

Matching Supply with Demand: An Introduction to Operations Management

Solutions to End-of-Chapter Problems

(last revised December 2011; make sure to visit www.cachon-terwiesch.net for the latest updates, excel files, ppt files and other information)

Chapter 6

6.2. Penne Pesto

Average amount of service time per guest (in hours)	1
Average "inventory" of customers	50
Average number of customers served in an evening	200

Annual revenue	1460000
Annual labor costs	657000
Annual rent and overhead costs	365000
Annual material costs	401500
EBIT	36500
Invested capital	200000
ROIC	0.1825

If we reduce the turnaround time, the average amount of service time per guest is 55/60 hours.

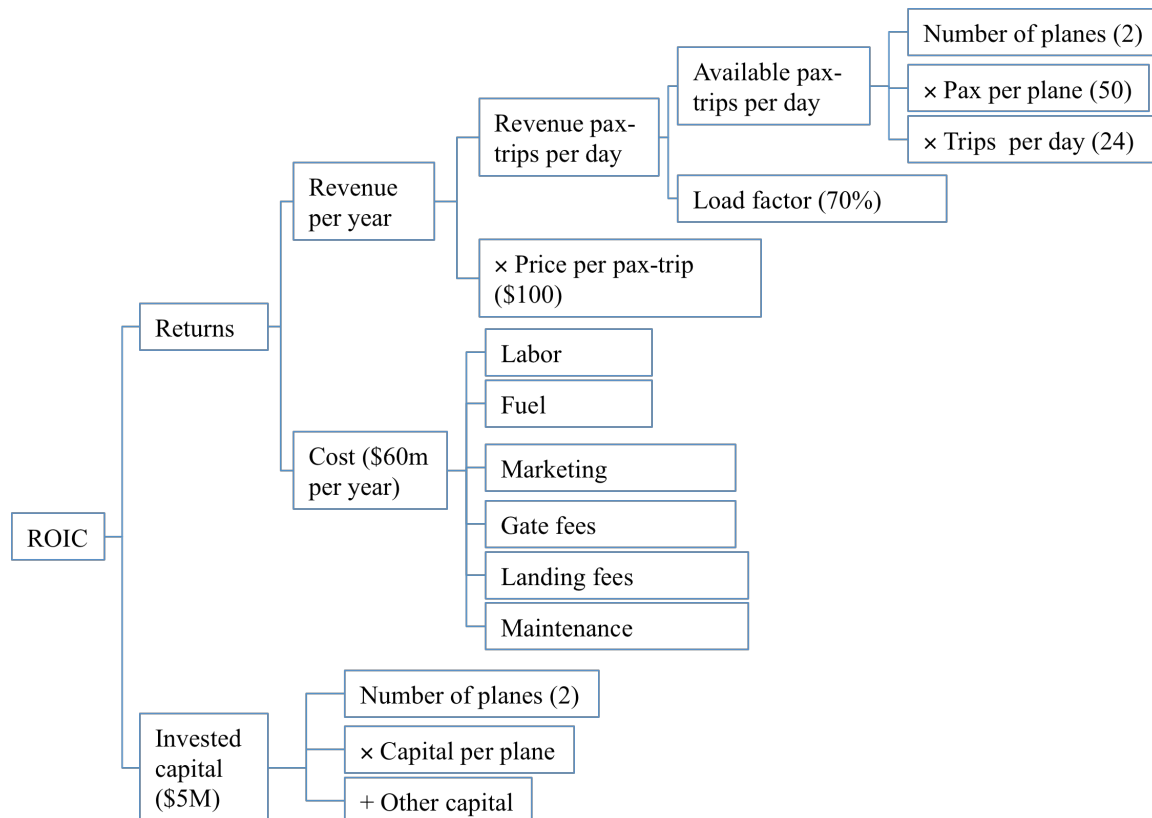
Average number of customers served in an evening	218.1818
Annual revenue	1592727
Annual labor costs	657000
Annual rent and overhead costs	365000
Annual material costs	438000
EBIT	132727.3
Invested capital	200000
ROIC	0.663636

If overhead could be reduced by 100 per day, we have the following:

EBIT	73000
ROIC	0.365

6.3 Philly Air

PA1. Draw an ROIC (return on invested capital) tree for the company that incorporates all of the above information.



PA2. What is the current ROIC?

$$\text{Revenues per year} = \text{load factor} \times 50 \times 2 \times 24 \times 365 \times 100 = 61,320,000$$

$$\text{Costs per year} = 60,000,000$$

$$\text{Returns} = \text{Revenues per year} - \text{Costs per year} = 1,320,000$$

$$\text{ROIC} = \text{Returns per year} / \text{Invested Capital} = 1,320,000 / 5,000,000 = \underline{26.4\%}$$

PA3. What is the minimum load factor at which the company breaks even?

The load factor at which the company breaks even satisfies

$$\text{Returns} = \text{load factor} \times 50 \times 2 \times 24 \times 365 \times 100 - 60,000,000 = 0.$$

$$\text{This gives load factor} = 60,000,000 / (50 \times 2 \times 24 \times 365 \times 100) = \underline{68.49\%}$$

PA4. What load factor would the company have to achieve so that it obtained a ten percentage point increase in the ROIC (e.g. an ROIC increasing from 5% to 15%)?

One needs to solve for

$$(\text{load factor} \times 50 \times 2 \times 24 \times 365 \times 100 - 60,000,000) / 5,000,000 = 36.4\%,$$

which gives

$$\text{load factor} = \underline{70.57\%}$$

6.4 Oscar's office building

Base Case

Building size	14000
Rent per square foot	4
Demand based on price	11200

Monthly fixed costs	8000
Variable costs per unit occupied	1.25

Monthly revenue	44800
Monthly fixed costs	8000
Monthly variable costs	14000
Monthly return	22800
Yearly return	273600
Invested capital	1800000
ROIC	0.152

Analysis with Rent = \$5 per sq. ft.

Building size	14000
Rent per square foot	5
Demand based on price	7000

Monthly fixed costs	8000
Variable costs per unit occupied	1.25

Monthly revenue	35000
Monthly fixed costs	8000
Monthly variable costs	8750
Monthly return	18250
Yearly return	219000
Invested capital	1800000
ROIC	0.121667

6.5 OPIM Bus Inc

OB1. Draw an ROIC (return on invested capital) tree for the company.

This is a very top heavy tree, in which only the revenue branch is broken up in detail. Costs and invested capital are given in the question.

Revenue: $2 \text{ vehicles} * 24 \text{ trips} * 35 \text{ seats} * \$10 * 365 \text{ days} = 6,132,000$

Profit: $6,132,000 - 6,000,000 = 132,000$

OB2. What is the current ROIC?

$ROIC = 132,000 / 500,000 = 0.264$

OB3. What is the minimum load factor at which the company breaks even?

$365 * 2 * 24 * 50 * \text{load factor} * 10 = 6,000,000$

Load factor = 68.49%

OB4. By how much will the firm have to increase the load factor to achieve a ten percentage point increase in the ROIC (e.g. from 5% to 15%)?

ROIC increases to 0.364

$365 * 2 * 24 * 50 * \text{load factor} * 10 - 6,000,000 = 500,000 * 0.364$

Load factor = 0.7057 (load factor needs to increase from 0.70 to 0.7057)

Corresponding to 35.28 seats sold.