Lesson 22 – Accounting and Engineering Economics

The Role of Accounting

Three functions within business

1. Engineering economy:
   - Analyzes economic impact of alternatives and projects over life cycles
2. Accounting:
   - Determines dollar impact of past decisions, reports economic viability of the firm, and evaluates funding sources
3. Management:
   - Allocates investment funds to projects, evaluates performance, allocates resources, and directs personnel

Accounting for Business Transactions

- Functions:
  - Records, analyzes, and reports on transactions
  - Summarizes and analyzes financial data
  - Provides data for general accounting and cost accounting
  - Forecasting, estimating future revenues, expenses

The Balance Sheet

- Primary accounting statements:
  - Balance sheet:
    - Firm's financial condition at a specific time
  - Income statement:
    - Firm's performance over a period of time
- Fundamental accounting equation:
  - Assets = Liabilities + Equity
    - Assets have monetary value and are owned by the firm.
    - Liabilities are dollar claims against the firm.
    - Equity represents the available funding from the firm.

Assets and Liabilities

Balance Sheet for Engineered Industries, 31 December 2011 (all amounts in $1,000s)

Assets		**Liabilities**	
Current assets		Current liabilities	
Cash	1,940	Accounts payable	1,150
Accounts receivable	950	Notes payable	80
Securities	4,100		
Inventories	1,860	Accrued expense	950
(*minus*)Bad debt provision	−80	Total current liabilities	2,180
Total current assets	8,770		
		Long-term liabilities	1,200
		Total liabilities	**3,380**
Fixed assets			
Land	335		
Plant and equipment	6,500		
(*minus*)Accumulated depr.	−2,350		
Total fixed assets	4,485	**Equity**	
		Preferred shares	110
Other assets		Common shares	650
Prepays/deferred charges	140	Capital surplus	930
Intangibles	420	Retained earnings	8,745
Total other assets	560	Total equity	10,435
Total assets	**13,815**	**Total liabilities and equity**	**13,815**

Liabilities and Equity

- Liabilities:
  - Short term: Due within one year
  - Long term: Longer due dates (mortgages etc.)
- Working capital = Current assets – Current liabilities
- Equity:
  - At any point in time the difference between the total worth minus what is owed

The Income Statement

- A.K.A., the profit and loss statement
- Summarizes the firm's revenues and expenses over a period of time (month, quarter, year etc.)

Revenues − Expenses = Net profit (Loss)

The Income Statement, cont'd

Income Statement for Engineered Industries for End of Year 2012 (all amounts in $1,000)

Operating revenues and expenses	
Operating revenues	
Sales	18,900
(*minus*) Returns and allowances	−870
Total operating revenues	**18,030**
Operating expenses	
Cost of goods and services sold	
Labour	6,140
Materials	4,640
Indirect cost	2,280
Selling and promotion	930
Depreciation	450
General and administrative	2,160
Lease payments	510
Total operating expense	**17,110**
Total operating income	**920**
Non-operating revenues and expenses	
Rents	20
Interest receipts	300
Interest payments	−120
Total non-operating income	**200**
Net income before taxes	**1,120**
Income taxes	390
Net profit (loss) for Year 2012	**730**

BALLARD POWER SYSTEMS INC.

Consolidated Statement of Loss and Comprehensive Loss

For the year ended December 31

(Expressed in thousands of U.S. dollars, except per share amounts and number of shares)

	Note	2017	2016
Revenues:			
Product and service revenues		**$ 121,288**	$ 85,270
Cost of product and service revenues		**79,688**	61,086
Gross margin		**41,600**	24,184
Operating expenses:			
Research and product development		**25,022**	19,827
General and administrative		**12,602**	12,938
Sales and marketing		**7,951**	7,190
Other expense	24	**902**	2,298
Total operating expenses		**46,477**	42,253
Results from operating activities		**(4,877)**	(18,069)
Finance income (loss) and other	25	**1,780**	(777)
Finance expense	25	**(732)**	(686)
Net finance expense		**1,048**	(1,463)
Loss on sale of assets	26	**(1,365)**	(623)
Equity in earnings of investment in joint venture	12	**201**	—
Impairment charges on intangible assets and property, plant and equipment	27	**(1,484)**	(1,151)
Loss before income taxes		**(6,477)**	(21,306)
Income tax expense	28	**(1,571)**	(381)
Net loss		**(8,048)**	(21,687)
Other comprehensive income (loss):			
Items that will not be reclassified to profit or loss:			
Actuarial loss on defined benefit plans	18	**(206)**	(361)
		(206)	(361)
Items that may be reclassified subsequently to profit or loss:			
Foreign currency translation differences		**(1,139)**	268
		(1,139)	268
Other comprehensive loss, net of tax		**(1,345)**	(93)
Total comprehensive loss		**$ (9,393)**	$ (21,780)

See accompanying notes to consolidated financial statements.

Linking the Balance Sheet, Income Statement, and Capital Transactions

- For engineering economics the most important links between these items are:
  - Overall profit or loss (income statement) and the starting and ending equity (balance sheets)
  - Acquisition of capital assets
  - Depreciation of capital assets
- Change in Retained Earnings (RE):
  - $RE_{end} = RE_{beg}$ + Net Income/Loss + New Stock – Dividends

Cash vs. Accrual Accounting

- Cash accounting: records revenues and expenses when the cash moves
  - Works well for simple, cash based business but quickly gets overwhelmed as complications arise
- Accrual Accounting: records revenues and expenses as they are incurred
  - E.g. revenue entered when a sale is invoiced, not when payment received
  - Expenses entered when ordered

Traditional Cost Accounting

- Cost accounting:
  - Used to develop product costs; determine the mix of labour, materials, and other costs in a production setting; and evaluate outsourcing and subcontracting possibilities
- Direct costs:
  - Activities directly associated with the final product (materials, design, etc.)
- Indirect costs:
  - Costs not easily linked directly to a project (machine depreciation, management/sales/administration costs etc.)

Traditional Cost Accounting, cont'd

- Indirect costs are sometimes allocated across projects through absorption costing:
  - Allocating overhead costs based on factors such as number of direct-labour costs each project has or direct-labour hours or direct-material cost or total direct cost
- Indirect and overhead costing can distort product costs.
  - Some firms are shifting to activity-based costing (ABC) where activities are linked to specific costs and in this way overhead is potentially minimized.

Example – Absorption Costing

- A company produces 50,000 units of a product. It has
  - Direct Material Costs of $20 per unit
  - $17 per unit in Direct Labour costs
  - $3 per unit in variable manufacturing costs
- Fixed overheads total $100,000 per year.
- Cost per unit = $20 + $17 +$3 + $100000/50000 = $42 per unit

Example – Activity Based Costing

- Business produces generators
  - 100 units of its 10 kW generator
  - 500 units of its 5 kW generator
- 10 kW generator has DM/DL costs of $500 per unit
- 5 kW generator has DM/DL costs of $300 per unit
- Both use the same assembly line with a total overhead cost of $70,000. It takes twice as long to assemble a 10 kW generator as a 5 kW generator
  - 10 kW uses 2/7 of line time, and is given $17,142 in overhead costs, or $171 per unit
  - 5 kW uses 5/7 of line time, given $42,857 in overhead costs, or $86 per unit

Activity Based vs Absorption Costing

- Activity based costing generally provides better insight into true costs and profitability of products or services
- Effectively it converts indirect costs into direct costs
  - How much of HR expenses are devoted to a given product? How much of building rent?
- More precise, but expensive and time consuming to do properly – may not be needed if overhead is small proportion
- Absorption costing is simpler, easier to implement, but offers less understanding of what individual products are costing

Other Problems To Watch For

- Numerous files and systems that may have the data that should be used in analysis.
- Inventory or land valued too-low because its based on acquisition cost.
- Capital equipment being valued too high or too low depending on the depreciation methods and company policy.