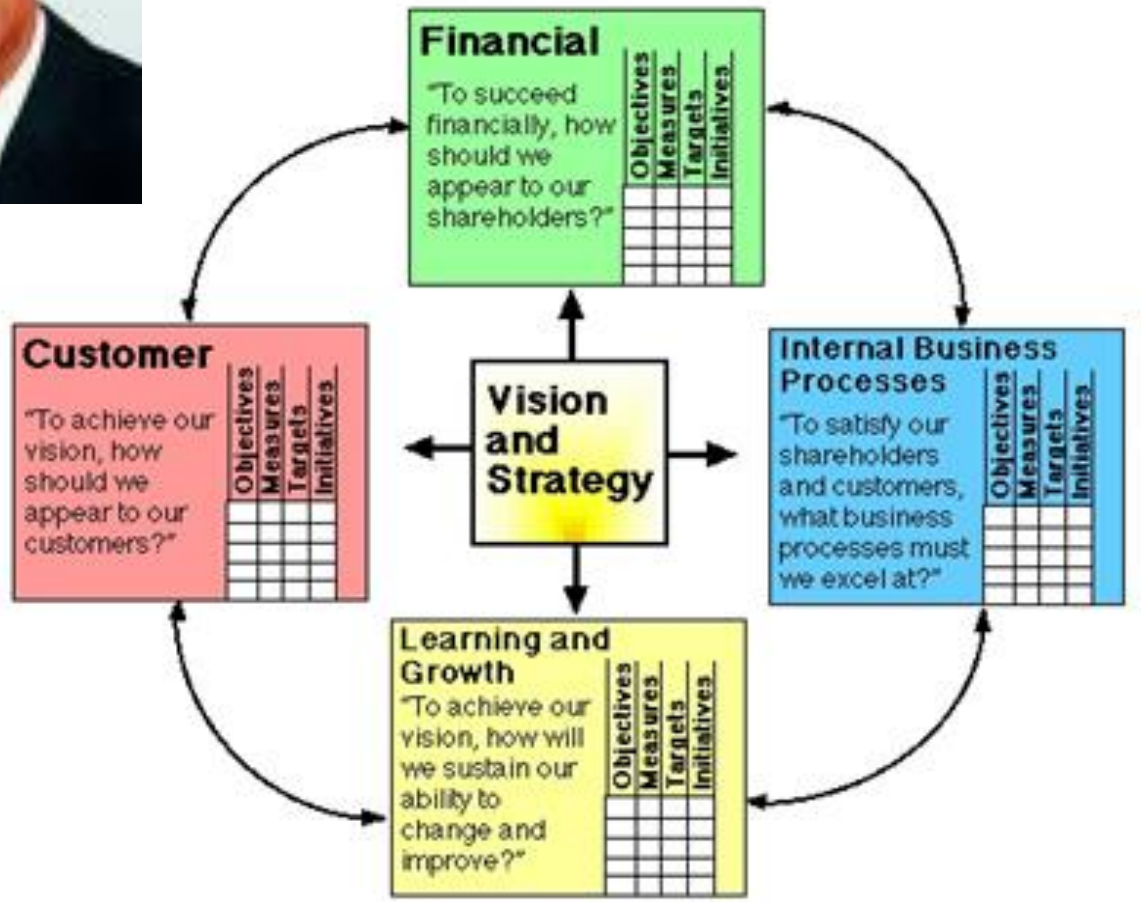
- Enterprise value (EV) is a measure of what the market says a company is worth for acquisition purposes

The Balanced Scorecard: linking Strategy to Performance Measurement


TRANSLATING
STRATEGY
INTO ACTION
The
BALANCED
SCORECARD
Robert S. Kaplan
David P. Norton
"A LANDMARK ACHIEVEMENT."
—Michael Hammer

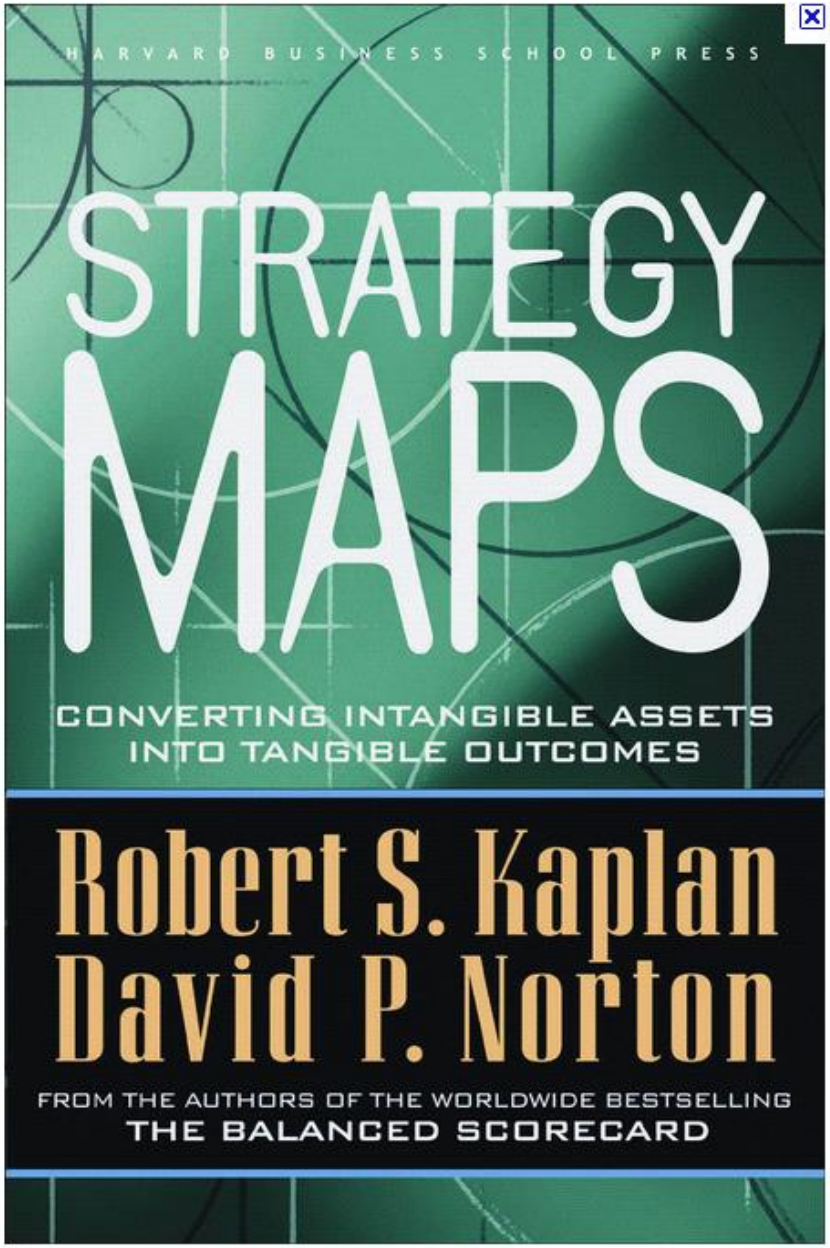


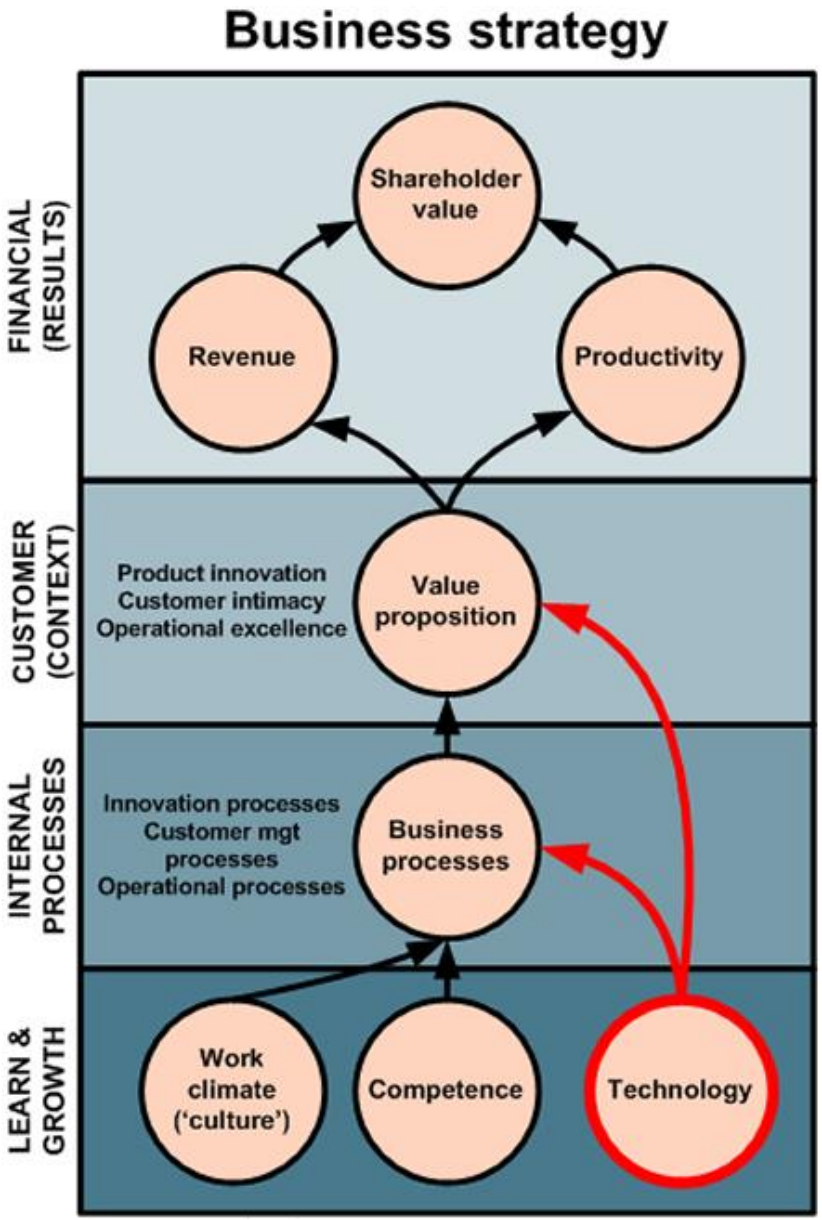
Balanced Scorecard



Adapted from Robert S. Kaplan and David P. Norton, "Using the Balanced Scorecard as a Strategic Management System," Harvard Business Review (January-February 1996): 76.


COMMUNITY
ACTIVELY SUPPORTING LOCAL COMMUNITIES
BUYING AND SELLING OUR PRODUCTS RESPONSIBLY
CARING FOR THE ENVIRONMENT
GIVING CUSTOMERS HEALTHY CHOICES
CREATING GOOD JOBS AND CAREERS
CUSTOMER
FINANCE
PEOPLE
OPERATIONS
Every little helps

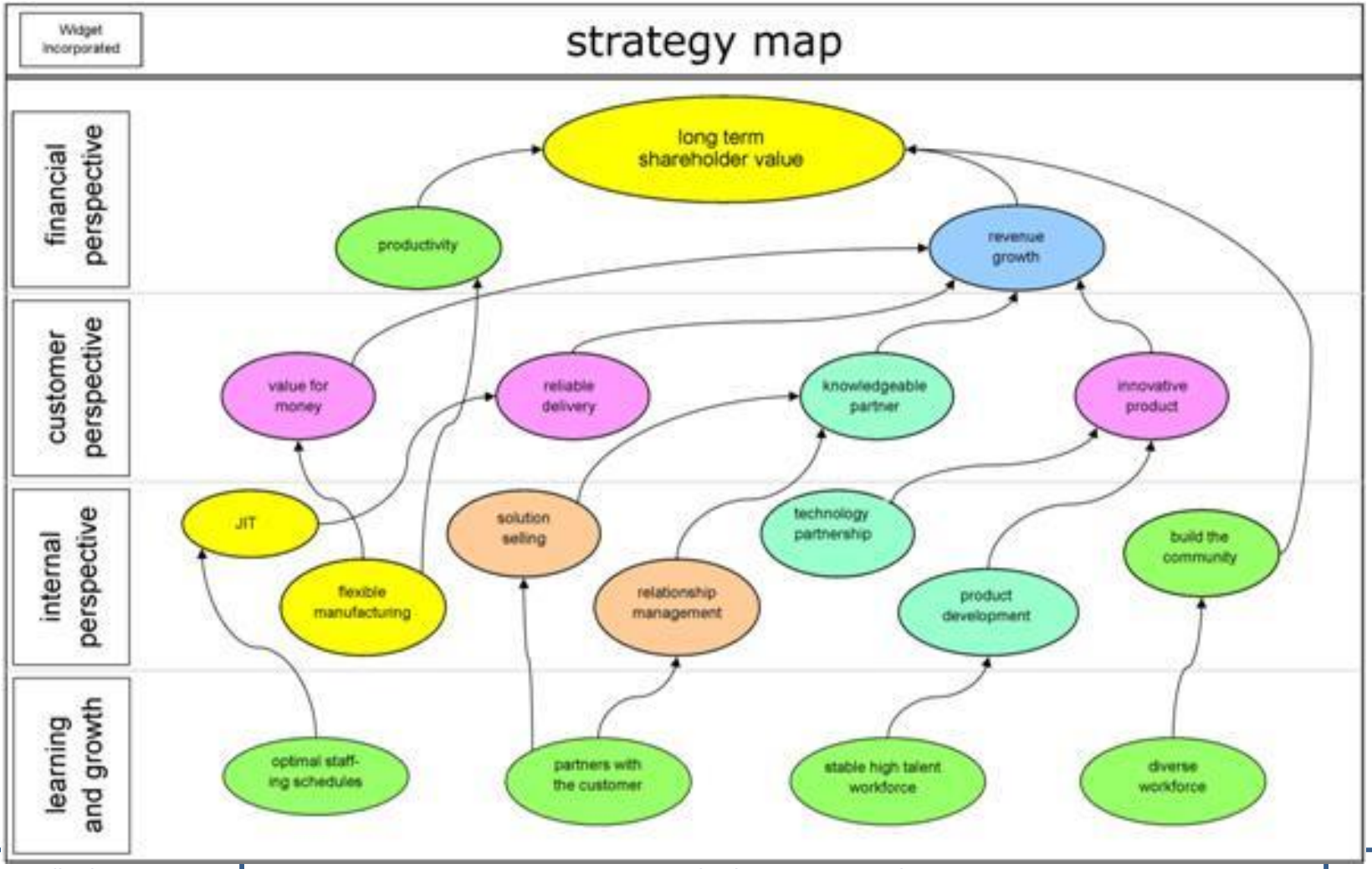

HARVARD BUSINESS SCHOOL PRESS
STRATEGY MAPS
CONVERTING INTANGIBLE ASSETS INTO TANGIBLE OUTCOMES
Robert S. Kaplan
David P. Norton
FROM THE AUTHORS OF THE WORLDWIDE BESTSELLING
THE BALANCED SCORECARD


Business strategy
FINANCIAL (RESULTS)
Shareholder value
Revenue
Productivity
CUSTOMER (CONTEXT)
Product innovation
Customer intimacy
Operational excellence
Value proposition
INTERNAL PROCESSES
Innovation processes
Customer mgt processes
Operational processes
Business processes
LEARN & GROWTH
Work climate ('culture')
Competence
Technology

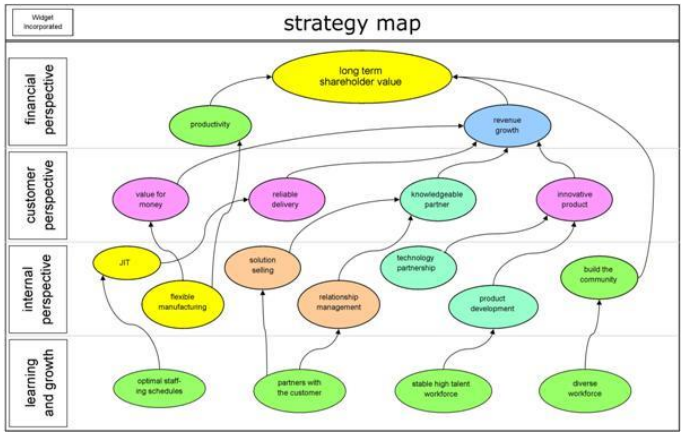
CAUSE & EFFECT Diagramme

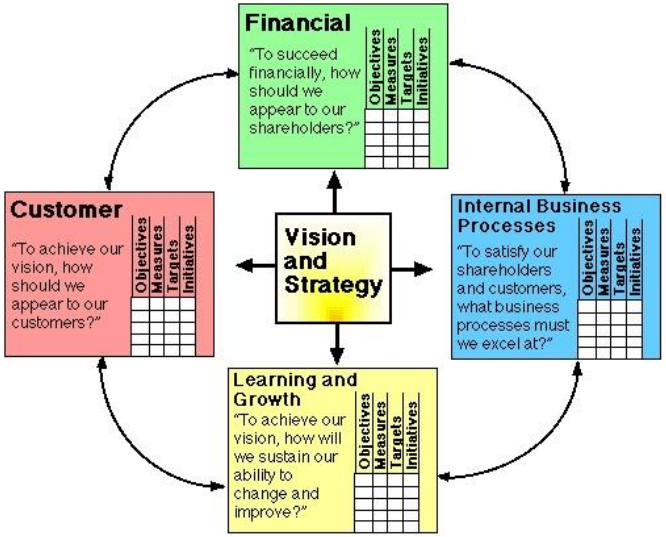
- What we need to deliver in one “perspective” to effect another “perspective” to deliver..
- Ultimate to deliver our corporate objectives – Shareholder Value?
- Underpinned by our values, driven by our mission and vision

The strategy map – a ‘picture’ of the strategy’



Managing the business using a BSC approach

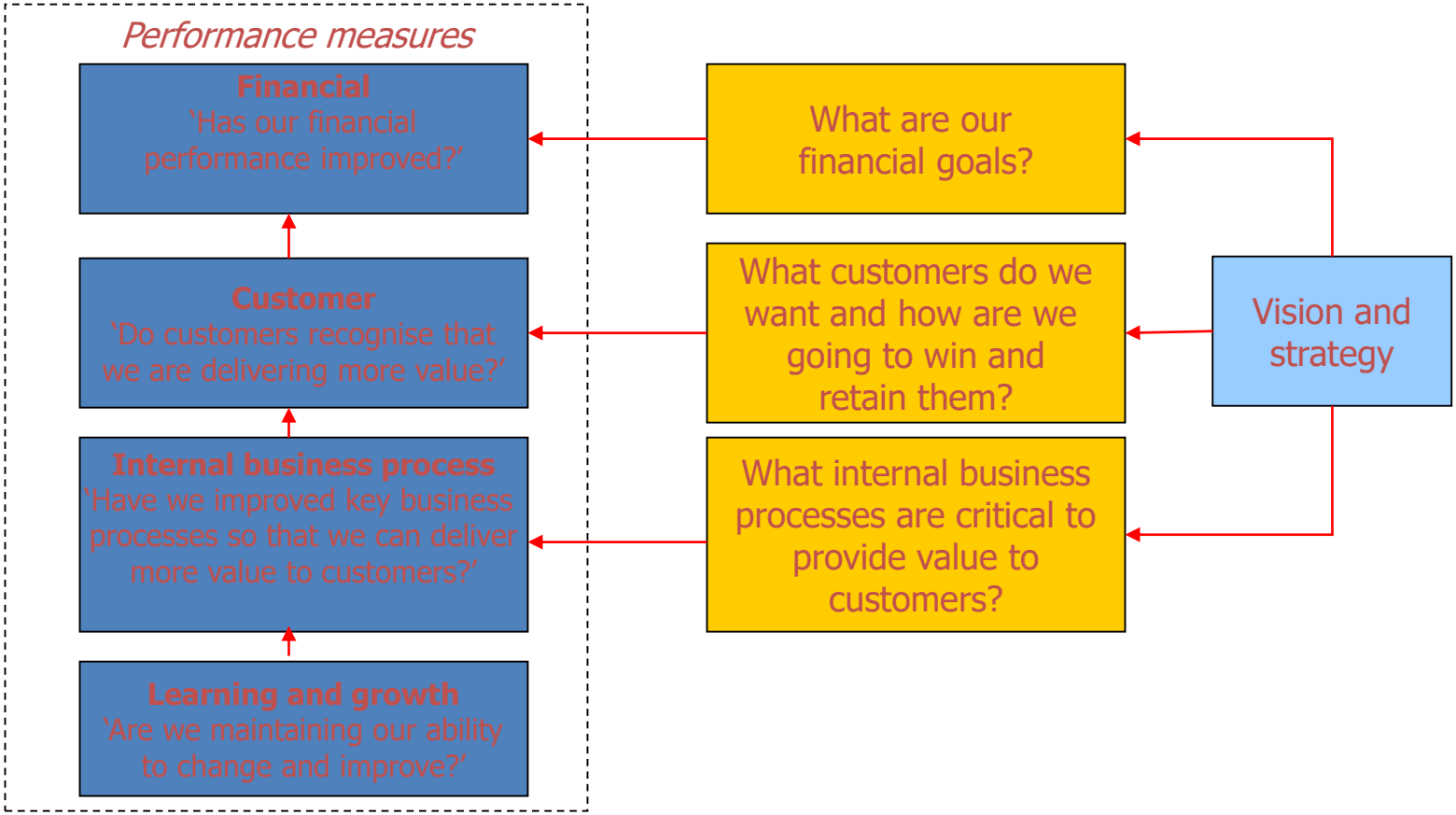




'Describe the strategy'

'Measure the strategy

Designing the Scorecard - from Strategy to Performance Measurement



Balanced Scorecard
Top 10 Implementation issues

1. No executive sponsorship
2. Lack of education and training
3. No strategy
4. No clear objectives for programme
5. Timing
6. Inconsistent management practices
7. No new measures – mainly focused on finance / process
8. Terminology
9. Lack of effective cascading
10. Poor understanding of cause and effect

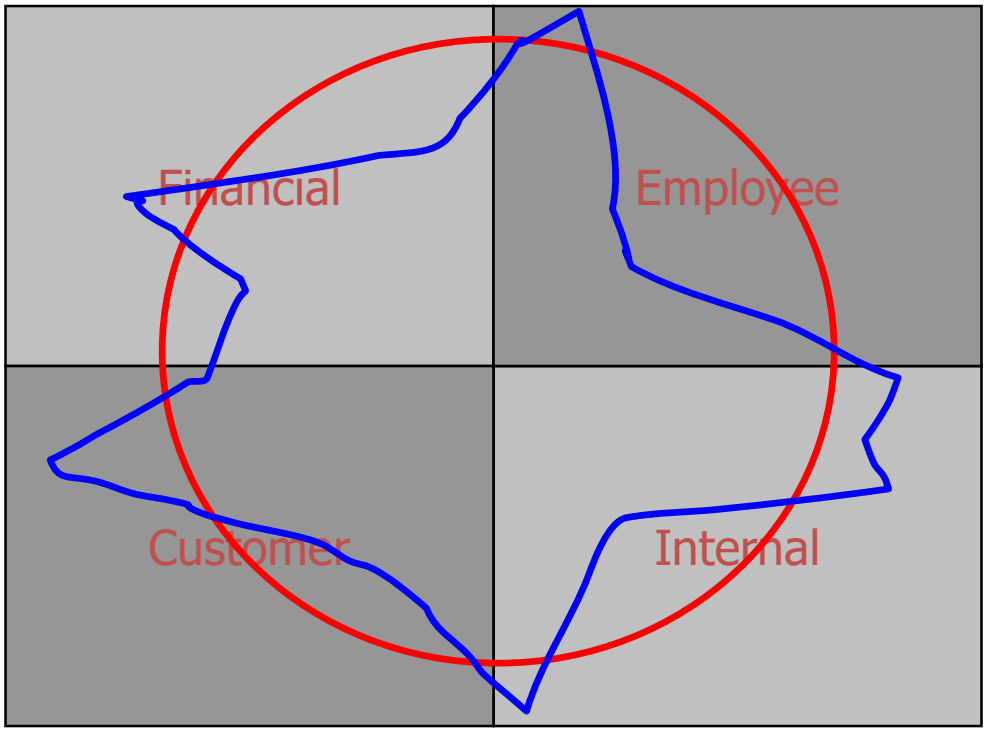
Balanced Scorecard – The Benefits

- PUT STRATEGY IN BUDGETS
- Translating Strategy into Action
- Improved Resource Allocation
- Enhances Management Strategic Feedback & Learning
- Clear communication of Strategy may highlight divergent views on strategy
- Can result in a re-design / simplification of the Budget Process

Presentation
KPI wheel & RAG Status Traffic Lights

Actual

Target





Quality as a Competitive Tool

- Quality—the total features and characteristics of a product or a service made or performed according to specifications to satisfy customers at the time of purchase and during use.
- Companies find that a focus on the quality of a product or service generally builds expertise in producing it, lowers the cost of providing it, creates higher satisfaction for customers using it and generates higher future revenues for the company selling it.

Quality as a Competitive Tool

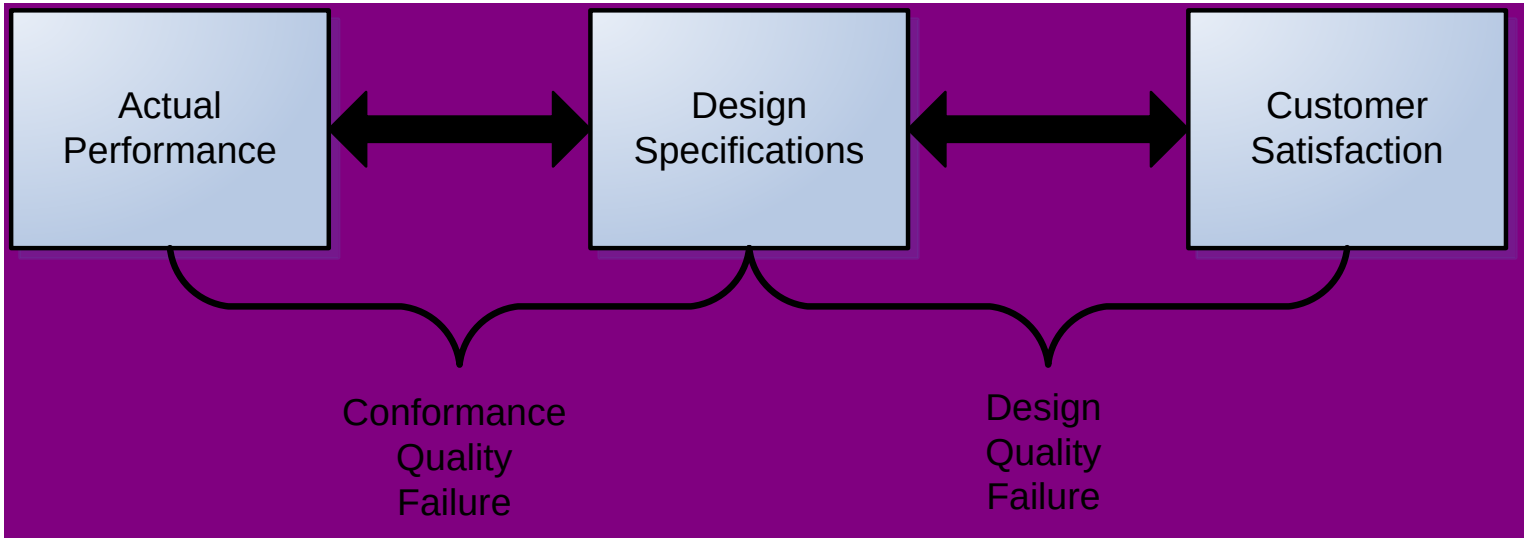
- Companies are also using quality management and measurement practices to find cost-effective ways to reduce the environmental and economic costs of air pollution, wastewater, oil spills, and hazardous waste disposal.
- Product quality can also be an important engine for environmental progress.

Two Basic Aspects of Quality

1. Design quality—refers to how closely the characteristics of a product or service meet the needs and wants of customers.
2. Conformance quality—refers to the performance of a product or service relative to its design and product specifications.

Quality has both financial and nonfinancial components relating to customer satisfaction, improving internal quality processes, reducing defects and the training and empowering of workers. Let's look at it from the four perspectives of the balanced scorecard.

Quality and Failure



Four Perspectives of the Balanced Scorecard

1. Financial
2. Customer
3. Internal business process
4. Learning and growth

The Financial Perspective: Costs of Quality (COQ)

- Four categories of quality costs:
  1. Prevention costs—costs incurred to preclude the production of products that do not conform to specifications.
  2. Appraisal costs— costs incurred to detect which of the individual units of products do not conform to specifications.
  3. Internal failure costs—costs incurred on defective products before they are shipped to customers.
  4. External failure costs—costs incurred on defective products after they are shipped to customers.

Items pertaining to Costs-of- Quality Reports

Prevention Costs	Appraisal Costs	Internal Failure Costs	External Failure Costs
Design engineering	Inspection	Spoilage	Customer support
Process engineering	Online product manufacturing and process inspection	Rework	Manufacturing/ process engineering for external failures
Supplier evaluations	Product testing	Scrap	Warranty repair costs
Preventive equipment maintenance		Machine repairs	Liability claims
Quality training		Manufacturing/ process engineering on internal failures	
Testing of new materials			

Determining COQ by adapting the seven-step Activity-Based Costing approach

1. Identify the chosen cost object.
2. Identify the direct costs of the quality of the product.
3. Select the activities and cost-allocation bases to use for allocating the indirect costs of quality to the product.
4. Identify the indirect costs of quality associated with each cost-allocation base.
5. Compute the rate per unit of each cost-allocation base.

Determining COQ using Activity-Based Costing, concluded

6. Compute the indirect costs of quality allocated to the product.
7. Compute the total costs of quality by adding all direct and indirect costs of quality assigned to the product.

Activity-Based COQ Analysis example

	A	B	C	D	E	F	G
1	**PANEL A: COQ REPORT**						**Percentage of**
2		**Cost Allocation**		**Quantity of Cost**		**Total**	**Revenues**
3	**Cost of Quality and Value-Chain Category**	**Rate[a]**		**Allocation Base**		**Costs**	**(5) = (4) ÷**
4	**(1)**	**(2)**		**(3)**		**(4) = (2) x (3)**	**$300,000,000**
5	*Prevention costs*						
6	Design engineering (R&D/Design)	$ 80	per hour	40,000	hours	$ 3,200,000	1.1%
7	Process engineering (R&D/Design)	$ 60	per hour	45,000	hours	2,700,000	0.9%
8	Total prevention costs					5,900,000	2.0%
9	*Appraisal costs*						
10	Inspection (Manufacturing)	$ 40	per hour	240,000	hours	9,600,000	3.2%
11	Total appraisal costs					9,600,000	3.2%
12	*Internal failure costs*						
13	Rework (Manufacturing)	$100	per hour	100,000	hours	10,000,000	3.3%
14	Total internal failure costs					10,000,000	3.3%
15	*External failure costs*						
16	Customer support (Marketing)	$ 50	per hour	12,000	hours	600,000	0.2%
17	Transportation (Distribution)	$240	per load	3,000	loads	720,000	0.2%
18	Warranty repair (Customer service)	$110	per hour	120,000	hours	13,200,000	4.4%
19	Total external failure costs					14,520,000	4.8%
20	Total costs of quality					$40,020,000	13.3%
21							
22	[a]Amounts assumed.						
23							
24	**PANEL B: OPPORTUNITY COST ANALYSIS**						
25						**Total Estimated**	**Percentage**
26						**Contribution**	**of Revenues**
27	**Cost of Quality Category**					**Margin Lost**	**(3) = (2) ÷**
28	**(1)**					**(2)**	**$300,000,000**
29	*External failure costs*						
30	Estimated forgone contribution margin						
31	and income on lost sales					$12,000,000[b]	4.0%
32	Total external failure costs					$12,000,000	4.0%
33							
34	[b]Calculated as total revenues minus all variable costs (whether output-unit, batch, product-sustaining, or facility-sustaining) on						
35	lost sales in 2008. If poor quality causes Photon to lose sales in subsequent years as well, the opportunity costs will be						
36	even greater.						

Cost of Quality-opportunity costs

- Opportunity costs result from poor quality:
  1. Contribution margin and income foregone from lost sales.
  2. Lost production.
  3. Lower prices.
- These opportunity costs are not recorded in the financial accounting systems.

The Customer Perspective

- Nonfinancial measures of customer satisfaction include:
  - Market research information on customer preferences for and customer satisfaction with specific product features.
  - Market share.
  - Percentage of highly satisfied customers
  - Number of defective units shipped to customers as a percentage of total units shipped.
  - Number of customer complaints.
  - Percentage of products that fail soon after delivery.
  - Average delivery delays.
  - On time delivery rate

The Internal-Business- Process Perspective

- Three techniques for identifying and analyzing quality problems:
  1. Control charts.
  2. Pareto diagrams.
  3. Cause-and-effect diagrams.

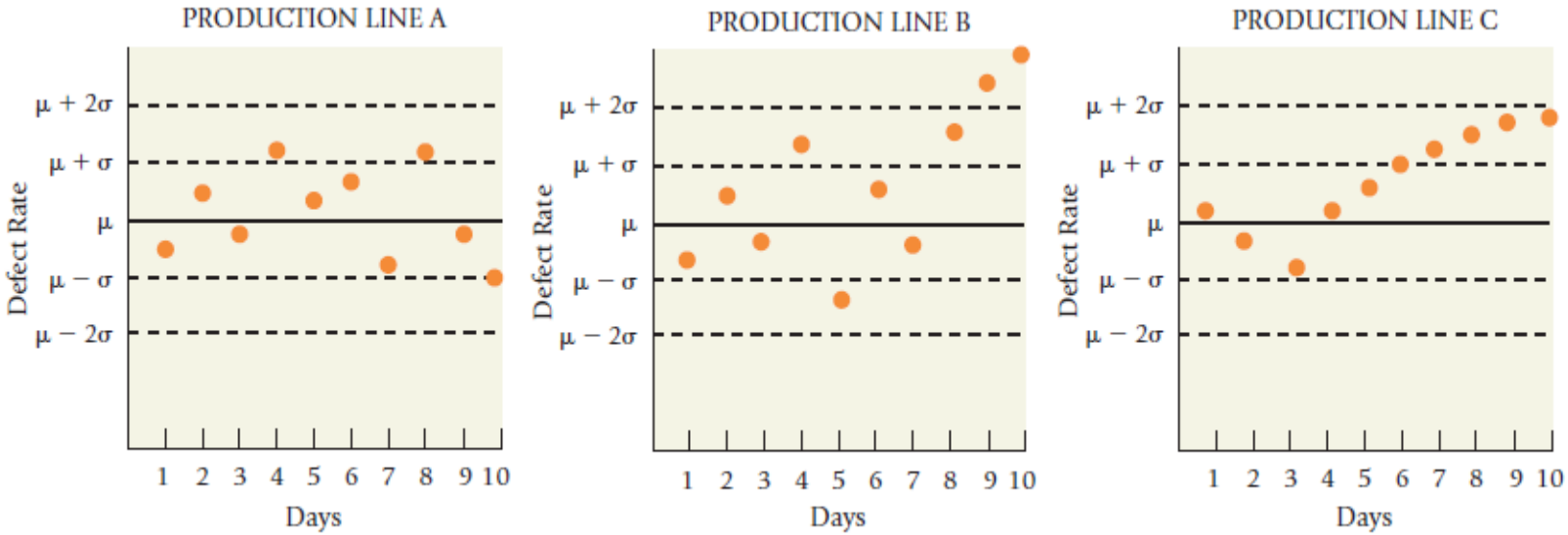
Control Charts

- Statistical quality control (SQC) is a formal means of distinguishing between random and nonrandom variations in an operating process.
- Random variations occur, for example, when chance fluctuations in the speed of equipment cause defective products to be produced.
- Nonrandom variations occur when defective products are produced as a result of a systematic problem such as an incorrect speed setting, a flawed part design, or mishandling of a component part.

Control Charts

- Control charts are a graph of a series of successive observations of a particular step, procedure, or operation taken at regular intervals of time.
- Each observation is plotted relative to specified ranges that represent the limits within which observations are expected to fall.
- Only those observations that fall outside the control limits are regarded as nonrandom and worth investigating.

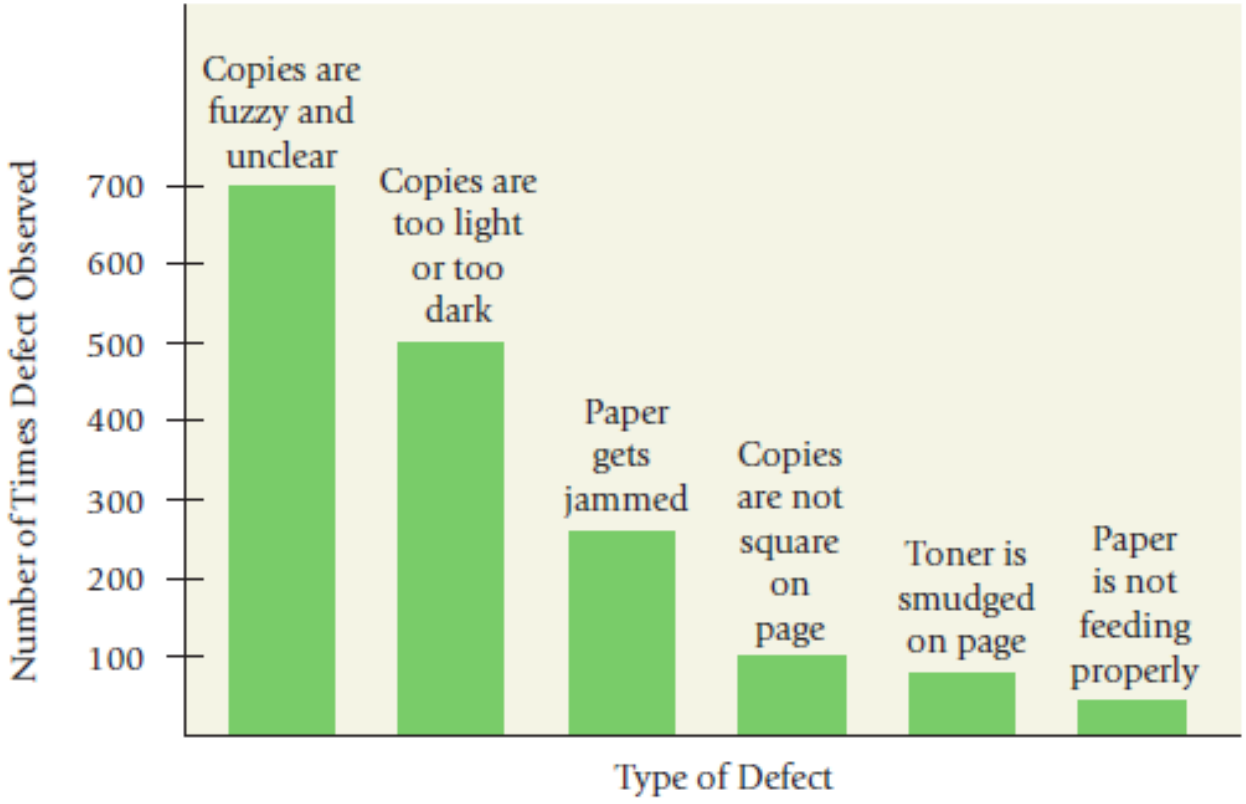
Quality Control Charts examples



Pareto Diagrams

- Observations outside control limits serve as inputs for Pareto diagrams.
- Pareto diagram—a chart that indicates how frequently each type of defect occurs, ordered from the most frequent to the least frequent.

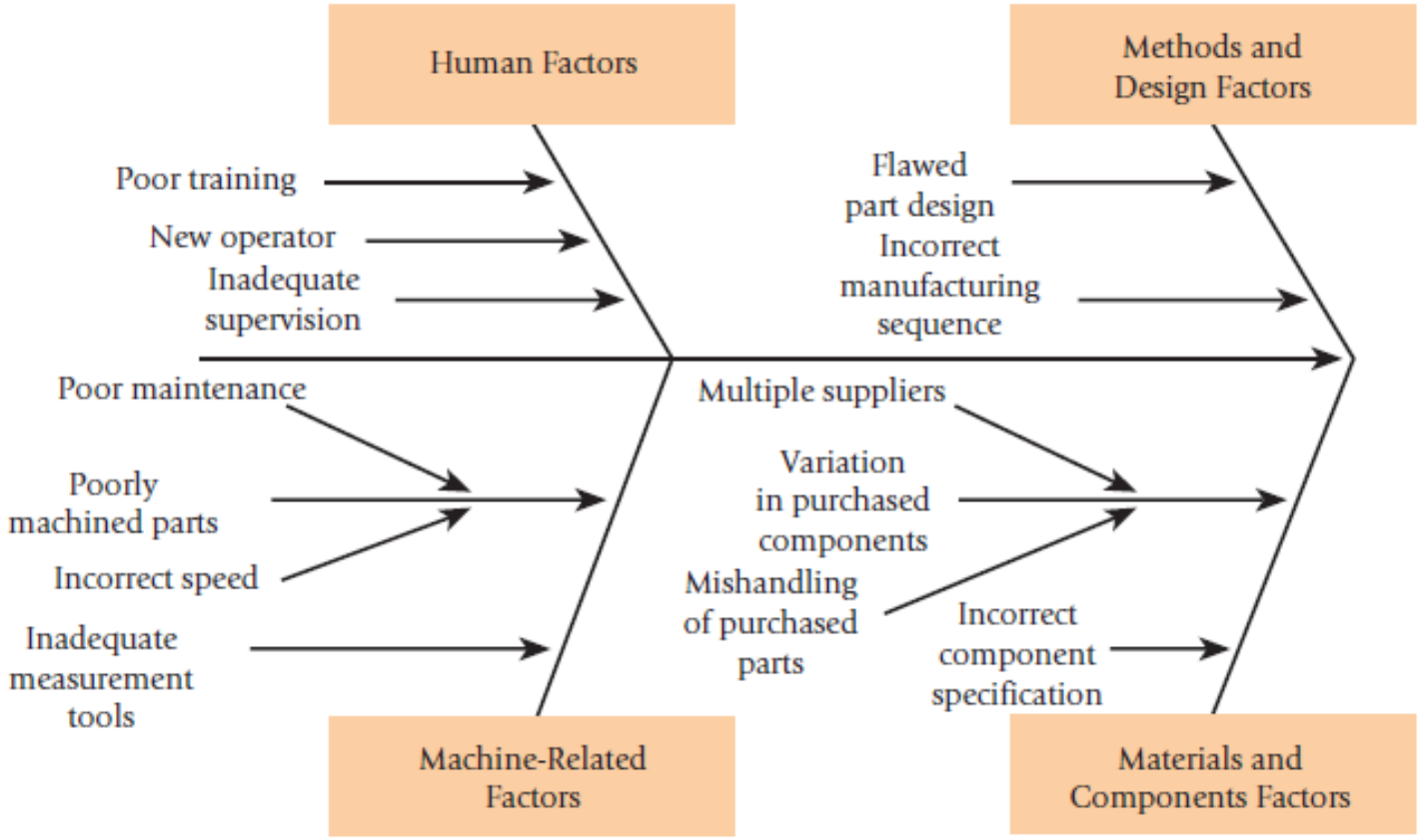
Pareto Diagram example



Cause-and-Effect Diagrams

- Identifies potential causes of defects.
- Problems identified by the Pareto diagram are analyzed using cause-and-effect diagrams.
- Also called fishbone diagrams because they resemble the bone structure of a fish.
- The large “bones” coming off the backbone represent the main categories of potential causes of failure.
- The four categories are: human factors, methods and design factors, machine-related factors and materials and components factors.

Cause-and-Effect Diagram example



Nonfinancial Measures of Internal-Business-Process Quality

- Percentage of defective products manufactured.
- Percentage of reworked products.
- Number of different types of defects analyzed using control charts, Pareto diagrams and cause-and-effect diagrams.
- Number of design and process changes made to improve design quality or reduce the costs of quality.

The Learning-and-Growth Perspective for Quality

- Experience and qualifications of design engineers.
- Employee turnover ratio.
- Employee empowerment.
- Employee satisfaction.
- Employee training.

Weighing the costs and benefits of improving quality

- When faced with a quality issue, managers should evaluate each alternative identifying the relevant costs and benefits for each alternative.
- Ask: How total costs and total revenues will change under each alternative.

Advantages of COQ (Financial) Measures

- COQ focuses managers' attention on how poor quality affects operating income.
- COQ help managers aggregate costs to evaluate the tradeoffs of incurring prevention costs and appraisal costs to eliminate internal and external failure costs.
- COQ measures assist in problem solving by comparing costs and benefits of different quality-improvement programs and by setting priorities for cost reduction.

Advantages of Nonfinancial Measures of Quality

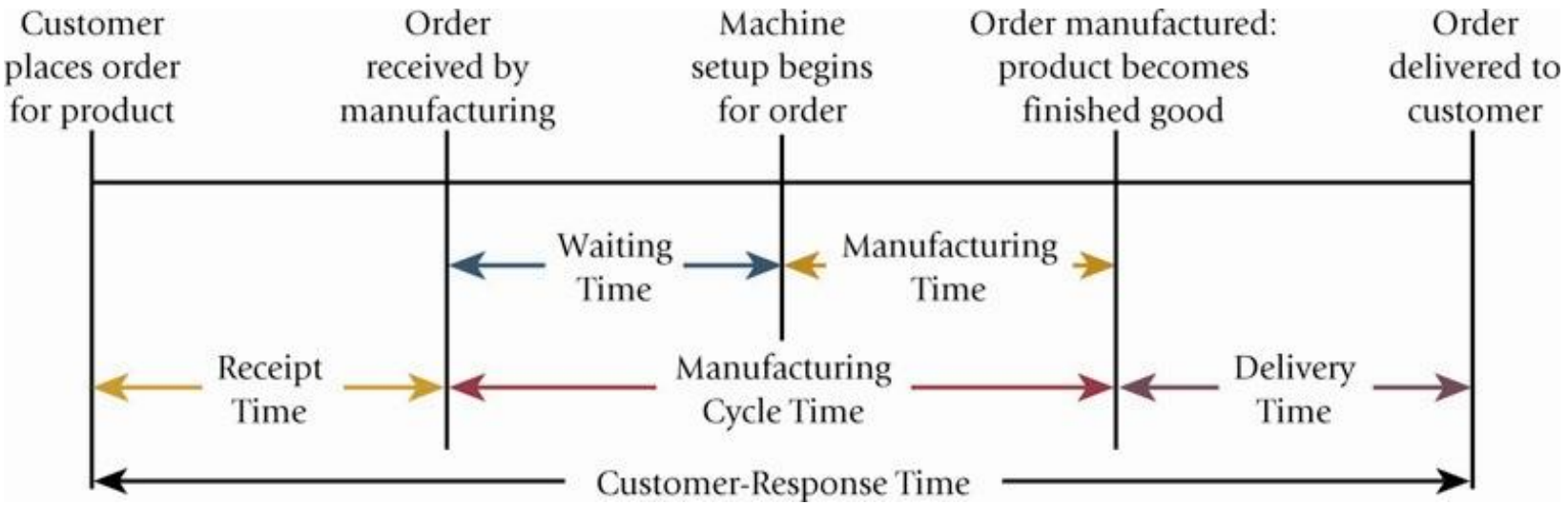
- Nonfinancial measures of quality are often easy to quantify and understand.
- Nonfinancial measures direct attention to physical processes and to areas that need improvement.
- Nonfinancial measures provide immediate short-run feedback on whether quality-improvement efforts are succeeding.
- Nonfinancial measures are useful indicators of future long-run performance.

Time as a Competitive Tool

- Companies view time as a driver of strategy.
- Managers need to measure time properly to manage it.
- Two operational measures of time:
  - Customer response time: how quickly companies respond to customers' demands for their products and services.
  - On-time performance: indicates how reliably companies meet their scheduled delivery dates.

Managers also measure the causes and costs of delays.

Customer-Response Time Illustrated



Time Drivers

- A time driver is any factor that causes a change in the speed of an activity when the factor changes.
- Two time drivers:
  1. Uncertainty about when customers will order products and services.
  2. Bottlenecks due to limited capacity. A bottleneck occurs in an operation when the work to be performed approaches or exceeds the capacity available to do it.

Managers should use the five-step decision-making process to exam opportunities.

Relevant revenues and costs of delays

- Manufacturing cycle times affect both revenues and costs.
- Revenues are affected because customers are willing to pay a higher price for faster delivery.
- Relevant costs will likely include inventory carrying costs.

The Balanced Scorecard and Time-based Measures

We'll use the structure of the balanced scorecard perspectives to summarize how financial and nonfinancial measures of time relate to one another, reduce delays, and increase the output of bottleneck operations.

- Financial measures:
  - Revenue gains or price increases from fewer delays.
  - Carrying costs of inventories.
- Customer measures:
  - Customer-response time.
  - On-time performance

The Balanced Scorecard and Time-based Measures, cont'd

- Internal-business-process measures:
  - Average manufacturing time for key products.
  - Manufacturing cycle efficiency for key processes.
  - Defective units produced at bottleneck operations.
  - Average reduction in setup time and processing time at bottleneck operations.

The Balanced Scorecard and Time-based Measures, concluded

- Learning and growth measures:
  - Employee satisfaction.
  - Number of employees trained in managing bottleneck operations.

Managers use both financial and nonfinancial measures to manage the performance of their firms along the time dimension.

Financial perspective, Customer perspective

Financial Perspective

Examples of objectives:

Targets for profits, income, accounting return measures, cash flows, or other operating ratios

Examples of measures:

Economic profit

Income from operations

ROI, residual income, EVA©

Operational cash flow

Inventory turns

The Financial Perspective

Objectives:

- Maximize Profit
- Maximize Cash
- Control Costs
- Effective Investment Utilization
- Minimize Inventory

Measurements:

- Income from operations
- ROI, residual income, EVA©
- Working capital
- Operational cash flow
- Inventory turns

Customer Perspective

Examples of objectives:

Improve customer satisfaction, targets for market share, repeat order rate or number of complaints

Examples of measures:

Rank in customer surveys

Market share

Repeat order rate

Number of complaints

The Customer Perspective

Objectives:

- Improve customer satisfaction
- Increase market share
- Increase repeat customers

Measurements:

- Customer survey ratings
- Market share
- Airline passenger loads
- Customer retention rates
- New customer acquisitions

Internal Business Process perspective, Learning and growth perspective

Internal Business Process Perspective

Examples of objectives:

Reduce process cycle time, number of engineering changes, and order response time, increase capacity utilization

Examples of measures:

Percentage reduction in process cycle time

Number of engineering changes

Order response time

Capacity utilization

The Internal Business Process

- The internal business process perspective contains three stages:
  - In the innovation cycle, customer preferences are determined and the products are designed.
  - In the operations cycle, goods and services are produced and delivered to the customer.
  - The post-sales service cycle supports the customer after the sale.

The Internal Business Process Perspective

Objectives:

- Reduce cycle time
- Reduce engineering changes
- Improve order response time
- Efficient capacity utilization
- Minimize waste

Measurements:

- # of engineering changes
- Order response time
- Cycle time
- Defects per million
- Warranty costs
- # of returns

Learning and Growth Perspective

Examples of objectives:

Reduce turnover percentage of protected patents, improve employee training, improve quality.

Examples of measures:

Percentage of patent-protected turnover

Training days per employee

Quality improvement team participation, or number of quality improvement suggestions, or defect rate

Learning & Growth Perspective

Objectives:

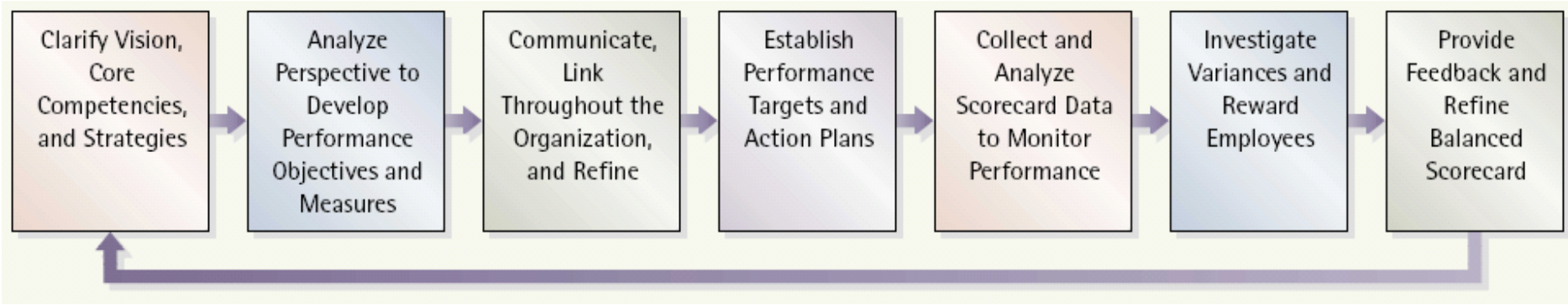
- High quality employee training
- Minimize turnover
- Develop efficient information systems

Measurements:

- Training hours per employee
- Retention rate
- Specific skill development metrics
- Number of information systems

Developing and adapting scorecard

Implementing a Balanced Scorecard



Limitations

- **Expensive to implement**
  - Consultants
  - Management and employee time
- **Difficult to find appropriate weighting of measures in compensation package**
- **Managers may choose measures that reflect strengths**
- **Is there a lead and lag relationships between measures?**

Building the Balanced Scorecard

Introduction

- Balanced Scorecards provide a framework for communicating strategy in operating terms (measurements and targets).
- You must communicate strategy in operating terms if you expect people to execute on your strategy.
- When people are asked about strategy, they reach for their balanced scorecard.

Agenda

- This slide presentation will outline the major steps for building a balanced scorecard.
- How you execute these steps will depend upon many factors: Company culture, tolerance for change, leadership, etc.
- However, please try to follow the same sequence, focusing on the strategic maps.

Overview

- Balanced Scorecards are constructed from strategic maps
- Throughout the process, we will refer back to these maps, making sure everything is linked. This is very important since we want to capture a “cause and effect” relationship in building the scorecard.

Why the Balanced Scorecard

- Improves how you communicate strategy
- Superimposes a discipline whereby you capture cause-effect; otherwise you create pockets of under-performance.
- Also forces you to think about strategic measurement as opposed to tactical or operating type measurements

Start with Strategy

- Begin with your strategic plan – what things are critical to future success?
- Focus on customers – what values will we add to our customers
- Define the processes – how will we deliver these services to our customers
- Build the organization – what capabilities must we put in place

Strategic Goals

- The first components of your strategy are goals.
- Strategic goals establish direction in concrete terms.
- Strategic goals anchor the rest of the process.
- Strategic goals should fit with the vision and mission of the organization.

Goal Attributes

- Very short statement
- Directly relates to the mission
- Broad in scope
- Covers long time period (such as 3 years)
- Examples:
  - Improve Customer Service
  - Leverage Core Competencies
  - Develop more innovative products

Strategic Objectives

- Once we establish our first anchor (goals), we can develop a set of strategic objectives.
- Strategic objectives define what actions must be taken to reach the strategic goals.
- Objectives are critical to future success. For example, in order to grow revenues, we must introduce new products and expand our market share.

Objective Attributes

- Longer statement than goal statement
- More specific than goal statement
- Indirect relationship to mission
- Covers shorter time period than goal (such as 6 months or 1 year)
- Example:

  - We will expand call center services to include technical support

Strategic Themes

- Based on strategic goals, three to five strategic themes should emerge.
- From these themes, we will develop a strategic map.
- Four common strategic themes are: Operating Efficiencies, Customer Relations, Product Innovation, and Growing the Business.

Strategic Model

- Strategic Models can emerge from four principles:

1. Translate strategies into operating terms.
2. Link strategies throughout the entire organization.
3. Commit everyone to implementing strategy.
4. Make strategizing a continuous process of learning and adjusting to change.

Four Perspectives

- Before we build strategic maps, we need to define four perspectives:

Financial: Top layer in the map, represents financial outcomes (profits, revenues, etc.)

Customer: Next layer down, enables financial results (service, image, price, quality, etc.)

Internal Processes: The values added to customers, such as delivery, production, distribution, etc.

Learning & Growth: The people, systems, and organization that enable processes.

Strategic Mapping

- Strategic Maps are the foundation of the Balanced Scorecard.
- You will need one strategic map for each strategic theme.
- Maps are constructed over four perspectives.
- Strategic objectives are mapped over the four perspectives, linked together.

Linking

- Strategic objectives need to be placed in the Strategic Map according to which perspective fits with the objective.
- Objectives may cross over more than one perspective.
- We usually start at the top with outcomes and work our way down, looking at what enables (drives) the outcome.

Approval

- Once you have completed the strategic maps, you will need to get approval from executive management. Does this map accurately tell the “story” of our strategy?
- If management disagrees with the map, go back and redo the maps. We need to get this step right since it represents the foundation for the entire scorecard.

Measurements

- For each strategic objective, you need one measurement.
- Measurement provides us with feedback on meeting the strategic objective.
- Most organizations will use many of their existing measurements.
- Organizations requiring major change should include driver type measurements.

Measurement Criteria

- Measurements should drive change, providing teeth to our strategy.
- Measurements define objectives in specific terms. A good measurement should tell you what your objective is – this is an indicator of good linkage.
- Measurements should be repeatable, quantifiable, and verifiable.

Good Measurements

- Customer satisfaction:
  - Response time to service customer
  - Satisfaction survey scores
- Process Efficiency:
  - Cycle time
  - Downtime
  - Number of Restarts

Lead and Lag Measurements

- Leading measurements are drivers behind performance and provide some predictability (forward looking)
- Lagging measurements are usually final outcomes that look back, such as customer satisfaction or return on investment
- Balanced scorecards should include both leading and lagging type measurements

Targets

- Once you establish measurements, you need to set a target for each measurement.
- Targets push the organization to a required level of performance.
- Targets put focus on the strategy, expressing the specifics of the strategy.
- When an organization hits its targets, then it has successfully implemented its strategy.

Examples of Targets

- Total Time to Recruit New Employees: Less than 40 days by year-end
- Utilization of rental facilities: Increase to 85% during peak summer months
- Growth in top line revenues: 10% increase over last year
- Improve overall customer satisfaction: Total scores exceed 90%

Initiatives

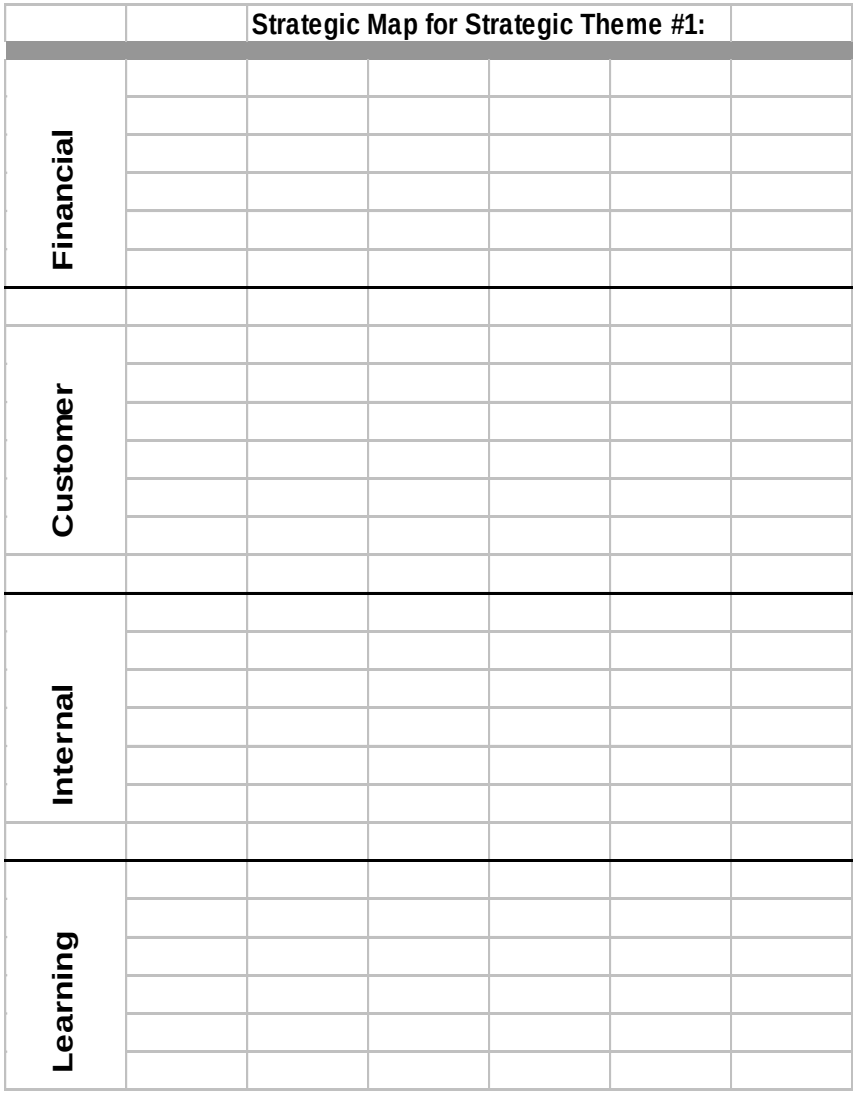
- In order for things to happen in an organization, you must initiate major projects or programs. For example, improving customer service may require a new customer management system.
- Once you launch appropriate initiatives, you should be able to meet your strategic objectives. This closes the loop, everything is now linked and away we go!

Initiative Attributes

- Sponsored by senior management
- Designated owners manage project(s)
- Includes deliverables or milestones
- Usually has some time deadlines
- Could be difficult to launch – lack of support, no funding, poorly defined, etc.

Templates

Throughout this process, you can use templates to capture, analyze and document data. Templates are used for strategic mapping, defining measurements, etc.



Other Important Steps

- Scorecards are built around three teams: Leadership Team (upper level management), Core Team (middle level management) and Measurement Team (lower level functional personnel).
- Scorecards are built around at least four group meetings: Kick Off Meeting followed by at least one meeting for each of the three teams.

Implementation

- The minimum time for developing a balanced scorecard is three months.
- Full deployment of scorecards throughout the entire organization can take more than one year.
- The best place to start building a scorecard is where all components of the value chain are in place: Customer, Innovation, Production, Delivery, Services, etc.

Summary

- Balanced Scorecards are the best way of communicating strategy.
- Scorecards rely on a fully integrated approach: Goals, Objectives, Mapping, Measurements, Targets, and Initiatives.
- The building of a balanced scorecard can be experimental, whereby you test your strategies, refine, and make changes as you get feedback and learn what works.

Final Review & Questions



Thank You

