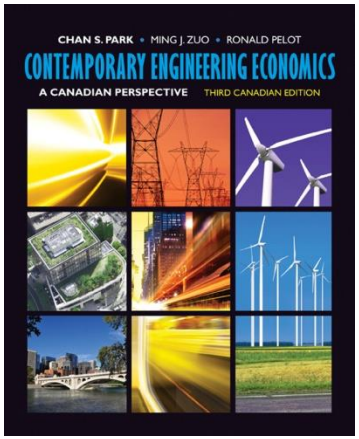
Estimating Profit from Production



Lecture No. 22
Chapter 7
Contemporary Engineering Economics
Third Canadian Edition

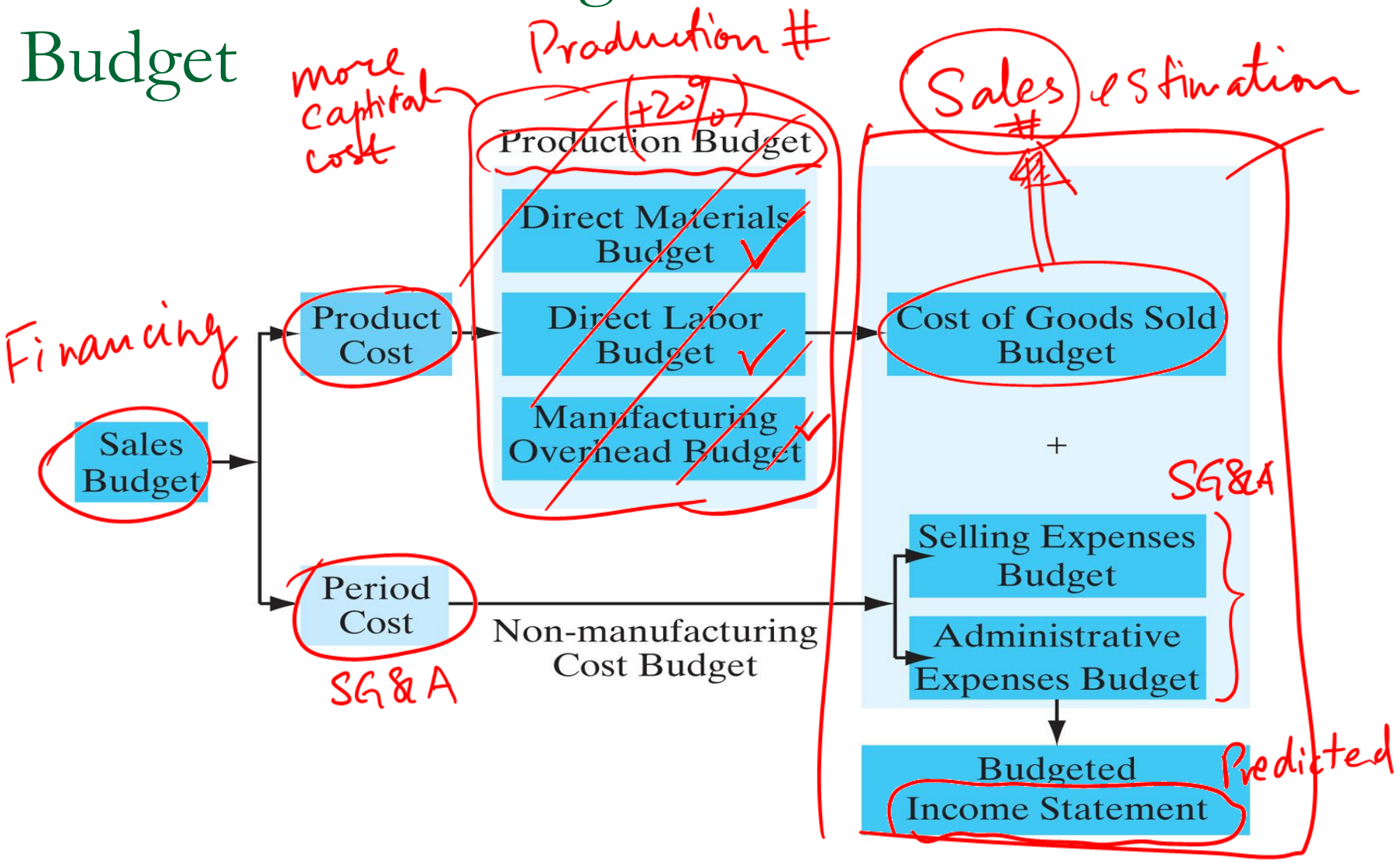
Lecture 22 Objectives

- How does a firm develop a production budget related to operating activities?

Calculation of Operating Income

- Project revenue:
  - the income earned by a business as a result of providing products or services to customers
- Project expenses:
  - the expenses incurred to generate the revenues of the specified operating period

Process of Creating a Master Production Budget



Sales Budget for a Manufacturing Business

Total annual volume = 5,000 units
Unit sales price = $15

Sales Budget Schedule (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Budgeted units	1,000	1,200	1,300	1,500	5,000
Sales price	$ 15	$ 15	$ 15	$ 15	$ 15
Estimated sales	$ 15,000	$ 18,000	$ 19,500	$ 22,500	$ 75,000

Preparing the Production Budget

Desired ending inventory units to carry: 20% of the budgeted units
Beginning inventory position: 100 units

Production Budget (Year 2010)—Product X

	1Q	2Q	3Q	4Q	Annual Total
Budgeted units to be sold	1000	1200	1300	1500	5000
Desired ending inventory	200	240	260	300	1000
Total units needed	1200	1440	1560	1800	6000
Less beginning inventory	100	200	240	260	800
Units to produce	1100	1240	1320	1540	5200

b
(+20%) c
d
a
e
previous period (left-over)

$d = b + c$

$e = d - a$

Materials Budget

Direct Materials Budget (Year 2010)—Product X

	1Q	2Q	3Q	4Q	Annual Total
Units to produce	1,100	1,240	1,320	1,540	5,200
Unit cost of materials	$ 4	$ 4	$ 4	$ 4	
Cost of materials for units to be produced (a)	$ 4,400	$ 4,960	$ 5,280	$ 6,160	$ 20,800
Plus cost of materials in ending inventory (b)	$ 800	$ 960	$ 1,040	$ 1,200	$ 4,000
Total cost of materials needed (c)	$ 5,200	$ 5,920	$ 6,320	$ 7,360	$ 24,800
Less cost of materials in beginning inventory (d)	$ 400	$ 800	$ 960	$ 1,040	$ 3,200
Cost of materials to purchase (e)	$ 4,800	$ 5,120	$ 5,360	$ 6,320	$ 21,600

> Sales Units

200 240

purchasing purpose

$c = a + b$ $e = c - d$

Direct Labour Budget

Direct Labour Budget (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Units to produce	1100	1240	1320	1540	5200
× Direct labour cost per unit	$ 1.27	$ 1.30	$ 1.32	$ 1.35	
Total direct labour cost ($)	$ 1379	$ 1612	$ 1742	$ 2079	$ 5244

Overhead Budget

Variable overhead rate = $1.50 per unit
Fixed overhead rate = $230 per quarter

Manufacturing Overhead Budget (Year 2010)—Product X

	1Q	2Q	3Q	4Q	Annual Total
Units to produce	1100	1240	1320	1540	5200
Variable mfg overhead rate per unit ($1.50)	$ 1650	$ 1860	$ 1980	$ 2310	$ 7800
Fixed mfg overhead	$ 230	$ 230	$ 230	$ 230	$ 920
Total overhead	$ 1880	$ 2090	$ 2210	$ 2540	$ 8720

Preparing Cost of Goods Sold Budget

COGS

Cost of Goods Sold (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Budgeted sales units	1,000	1,200	1,300	1,500	5,000
Direct materials ($4/unit)	$ 4,000	$ 4,800	$ 5,200	$ 6,000	$ 20,000
Direct labour ($3/unit)	$ 1,270	$ 1,570	$ 1,720	$ 2,020	$ 6,580
Mfg overhead:					
Variable ($1.50 per unit)	$ 1,500	$ 1,800	$ 1,950	$ 2,250	$ 7,500
Fixed	$ 230	$ 230	$ 230	$ 230	$ 920
Cost of goods sold	$ 7,000	$ 8,400	$ 9,100	$ 10,500	$ 35,000

this portion is constant

Note: Mfg overhead fixed portion is included into COGS

Selling Expenses Budget for a Manufacturing Business

Variable commission rate = 5% of unit sales

Selling Expenses (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Budgeted unit sales ($)	$ 15,000	$ 18,000	$ 19,500	$ 22,500	$ 75,000
Variable expenses:					
Commission (5%)	$ 750	$ 900	$ 975	$ 1,125	$ 3,750
Fixed expenses:					
Rent	$ 500	$ 500	$ 500	$ 500	$ 2,000
Advertising	$ 300	$ 300	$ 300	$ 300	$ 1,200
Office expenses	$ 200	$ 200	$ 200	$ 200	$ 800
Total selling expenses	$ 1,750	$ 1,900	$ 1,975	$ 2,125	$ 7,750

SG&A

Administrative Expenses Budget

Administrative Expenses (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Variable expenses:					
Fixed expenses:					
Salaries	$ 1400	$ 1400	$ 1400	$ 1400	$ 5600
Insurance	$ 135	$ 135	$ 135	$ 135	$ 540
Office supplies	$ 300	$ 300	$ 300	$ 300	$ 1200
Utilities (phone, power, water, etc.)	$ 500	$ 500	$ 500	$ 500	$ 2000
Other office expenses	$ 150	$ 150	$ 150	$ 150	$ 600
Total administrative expenses	$ 2485	$ 2485	$ 2485	$ 2485	$ 9940

Constant

The Budgeted Income Statement

Based on sales unit number

Budgeted Income Statement (Year 2010)—Product X					
	1Q	2Q	3Q	4Q	Annual Total
Sales	$ 15,000	$ 18,000	$ 19,500	$ 22,500	$ 75,000
Cost of goods sold	$ 7,000	$ 8,400	$ 9,100	$ 10,500	$ 35,000
Gross income	$ 8,000	$ 9,600	$ 10,400	$ 12,000	$ 40,000
Operating expenses:					
Selling expenses	$ 1,750	$ 1,900	$ 1,975	$ 2,125	$ 7,750
Administrative expenses	$ 2,485	$ 2,485	$ 2,485	$ 2,485	$ 9,940
Operating income	$ 3,765	$ 5,215	$ 5,940	$ 7,390	$ 22,310
Interest expenses	$ —	$ —	$ —	$ —	$ —
Net income before taxes	$ 3,765	$ 5,215	$ 5,940	$ 7,390	$ 22,310
Income taxes (35%)	$ 1,318	$ 1,825	$ 2,079	$ 2,587	$ 7,809
Net income	$ 2,447	$ 3,390	$ 3,861	$ 4,804	$ 14,502

Measures for Profitability of the Operation

- **Gross Margin**

  Gross margin = Gross income/Net sales

  = $40,000/$75,000 = 53%

- **Operating margin**

  Operating margin = Operating income/Net sales

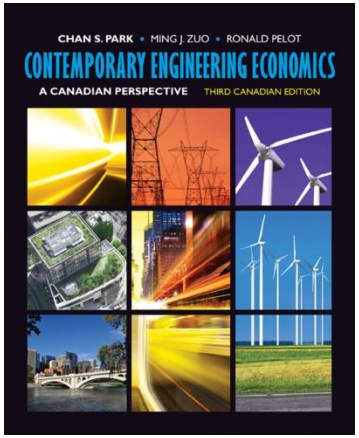
  = $22,310/$75,000 = 30%

- **Net profit margin**

  Net profit margin = Net income/Net sales

  = $14,502/$75,000 = 19%

Summary



Engineers are often asked to prepare the production budgets related to their operating division as well as budgets for new projects. Doing this requires a knowledge of budgeting scarce resources, such as labour and materials, and an understanding of the overhead cost.