

Engineering Economy I

Engineering Economic Decisions
Accounting and Financial Decisions

Lecture No.1 – Chapters 1 and 2



Chapter 1 – Outline

- Introduce the different types of businesses
- Introduce role of engineers in economic decisions
- Introduce the main types of engineering economic decisions
- Understood that time and uncertainty are the defining aspects of any investment project
- Introduce the four fundamental principles that must be applied in all engineering economic decisions



Types of business organization

- Yahoo, Apple Computer, Microsoft Corporation, and Sun Microsystems produce computer products and have a market value of several billion dollars each.
- First you will be introduced to the three primary forms of business organization and briefly discusses the role of engineers in business.



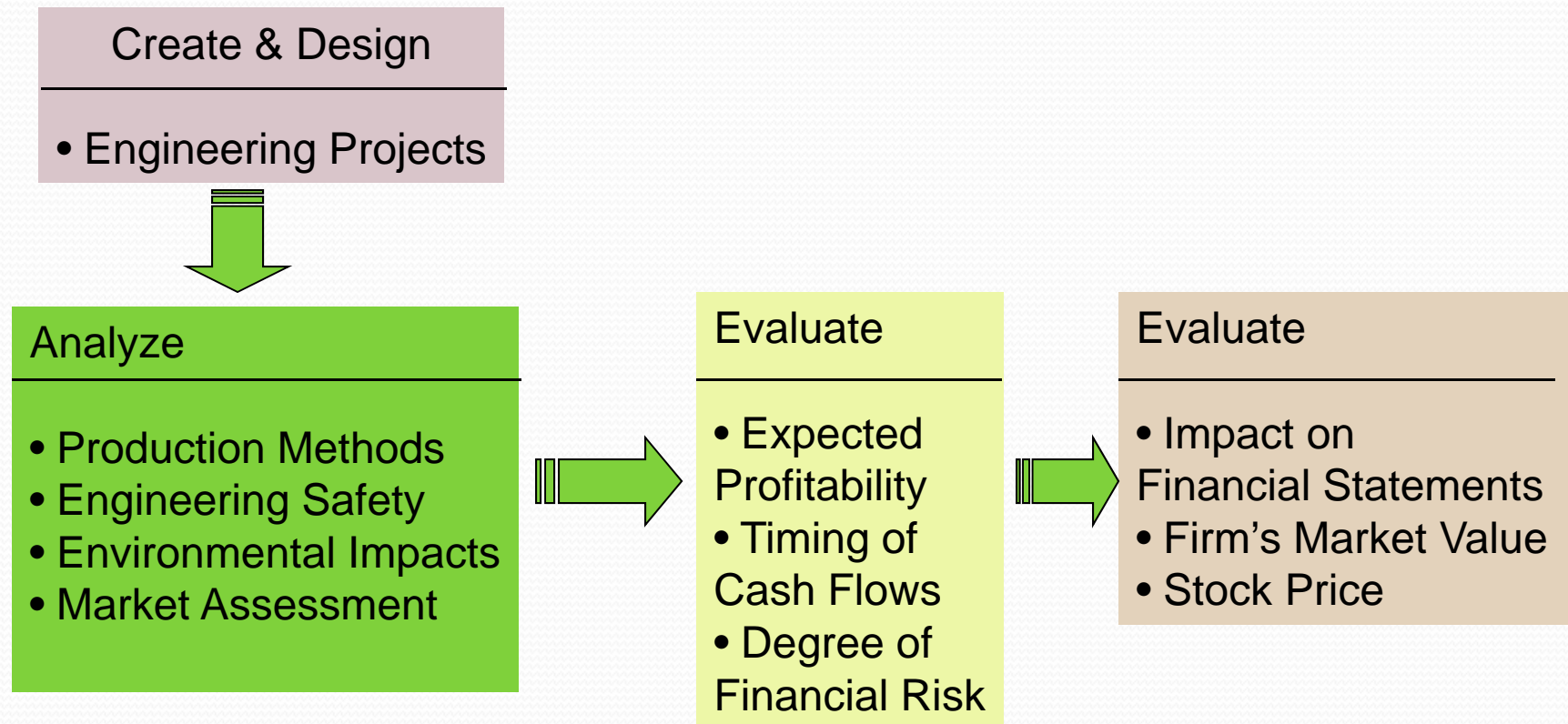
Types of business organization (cont'd)

- **Proprietorships**
 - One man company
 - Pros and Cons?
- **Partnerships**
 - Similar to previous
 - Different how? Pros and Cons?
- **Corporations**
 - Public Legal entity under federal law
 - Pros and Cons?

Types of business organization example

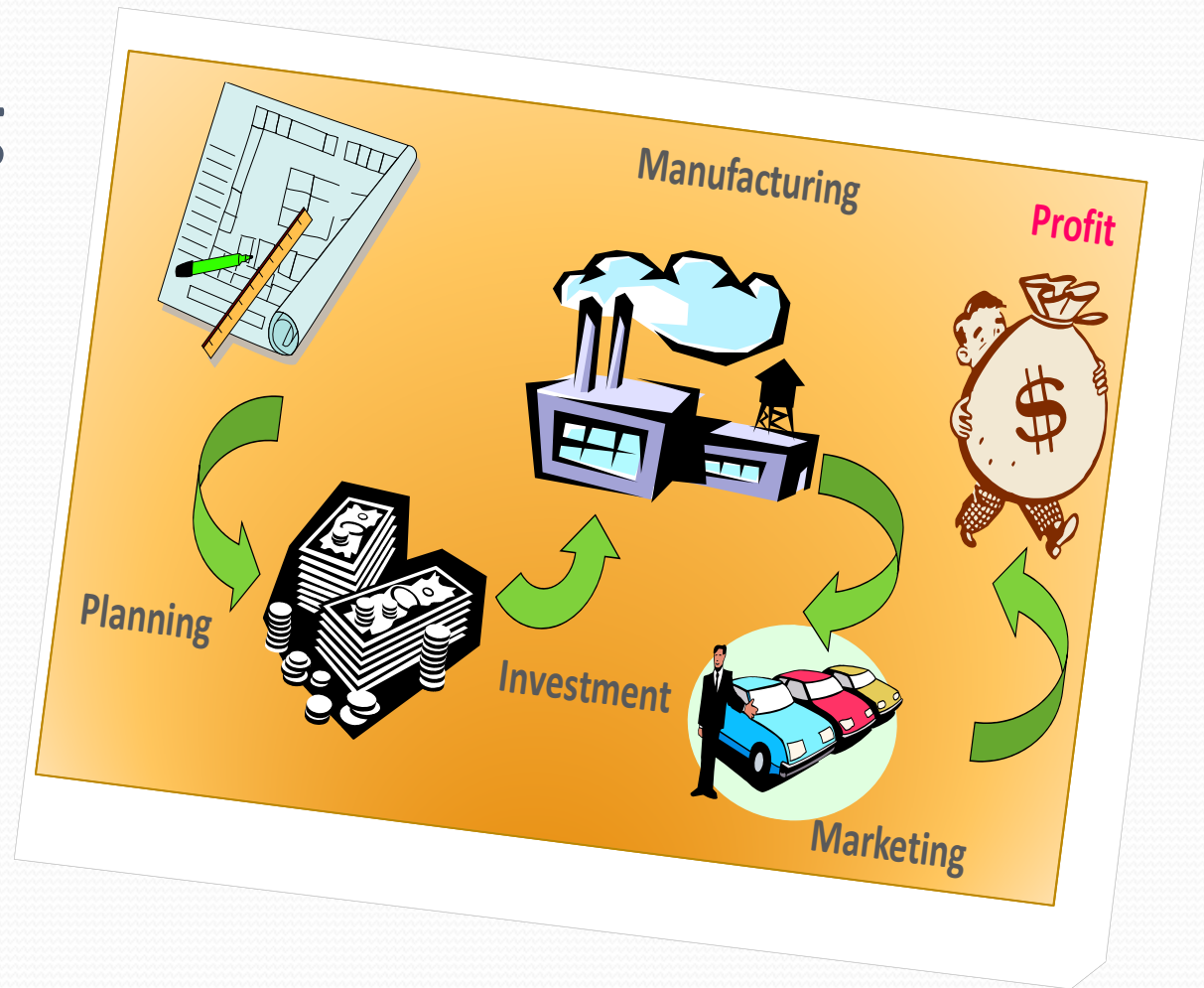
- **Apple computer**
 - Started as a two-man (Steves) garage operation
 - Couldn't raise capital for expansion and felt that bankruptcy risk was too high
 - Converted to corporation
- In the United States, the overwhelming majority of business firms are proprietorships, followed by corporations and partnerships.
- Since most business is done by corporation, we will address economic decisions encountered in that form.

Role of Engineers in Business



Engineering Economic Decisions

Plan for the acquisition of equipment (capital expenditure) that will enable the firm to design and produce products economically



What Makes Engineering Economic Decisions Difficult?

- Estimating a Required investment
- Forecasting a product demand
- Estimating a selling price
- Estimating a manufacturing cost
- Estimating a product life



Accounting Vs. Engineering Economy

Evaluating past performance



Accounting

Evaluating and predicting future events



Engineering Economy

Past

Present

Future



Two Factors in Engineering Economic Decisions

- **Time**
- **Uncertainty**

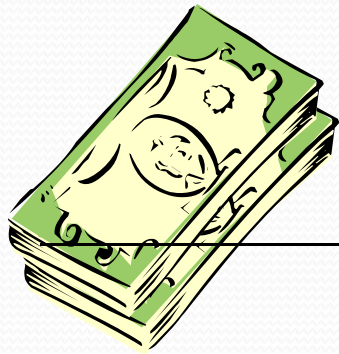
Common Types of Strategic Engineering Economic Decisions

- Equipment or process selection
- Equipment replacement decisions
- New product and product expansion
- Cost reduction
- Improvement in service or quality

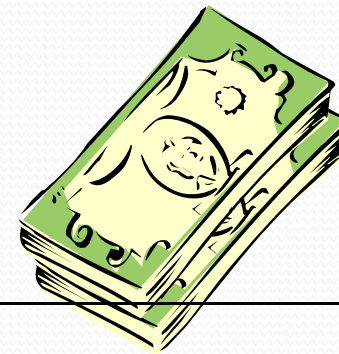
Fundamental Principles of Engineering Economics

- **Principle 1:** A nearby dollar is worth more than a distant dollar
- **Principle 2:** All it counts is the differences among alternatives
- **Principle 3:** Marginal revenue must exceed marginal cost
- **Principle 4:** Additional risk is not taken without the expected additional return

Principle 1: A nearby dollar is worth more than a distant dollar



Today



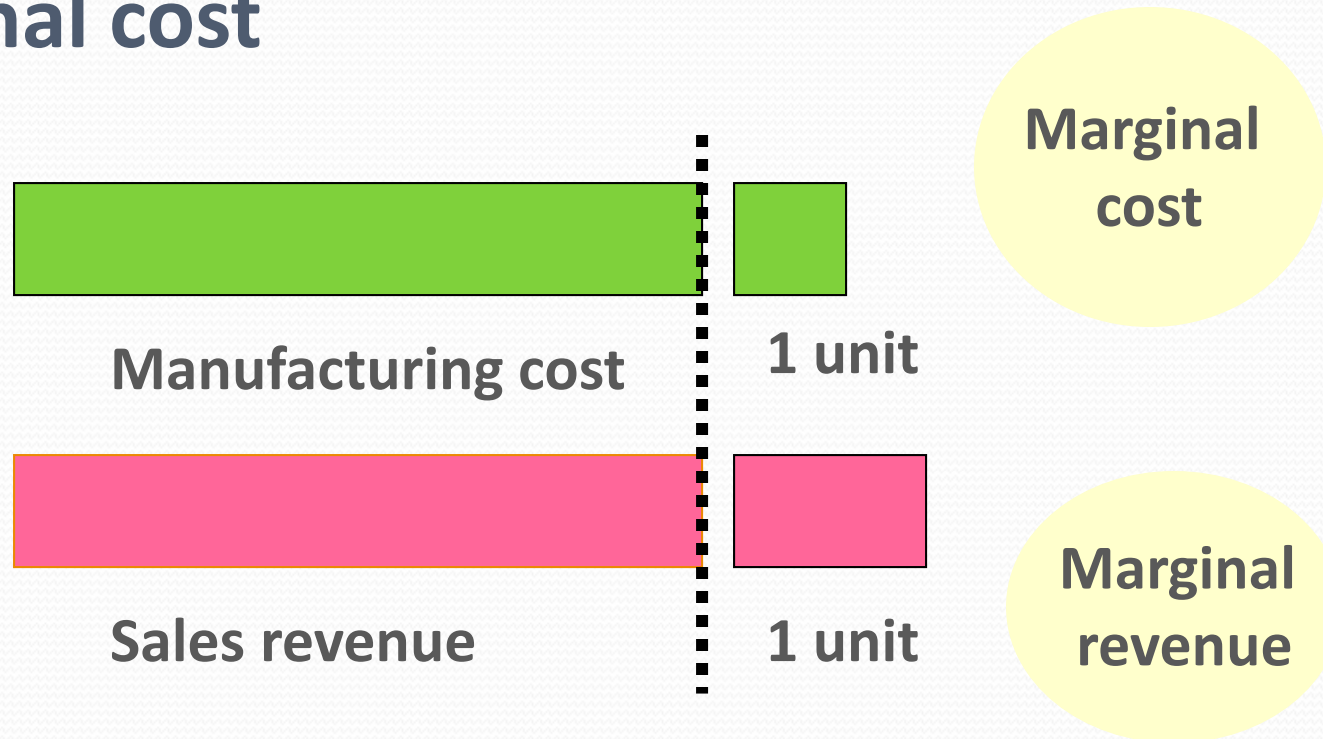
6-month later

Principle 2: All it counts is the differences among alternatives

Option	Monthly Fuel Cost	Monthly Maintenance	Cash outlay at signing	Monthly payment	Salvage Value at end of year 3
Buy	\$960	\$550	\$6,500	\$350	\$9,000
Lease	\$960	\$550	\$2,400	\$550	0

Irrelevant items in decision making

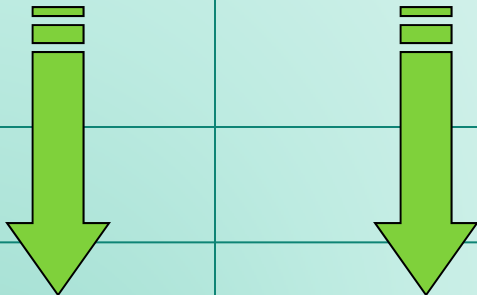
Principle 3: Marginal revenue must exceed marginal cost



- **Marginal Cost:** additional cost incurred by a given alternative
- **Marginal Revenue:** additional revenue incurred by a given alternative

Principle 4: Additional risk is not taken without the expected additional return

Investment Class	Potential Risk	Expected Return
Savings account (cash)	Low/None	1.5%
Bond (debt)	Moderate	4.8%
Stock (equity)	High	11.5%





Chapter 2 – Outline

- **The role of accounting in economic decisions.**
- **Four types of financial statements prepared for investors and regulators.**
- **How to read the balance sheet statement.**
- **How to use the income statement to manage a business.**
- **The sources and uses of cash in business operation.**

Objective of the Company

- Increase the market value of the company
- Market value: stock price reflected in the financial market

Market values of some of well known U.S. firms (July 21 ,2015)

Company	Stock Price	Market Value
Google	\$670	\$462 B
Facebook	\$98	\$274 B
Walmart	\$73	\$234 B
Coca Cola	\$41	\$180 B
Ford Motor	\$14	\$58 B



Factors that Affect Market Value

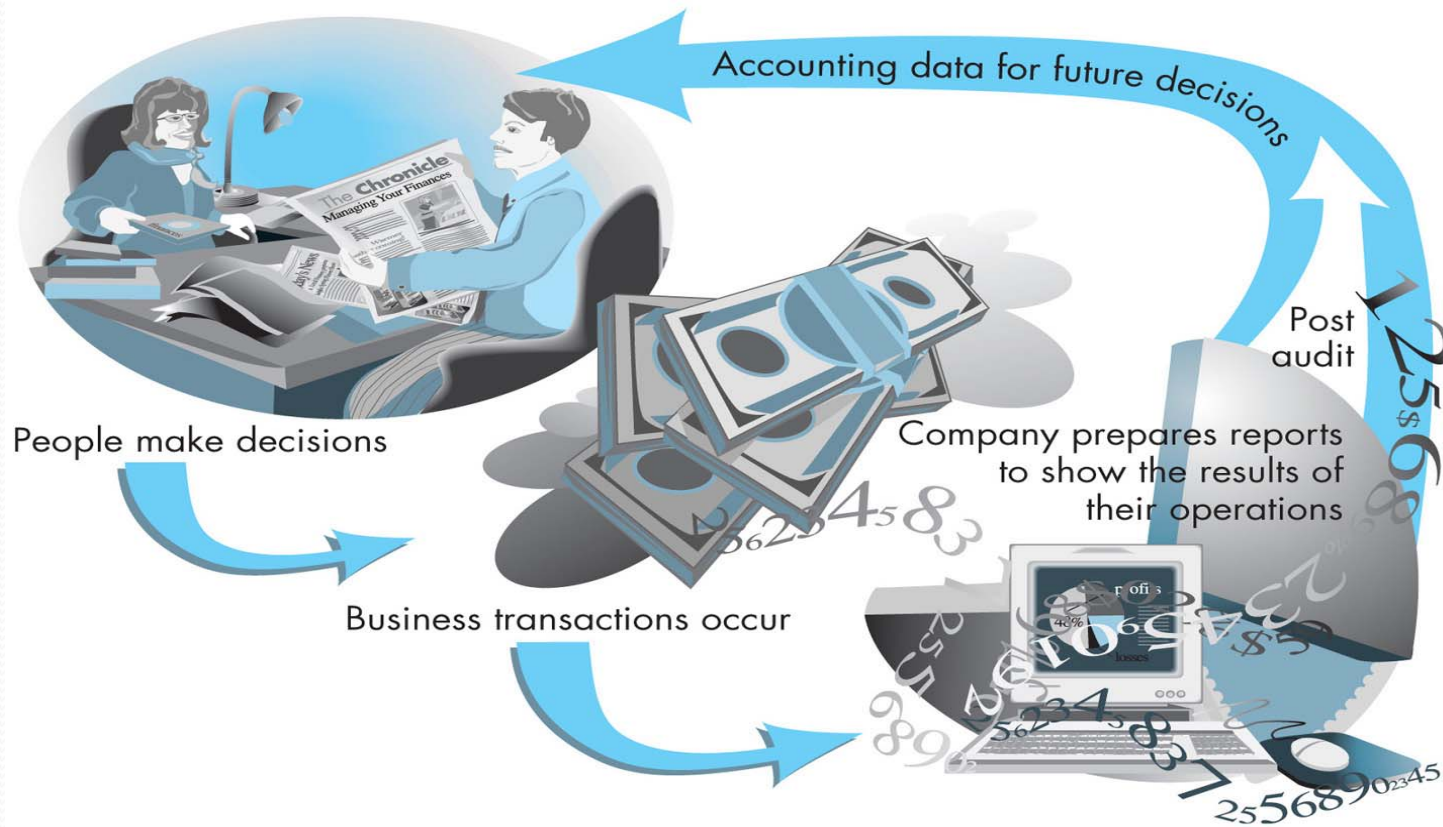
- **How is the company doing at a particular time?**
- **What is happening to other stock prices, that is, how are the competitors doing?**
- **How do investors expect the company to perform in the future – Decisions to invest in various projects and the actual performance of these projects**

Understanding Financial Statements

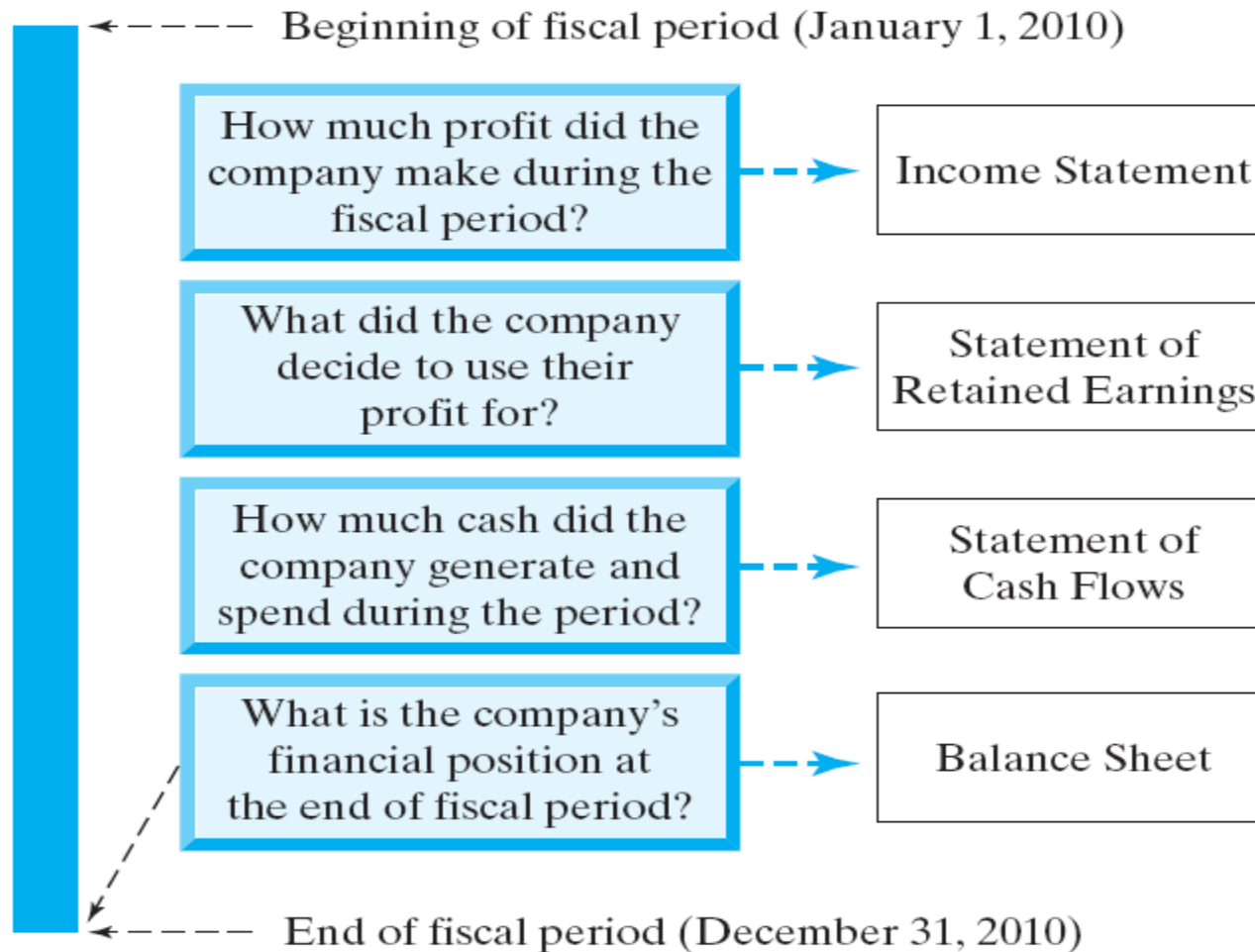
- ❑ **Accounting:** The Basis of Decision-Making
- ❑ **Financial Statements:** Financial Status for Businesses



Accounting – The Language of Business



Financial Status for Business



Typical Balance Sheet Statement

	As at	
	February 28, 2009	March 1, 2008
Assets		
Current		
Cash and cash equivalents	\$ 835,546	\$ 1,184,398
Short-term investments	682,666	420,709
Trade receivables	2,112,117	1,174,692
Other receivables	157,728	74,689
Inventory	682,400	396,267
Other current assets	187,257	135,849
Deferred income tax asset	183,872	90,750
	<u>4,841,586</u>	<u>3,477,354</u>
Long-term investments	720,635	738,889
Capital assets	1,334,648	705,955
Intangible assets	1,066,527	469,988
Goodwill	137,572	114,455
Deferred income tax asset	404	4,546
	<u>\$ 8,101,372</u>	<u>\$ 5,511,187</u>
Liabilities		
Current		
Accounts payable	\$ 448,339	\$ 271,076
Accrued liabilities	1,238,602	690,442
Income taxes payable	361,460	475,328
Deferred revenue	53,834	37,236
Deferred income tax liability	13,116	—
Current portion of long-term debt	—	349
	<u>2,115,351</u>	<u>1,474,431</u>
Deferred income tax liability	87,917	65,058
Income taxes payable	23,976	30,873
Long-term debt	—	7,259
	<u>2,227,244</u>	<u>1,577,621</u>

	As at	
	February 28, 2009	March 1, 2008
Shareholders' Equity		
Capital stock		
Common shares Issued - 566,218,819 voting common shares (March 1, 2008 - 562,652,461)	2,208,235	2,169,856
Retained earnings	3,545,710	1,653,094
Additional paid-in capital	119,726	80,333
Accumulated other comprehensive income	457	30,283
	<u>5,874,128</u>	<u>3,933,566</u>
	<u>\$ 8,101,372</u>	<u>\$ 5,511,187</u>

$$\text{Assets} = \text{Liabilities} + \text{Owners' Equity}$$

Typical Net Income Statement

ABC Company, Inc. Statement of Operations (Year Ended December 31, 20xx)		
Sales	\$5,000,000	100.0%
Less: Cost of Goods Sold	3,250,000	65.0%
Gross Profit (margin)	1,750,000	35.0%
Less: Selling, General & Admin. Expenses	1,000,000	20.0%
Operating Profit (margin)	750,000	15.0%
Less: Interest	250,000	5.0%
Net Income Before Taxes (NIBT)	500,000	10.0%
Less: Taxes	175,000	3.5%
Net Income (margin)	\$325,000	6.5%

Bottom line



Relationship Between Balance Sheets and Income Statement

