Economies of the scale plant size economics essay

The newly formed Bangladesh Automobile Corporation plans to produce and export an expensive sports car and has asked your consulting firm for advice on the size of plant to construct. Because of the union contract and technical features of automobile production, labour must be paid the equivalent of $12, 000 per person per annum, and each incremental change in plant size involves $900, 000 in annual expenses for depreciation, interest, and other fixed costs. The maximum the firm will have available for expenditure on capital and labour is $9 million per annum. BAC has supplied the following details of its production function, meticulously derived by its chief engineer. (The data in the body of the table represent automobiles produced, in units.) Labour can be varied virtually continuously; the table shows units of fifty persons for convenience. All other variable expenses are constant at $2, 500 per vehicle produced.

Capital

(units of

$900, 000)

Labour (units of 50 persons)

1

2

3

4

5

6

3

40

90

140

170

180

185

4

60

120

180

220

230

236

5

100

170

230

250

260

268

6

170

200

240

270

280

289

BAC's market research indicates that the new vehicle should be sold at around $50, 000 per unit and that the expected demand situation is as follows:

Units Demanded (annually) 100 150 200 250

Probability 0. 20 0. 50 0. 20 0. 10

(a) Plot the short run ATC curves suggested by the production function and input cost figures.

(b) Comment on the economies and diseconomies of plant size (if any) which are evident in your graph.

(c) Disregarding the probabilities, which plant do you suggest that BAC build if the demand is expected to be (i) 150, (ii) 200, or (iii) 250, and why?

(d) Now regarding the probabilities, which plant do you suggest that the company build, and why?

Answers:

(C) (i) If the demand is considered to be 150, then to calculate Profit, we would use the following formula: Profit = Total revenue – Total cost

For Plant 1:

The amount of labor required to produce 150 units will be 200(50×4).

Therefore, Profit = 150*50000-(2700000+(200*12000)+(150*2500)) =$ 2025000

For Plant 2:

The amount of labor required to produce 150 units will be 150(50×3).

Therefore, Profit = 150*50000-(3600000+(150*12000)+(150*2500)) = $ 1725000

For Plant 3:

The amount of labor required to produce 150 units will be 100(50×2).

Therefore, Profit = 150*50000-(4500000+(100*12000)+(150*2500)) =$ 1425000

For Plant 4:

The amount of labor required to produce 150 units will be 50(50×1).

Therefore, Profit = 150*50000-(5400000+(50*12000)+(150*2500)) =$ 1125000

Thus in this case where demand is 150, to generate profit, BAC should go with Plant 1 as it would maximize profit.

(ii) If the demand is considered to be 200.

For Plant 1:

In this case, where the demand is 200, Plant 1 cannot be used, as the maximum number of units that can be produced by Plant 1 would be 185.

For Plant 2:

The amount of labor required to produce 200 units will be 200(50×4)

Therefore, Profit = 200*50000-(3600000+(200*12000)+(200*2500)) =$ 3500000

For Plant 3:

The amount of labor required to produce 200 units will be 150(50×3)

Therefore, Profit = 200*50000-(4500000+(150*12000)+(200*2500)) =$ 3200000

For Plant 4:

The amount of labor required to produce 200 units will be 100(50×2)

Therefore, Profit = 200*50000-(5400000+(100*12000)+(200*2500)) =$

2900000

Thus in this case where demand is 200, to generate profit, BAC should go with Plant 2 as it would maximize profit and with Plant 1, 200 units can never be produced.

(iii) If the demand is considered to be 250,

For Plant 1:

In this case, where the demand is 250, Plant 1 cannot be used, as the

maximum number of units that can be produced by Plant 1 would be 185.

For Plant 2:

In this case, where the demand is 250, Plant 2 cannot be used, as the

maximum number of units that can be produced by Plant 2 would be 236.

For Plant 3:

The amount of labor required to produce 250 units will be 200(50×4)

Therefore, Profit = 250*50000-(4500000+(200*12000)+(250*2500)) =$

4975000

For Plant 4:

The amount of labor required to produce 250 units will be 100(50×4)

Therefore, Profit = 200*50000-(5400000+(100*12000)+(200*2500)) =$

4075000.

Thus in this case where demand is 250, to generate profit, BAC should go with Plant 3 as it would maximize profit and with Plant 1 and Plant 2, 250 units can never be produced.

(D) If we consider the probabilities, to identify which plant the company should build, then we need to consider the profit that can be made by each plant and then identify which plant makes maximum profit.

For Plant 1:

Case1:

When the demand is 100, the maximum profit that they would earn is $250000. Now if we consider the probability factor, where in this case it is 0. 2, then the profit made would be:

Total Profit = Profit * Probability

Demand = 100; Profit = $250000; Probability= 0. 2

Total Profit = 250000*0. 2 =$ 50000

Case 2:

When the demand is 150, the maximum profit that they would earn is $2025000. Now if we consider the probability factor, where in this case it is 0. 5, then the profit made would be:

Demand = 150; Profit = $ 2025000; Probability= 0. 5

Total Profit = 2025000* 0. 5 =$1012500

Case 3 and Case 4:

If the demand increases to 200 or 250, Plant 1 cannot be used as the

maximum units that can be produced by plant 1 is 185.

Thus the total profit that can be made by Plant 1 is $1062500.

For Plant 2:

Case1:

When the demand is 100, the company would make a loss of -$50000. Now if

we consider the probability factor, where in this case it is 0. 2, then the profit

made would be:

Demand = 100; Loss = -$50000; Probability= 0. 2

Total Profit =-50000 * 0. 2 =$ -10000

Case 2:

When the demand is 150, the maximum profit that they would earn is

$1725000. Now if we consider the probability factor, where in this case it is

0. 5, then the profit made would be:

Demand = 150; Profit = $ 1725000; Probability= 0. 5

Total Profit = 1725000* 0. 5 =$862500

Case 3:

When the demand is 200, the maximum profit that they would earn is

$3500000. Now if we consider the probability factor, where in this case it is

0. 2, then the profit made would be:

Demand = 200; Profit = $ 3500000; Probability= 0. 2

Total Profit = 3500000* 0. 2 =$700000

Case 4:

If the demand increases to 250, Plant 2 cannot be used as the maximum units that can be produced by plant 2 is 236.

Thus the total profit that can be made by Plant 2 is $1552500

For Plant 3:

Case1:

When the demand is 100, the company would make a loss of -$350000. Now if we consider the probability factor, where in this case it is 0. 2, then the profit made would be:

Total Profit = Profit/Loss * Probability

Demand = 100; Loss = -$350000; Probability= 0. 2

Total Profit =-350000* 0. 2 =-$ 70000

Case 2:

When the demand is 150, the company would make a loss of -$1075000. Now if we consider the probability factor, where in this case it is 0. 5, then the profit made would be:

Demand = 150; loss = -$1075000; Probability= 0. 5

Total Profit = -1075000* 0. 5 =-$537500

Case 3:

When the demand is 200, the maximum profit that they would earn is $3200000. Now if we consider the probability factor, where in this case it is 0. 2, then the profit made would be:

Demand = 200; Profit = $ 3200000; Probability= 0. 2

Total Profit = 3200000* 0. 2 =$640000

Case 4:

When the demand is 250, the maximum profit that they would earn is $4975000. Now if we consider the probability factor, where in this case it is 0. 1, then the profit made would be:

Demand = 150; Profit = $ 4975000; Probability= 0. 1

Total Profit = 4975000* 0. 1 =$497500

Thus the total profit that can be made by Plant 3 is $530000.

For Plant 4:

Case1:

When the demand is 100, the company would make a loss of -$1250000. Now if we consider the probability factor, where in this case it is 0. 2, then the profit made would be:

Total Profit = Profit/Loss * Probability

Demand = 100; Loss = -$1250000; Probability= 0. 2

Total Profit =-1250000* 0. 2 =-$250000

Case 2:

When the demand is 150, the maximum profit that they would earn is $1125000. Now if we consider the probability factor, where in this case it is 0. 5, then the profit made would be:

Demand = 150; loss = $ 1125000; Probability= 0. 5

Total Profit = 1125000* 0. 5 = $562500

Case 3:

When the demand is 200, the maximum profit that they would earn is $2900000. Now if we consider the probability factor, where in this case it is 0. 2, then the profit made would be:

Demand = 200; Profit = $ 2900000; Probability= 0. 2

Total Profit = 2900000* 0. 2 =$580000

Case 4:

When the demand is 250, the maximum profit that they would earn is $4075000. Now if we consider the probability factor, where in this case it is 0. 1, then the profit made would be:

Demand = 150; Profit = $ 4075000; Probability= 0. 1

Total Profit = 4075000* 0. 1 =$407500

Thus the total profit that can be made by Plant 4 is $1300000.

Plant 2 is the plant that would make maximum profit for BAC. Thus BAC should go with Plant 2.

Question II

Increasing returns with Network effect

The law of diminishing returns is not a mathematical theorem, but an empirical assertion that has been observed in almost every economic production process as the amount of variable input increases. An interesting exception occurs, however, with network effects. The greater the installed based of a network product, the larger the number of compatible network connections and therefore the more possible value for a new customer. Consequently, as the sales penetration increases, the firm's promotions and other selling activities to acquire new customers become increasingly more productive.

Discuss two examples of the product that fits this pattern.

Provide a graphic illustration of sales penetration curve pertaining to the network effect and explain your logic.

Answers:

Network effect occurs when the value of the product increases as the number of people using the product increases. Here the products success is determined by the increasing acceptability and compatibility of the product rather than it being superior of inferior than and of its competition.

(A)Examples of Network Effect are as flows:

Stock Exchanges: These are basically stock exchanges where stocks of listed companies are traded. They are very typical examples of the Network Effect. Here, the Market Liquidity or the amount of money that is there in the market is a major determinant of transaction cost for the sale and purchase of securities. As the number of buyers and sellers increases, the market liquidity also increases and hence the transaction cost decreases as the spread between the price at which purchase can be made and the price at which a sale can be made diminishes. This decrease in the difference between prices is because of increased competitiveness within the market and the power to determine the price shifts from few to many people and hence this entire event attracts a large number of buyers and sellers towards the market.

Websites: Many websites also display the Network Effect. One very important example is the online stores. For e. g. eBay. EBay has a bidding system wherein buyers can place bids on the products they want to buy within a certain period of time and the highest bid gets the product when the time frame expires. This model would not succeed if the number of buyers or sellers on eBay were less as few buyers or sellers can influence the price of a product considerably and take undue advantage. However, as the number of buyers and sellers on eBay increases, the auctions become more and more competitive which attracts more eBay users on both ends (Buying and selling). As the number buyers on eBay increases the bids prices rise and hence it becomes more viable to sell on eBay. This results in a spike in the number of sellers on eBay and hence brings down the prices of products as

the supply increases. All in all, more and more people find eBay more useful as the number of eBay users increases.

Social Networking websites such as Facebook, Twitter are also a very good example of The Network Effect. Here, as the number of people who register onto the websites increases, the better it is for the already existing users.

(B.)

C: UsersAdminDesktopUntitled. png

Explanation and Logic:

In the above figure, from 0 to 30 percent market share, the sales and advertising effort required to attain each additional point of market share have a diminishing return indicated by the reducing slope of the sales penetration curve. But when the number of users on a network based product reaches 30 to 40 percent market share, achieving more and more market share beyond that point becomes cheaper and cheaper (indicated by the increasing slope of the sales penetration curve). This is because beyond 30 percent market share, every point increase in the market share increases the probability of adoption of the product by another customer and hence the sales and advertising expense required to gain additional unit sales becomes comparatively less. Beyond 80 to 90 percent market share, it becomes increasingly expensive to gain the final adopters for the product as the selling and advertising required to achieve these customers again become subject to diminishing returs.

Question III

DEMAND: CASE STUDY: PERSONAL VIDEO RECORDER

Personal video recorders (PVRs) are digital video recorders used to record and replay television programs received from cable, satellite, or local broadcasts. But unlike VCRs, which they replace; PVRs offer many more functions, notably the ability to record up to 80 hours of programs and easy programming. A PVR consists of an internal hard disk and microprocessor. After the owner installs the hardware, the PVR downloads all upcoming TV schedules to the hardware via a phone or cable connection. Users merely enter the name of the show(s) they want recorded and the system finds the time and channel of the show and automatically records it. Users must subscribe to a cable or satellite system if they wish to record programs off these channels.

Besides ease of programming and much larger recording capacity than videotape, PVRs allow the user to watch a prerecorded show while the unit is recording a new program, pause watching live programs (for example, if the phone rings) and then resume watching the rest of the live broadcast, view instant replays and slow motion of live programs, and skip commercials.

In effect, PVRs, like older VCRs, allow viewers to control when they watch broadcast programs (called time shifting). However, PVRs provide much sharper pictures and are much simpler to operate than VCRs, and PVRs allow the user to download the television schedule for the next week.

Two companies currently sell the hardware and provide the subscription service: TiVo and ReplayTV. Both firms started in 1997: As of mid-2003 TiVo had nearly 700, 000 subscribers and ReplayTV had about 100, 000. Companies are developing new technologies that make it even easier for users to " snip" commercials.

Cable companies have begun offering a combined cable box and PVR in one unit for a small additional monthly charge. This further simplifies setup and operation, and the user gets a single bill.

Discussion Questions

1. Discuss how PVRs will affect the demand from advertisers?

2. Suppose you are in charge of setting the price for commercial advertisements shown during Enemies, a top network television show. There is a 60-minute slot for the show. However, the running time for the show itself is only 30 minutes. The rest of the time can be sold to other companies to advertise their products or donated for public service announcements. Demand for advertising is given by:

$$Qd = 30 – 0.0002P + 26 V$$

where Qd = quantity demanded for advertising on the show (minutes), P = the price per minute that you charge for advertising, and V is the number of viewers expected to watch the advertisement (in millions).

a. All your costs are fixed and your goal is to maximize the total revenue received from selling advertising. Suppose that the expected number of

viewers is one million people. What price should you charge? How many minutes of advertising will you sell? What is total revenue?

b. Suppose price is held constant at the value from part (a). What will happen to the quantity demanded if due to PVRs the number of expected viewers falls to 0. 5 million? Calculate the " viewer elasticity" based on the two points. Explain in words what this value means.

3. As more viewers begin using PVRs, what happens to the revenues of the major networks (CBS, NBC, ABC, and FOX)?

4. Discuss the long-run effects if a significant proportion of the viewers begin adopting these " advertising snipping" systems:

5. What advice would you give the major commercial networks and producers of programming for these networks as more consumers adopt PVRs?

SOURCE: J, Gudmundsen (2002); " Video Gizmos Change the Rules," Democrat and Chronicle (August), 5E and 8E; B. Fisher (2003); " TiVo and Replay N Have Features to Satisfy any N Junkie," Detroit News (June 24); R. Reilty (2003), " Great Invention Period;" Sports Illustrated (December 22), (Adopted from Managerial Economics, fourth ed. James Brickley, et. al. Ch. 4, pp. 120-121)

Answers:

(1.) If there is a surge in the use of PVRs, there will be a decrease in the demand from advertisers. It is for the simple reason that more people would use the PVRs to record TV shows and would skip the commercials shown in

between shows, thereby resulting in less viewership of ads. Hence there would be a decrease in demand from the advertisers and they would have to find other means of promotions.

(2.)(A) The production equation: $Qd = 30 - 0.0002P + 26V$

Viewership: 1 mil

Revenue : $Qd * P$

Qd

30

29

28

27

Price

130000

135000

140000

145000

Revenue

3900000

3915000

3920000

3915000

The ideal price to be charged is $14000 for 28 minutes because this is the value where the revenue is maximum.

To total revenue will be $3, 920, 000

(B) If the value is kept constant at $140, 000 and the viewership decrease because of PVRs to 0. 5 million, then Qd: 30-(0. 0002 x 140, 000) + (26 x 0. 5) = 15 . The quantity demanded will decrease from 28 to 15.

Viewers elasticity would be defined by [Î” Q/(Q1+Q2)/2]/[Î” V/(Va+V2)/2]= 0. 9

This is below 1, the elasticity of viewers is inelastic. The decrease in viewership will not cause a substantial decrease in demand of advertising.

(3.) As more consumers start using PVRs, the revenues of major networks like CNN, ABC, and Fox… etc will most likely fall substantially. Since total revenue is a component of price multiplied by the quantity demanded, the decrease in the quantity demanded will result in lower profits.

(4.) If a huge chunk of the viewers start to adopt these “ advertising snipping” systems, the long-run effects would be unfavorable towards the broadcasting firms resulting in lower profits and since lesser companies

would use commercials to adverting their products, there will be a significant decrease in the demand of infomercials and Ads respectively.

(5.) The suggestion that we would provide to these major commercial network firms for these networks would be

a. To increase the quality of the commercials and make them interesting and exciting. The firms should consider tha target audience watching that particular show at the time and construct commercials targeted towards them, so the viewers can actually enjoy the commercials instead of snipping them out.

b. The other suggestion would be to slowly decrease the price of the advertising rate per second so that the companies still continue to advertise and are not discouraged to stop advertising at all.

c. Another form of advertising could be to integrate advertising into the shows itself. The companies con collaborate with the production house of the prime shows and the actors can be made to use the products on the show (e. g. Actors can be shown wearing a particular brand of jacket)

Question IV

HP and DELL personal Computers

Consider the following questions about competitive strategy in personal computers.

Questions

Does easy access to distribution channels at Best Buy, Office Depot, and the direct- to- consumers on the Internet, and small minimum efficient scale in assembly operations indicate high or low entry threat in the PC business? Why?

Do suppliers appropriate little or most of the value in the PC value chain? Why?

What factors determine the intensity of rivalry in an industry? Is the intensity of rivalry in the PC industry high or low? Why?

Anwers:

(1.)Entry threat is Low for mature markets and Medium for developing markets.

Established players have a huge advantage over new entrants, because they have already attained their Minimum Efficient Scale, creating a cost advantage. Patents and copyrights are the most common artificial barriers to entry in the PC industry. Also, switching to competing product is very rare due to high switching costs and probable software incompatibility.

Startup costs for new entrants are also quite high mostly due to research and development, market research licensing expenditure and lack of established relations with key suppliers.

However, new entrants are capable of achieving market share in developing markets, like Eastern Europe, Latin America, Asia Pacific region, and the Middle East. So, smaller firms with the right resources and capability may be able to achieve economies of scale in developing markets.

(2.) Suppliers appropriate the most of the value in PC value chain because of the following:

Suppliers of core PC hardware (IBM, Intel) and software (Microsoft) hold dominant market position and almost impossible to switch, hence they have considerable bargaining power and can sell their products at premium price.

There is always a threat of forward integration by the suppliers since their products are technically sophisticated, innovative and protected by copyrights and other non-core PC components are easily obtainable through numerous sources.

Main competitive advantages in PC industry nowadays are costs and customer brand loyalty, hence profit margins of PC manufacturers are very low, which does not affect supplier profit margins.

Therefore, the suppliers tend to have little value in the PC value chain.

(3.)According to Porter's five forces,

Intensity of rivalry is high, when:

Intensity of rivalry is low, when:

- Competitors are numerous

- Competitors are few

- Competitors have relatively equal size

- Competitors have relatively unequal size

- Competitors have relatively equal market share

- Competitors have relatively unequal market share

- Industry growth is slow

- Industry growth is fast

- Fixed costs are high

- Fixed costs are low

- Products are weakly differentiated

- Products are highly differentiated

- Brand loyalty is insignificant

- Brand loyalty is significant

- Consumer switching costs are low

- Consumer switching costs are high

Pc market nowadays is relatively highly competitive, with only four main players selling weakly differentiated products. Brand loyalty is very important, because consumer switching costs are very high, hence main focus of the competition lies in innovation (to create temporary differentiation) and building tailored solutions to increase brand loyalty. Therefore we can conclude that intensity of rivalry in PC industry is relatively high.

Question V

Coke and Pepsi have sustained their market dominance for nearly a century. General Motors and Ford gave been hard hit by competition. What is different about product/market situations in these two cases that affect sustainability?

Answer:

The two sets of products are very different from each other. Pepsi and Coke is a fast moving consumer good, which is sold everywhere – and hence, it's extremely accessible and is consumed multiple times. However, cars fall in to the automobile industry and is not a fast moving good, a person takes into consideration multiple factors before graduating into a stage to be willing to purchase (readiness to buy) the product unlike Pepsi or Coke. For Pepsi and Coke due to the brand loyalty created through the years we cannot clearly say at what price a consumer will make a shift. However, when it comes to a car, we can tell that at even a slight fall or rise in the price can have an adverse effect on the demand of the product and a consumer will make the shift.

Why Pepsi and Coke managed to maintain its leadership position compared to General Motors and Ford because of it managed to adapt to changing market situations and consumer tastes and preferences whereas the two car manufacturers couldn't. In economic terms Coke and Pepsi managed to maintain its oligopolistic nature of market structures in comparison to General Motors and Ford who lost the battle of market dominance and the market turned into a monopolistic one. The only two ways in which a

challenger can enter the market and create a disruption in an oligopolistic market is by entering with large scale operational infrastructure to be able to compete with the economies of scale or the other way would be to succumb to the cost advantage by entering small scale. With respect to pepsi or coke when a new challenger enters the market with little knowledge or small scale production capabilities, they either buy it out or launch its own version of the product. Never have they ever faced a challenger of a competitive advantage until recently by red bull which is also only in the energy drinks category, overall beverage category its an unrealistic thought to conquer the market as no company can enter with a competitive edge in the mainstream carbonated drinks category. This helps Pepsi and Coke to maintain its leadership position. However, when the Japanese invaded the U. S market they had large scale operational advantage and brought products into the market which the consumer then wanted (small, reliable and well priced) which posed as a direct threat to General Motors and Ford. Their competitive advantage along with disruptive marketing lead to dwindling sales and eventually the sad demise of one the leading car manufacturers in the world. Therefore, above are the reasons why Pepsi and Coke managed to maintain their leadership situation when market situations changed and General Motors and Ford couldn't.