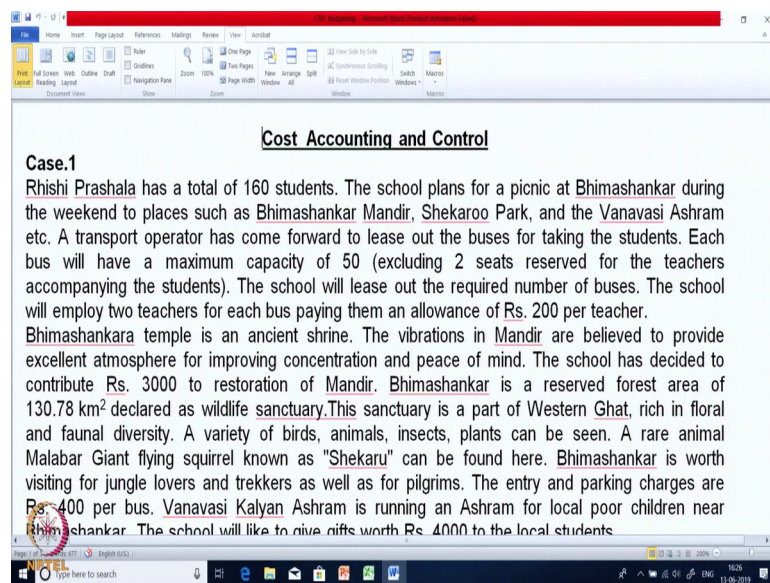


Cost Accounting
Prof. Varadraj Bapat
School of Management
Indian Institute of Technology, Bombay

Lecture - 11
Case Study: Break - Even Point

[FL] In last few sessions we have discussed CVP, BEP. In the last session we have also discussed the relevant cost versus sunk costs, we have done cases based on few decision making scenarios. Let us go for the next case again based on decision making and we have to calculate BEP, but this case is very interesting because we are going for a picnic. So, we have to take a decision for pricing for a school picnic please read the case yourself.

(Refer Slide Time: 01:06)



The screenshot shows a Microsoft Word document with the title "Cost Accounting and Control" centered at the top. Below the title, it is labeled "Case.1". The text describes a school picnic plan for 160 students to Bhimashankar. It details the bus capacity (50 seats, excluding 2 for teachers), the allowance for teachers (Rs. 200 per teacher), the cost for bus restoration (Rs. 3000), the sanctuary area (130.78 km²), the cost of entry and parking (Rs. 400 per bus), and the cost of gifts (Rs. 4000). The document is displayed in a window with a red title bar and a standard Word ribbon interface.

Cost Accounting and Control

Case.1

Rhishi Prashala has a total of 160 students. The school plans for a picnic at Bhimashankar during the weekend to places such as Bhimashankar Mandir, Shekaroo Park, and the Vanavasi Ashram etc. A transport operator has come forward to lease out the buses for taking the students. Each bus will have a maximum capacity of 50 (excluding 2 seats reserved for the teachers accompanying the students). The school will lease out the required number of buses. The school will employ two teachers for each bus paying them an allowance of Rs. 200 per teacher. Bhimashankara temple is an ancient shrine. The vibrations in Mandir are believed to provide excellent atmosphere for improving concentration and peace of mind. The school has decided to contribute Rs. 3000 to restoration of Mandir. Bhimashankar is a reserved forest area of 130.78 km² declared as wildlife sanctuary. This sanctuary is a part of Western Ghat, rich in floral and faunal diversity. A variety of birds, animals, insects, plants can be seen. A rare animal Malabar Giant flying squirrel known as "Shekaru" can be found here. Bhimashankar is worth visiting for jungle lovers and trekkers as well as for pilgrims. The entry and parking charges are Rs. 400 per bus. Vanavasi Kalyan Ashram is running an Ashram for local poor children near Bhimashankar. The school will like to give gifts worth Rs. 4000 to the local students.

So, Rhishi Prashala has total of 160 students and they are proposing to go for a picnic to Bhimashankar. Now, Bhimashankar is a very important pilgrimage place in Maharashtra, it also has a very interesting sanctuary there wherein you can see wild life. So, please go through this there is a reserve forest there cost details are also mentioned.

(Refer Slide Time: 01:50)

The following are the other cost estimates:

	Cost Per Person (Rs.)
Breakfast	20
Lunch	60
Health Drink	08
Entrance fee at Park (student)	20
Entrance fee at Park (adult)	40

Rent Rs. 4000 per bus.
 Special permit fee Rs. 700 per bus
 Prizes to students for games Rs. 5000
 Same variable costs are incurred in respect of the accompanying teachers.
 You are required to compute:

a) If school decides to charge Rs. 500/- per student, what is the BEP (no. of students) and PV Ratio? (you may give multiple answers)

BEP1 =
 PVR1 =

Now, based on the cost, the question is you are required to compute a: If school decides to charge 500 per student, what is a BEP in terms of number of students and what is a PV ratio? Interesting thing is you can have multiple answers, you can have up to 4 columns are given I mean 4 sales are given you can have up to 4 answers for BEP and 4 answers for PVR.

(Refer Slide Time: 01:16)

a) If school decides to charge Rs. 500/- per student, what is the BEP (no. of students) and PV Ratio? (you may give multiple answers)

BEP1 =
 BEP2 =
 BEP3 =
 BEP4 =

PVR1 =
 PVR2 =
 PVR3 =
 PVR4 =

b) If the school decides to take a few students from Municipal school at concessional fees, (so that fees just cover the incremental cost), how much it should charge from these students?

(Refer Slide Time: 02:28)

b) If the school decides to take a few students from Municipal school at concessional fees, (so that fees just cover the incremental cost), how much it should charge from these students? (you may give multiple answers)

CONC. FEE 1 =	
CONC. FEE 2 =	

In b part now school has decided to take a few students from Municipal school at a concessional fee. So, that they would be charged enough fee just to cover the incremental cost, now what will be the concessional fee again there are 4 possible answers.

(Refer Slide Time: 02:53)

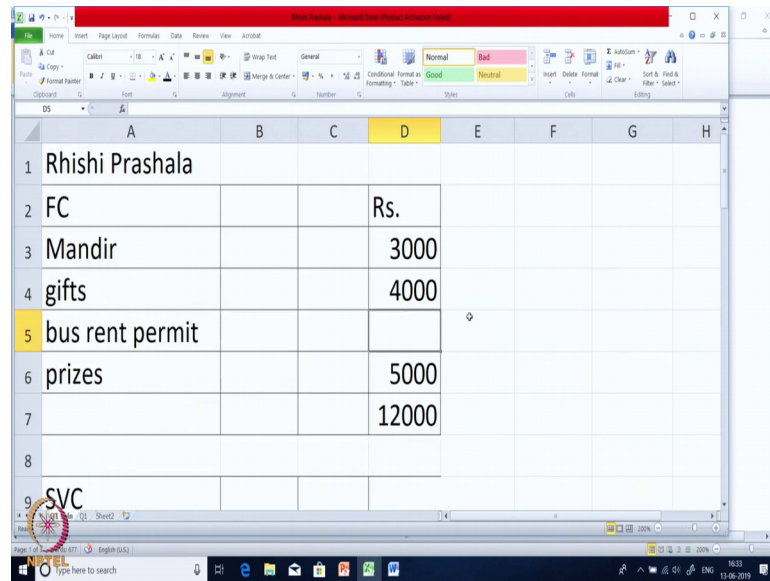
CONC. FEE 3 =	
CONC. FEE 4 =	

c) If estimated no. of school students are 80, 120, 150 and 160, and school decides to charge at cost, how much shall be fee.

Lower FEE 1 =	
Lower FEE 2 =	
Lower FEE 3 =	
Lower FEE 4 =	

And in part c as per the estimated number of students you need to make 4 columns. Now, instead of charging 500 school wants to just cover enough fee to cover the cost, so lower fee 1, 2, 3, 4. So, these three calculations are required please go through the case once again and then we will discuss the solution.

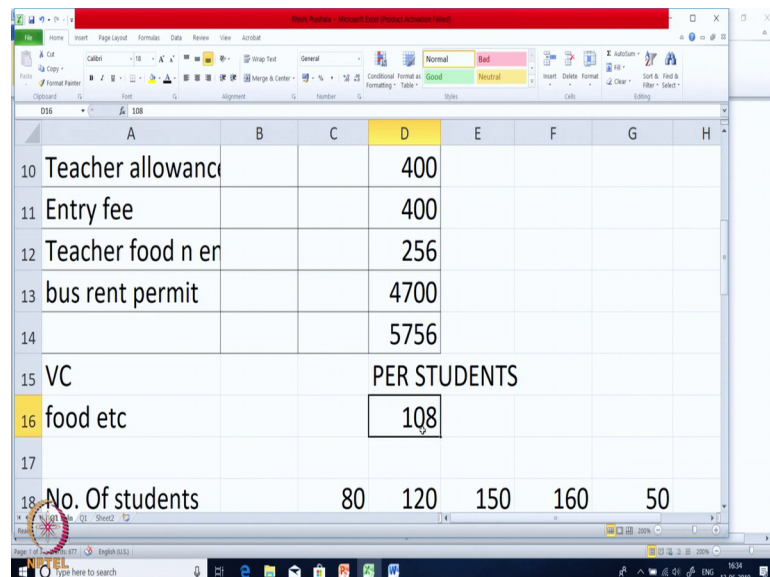
(Refer Slide Time: 03:58)



	A	B	C	D	E	F	G	H
1	Rhishi Prashala							
2	FC			Rs.				
3	Mandir			3000				
4	gifts			4000				
5	bus rent permit							
6	prizes			5000				
7				12000				
8								
9	SVC							

So, you are ready picnic [FL], but [FL] decision [FL], what are the costs involved and what is a price we are going to charge? So, let us start collecting the important data and we know in marginal costing or in CVP we segregate the cost as per their nature. So, please list down the fixed cost, variable cost and semi variable cost if any ok.

(Refer Slide Time: 04:31)



	A	B	C	D	E	F	G	H
10	Teacher allowance			400				
11	Entry fee			400				
12	Teacher food n en			256				
13	bus rent permit			4700				
14				5756				
15	VC			PER STUDENTS				
16	food etc			108				
17								
18	No. Of students		80	120	150	160	50	

So, are you able to identify, there is a cost of donation at [FL] that is 3000 that is a fixed cost, gifts are fixed cost, bus rent one more fixed cost, prices shall we take bus rent permit. How much is a bus rent permit cost? I think it is based on anything is missed out

special permit fee of 700 is per bus. So, we will not take it as a fixed cost, it becomes a semi variable cost.

(Refer Slide Time: 05:35)

	A	B	C	D	E	F	G	H
7								
8								
9	SVC							
10	Teacher allowance			400				
11	Entry fee			400				
12	Teacher food n en			256				
13	bus rent permit			4700				
14				5756				
15	VC				PER STUDENTS			

So, let us list out what are the semi variable cost. Teachers allowances, how much is a allowance to teacher? 200 per teacher for 2 teachers. So, in each bus the for each bus the cost will be 400, entry fee for the bus, bus permit fee, then the variable costs; variable cost is 108, are you getting it.

(Refer Slide Time: 06:20)

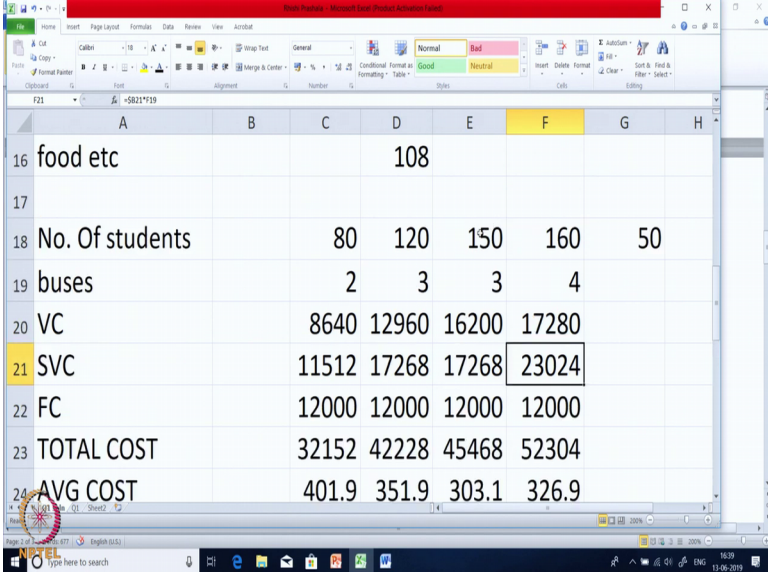
	C	D	E	F	G	H	I	J	K	L
10		400							20	
11		400							60	
12									8	
13		4700							20	
14									VC pu 108	
15		PER STUDENTS							VC per teach 128	
16		108								
17										
18	80	120	150	160	50					

So, we have made a list of cost on food etcetera which is 20, 60, 80 and 20 making variable cost per unit as 108 and variable cost per teacher is 128 right. Now, this 128 though is variable per teacher for us the cost unit is student. So, for every student the variable cost is 108, for teacher it is 128, but the variable cost of the teacher will need to be considered as the semi variable cost right and there are two teachers in one bus.

So, per bus cost is a cost calculation which we have made which includes teacher allowances, entry fee, food and other variable cost for the two teachers 258, 256, 4,700 is a bus rent, so it becomes 5756 per bus, fixed cost is 12000. Bus rent permit though I have entered will not be included in fixed cost; it will rather be included in semi variable cost which changes per bus not per student.

So, are you getting it now we have got three type of costs one which are totally changing with student that is variable, one which are changing with bus, so SVC Semi Variable and the third ones are not changing at all they are fixed.

(Refer Slide Time: 08:57)



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H
16	food etc			108				
17								
18	No. Of students		80	120	150	160	50	
19	buses		2	3	3	4		
20	VC		8640	12960	16200	17280		
21	SVC		11512	17268	17268	23024		
22	FC		12000	12000	12000	12000		
23	TOTAL COST		32152	42228	45468	52304		
24	AVG COST		401.9	351.9	303.1	326.9		

Now, let us go for they have actually asked us to calculate BEP and other things, but in the c part they have also asked us to calculate different costs as per number of students. So, it will be better to make different, so please open your net book prepare columns for 80, 120, 150 and 160 students right. So, how many buses will be required for 80 students? There will be 2 buses like that for each of the range let us go for number of buses 2, 3, 3 and 4 as per the number of students.

Now, how much will be the variable cost for 80 students? Now, there is no point in writing each variable cost for each student, we are essentially calculating total variable cost for 80 students and we know that variable cost is 108 per unit. So, 108 into 80 will be the VC for 80 students, so it comes 1680 are you getting. Now, much will be semi variable cost? It depends on number of buses, there are 2 buses and one bus cost 5756.

So, total SVC for 80 students comes to 11512 which is for 2 buses and total fixed cost is 12000 which is anyway fixed. So, total cost is 35152 for 80 students are you getting and what is a average cost? If we divide by 80 we get it as 401 around 400 rupees per student, if there are 80 students.

Now, we have been asked in the c part of the question compute for 80, 120, 150 and 160. So, we will try to calculate it for all these four in fact, we can also calculate it for 50 just for our own sake. Now, same calculation please make it for 120 students. Now, what is VC? 12960 right 108 into 120. Then semi variable cost how much it is? Now, it is for 3 buses. So, it comes to 17268, fixed cost is unchanged, so it is 12000, total cost is 42228 and now the average cost you can see there is a drop in average cost is 351.9. So, almost 50 rupees reduction has happened because number of students have gone up.

Now, let us see what happens if number of students go up to 150. So, how much is a VC now? It is 16200 at the rate of 108 into 150. Semi variable cost will be same now because it is now also its three buses, fixed cost is always constant at 1200, total cost will be now 45468 and the average cost goes down to 303 because this is called also known as economies of scale. Now, you are having more student, so total cost is going down.

Now, if you go for 160 students will total cost further go down? You can see here total cost is falling from 80 to 120 to 150, for 160 will it fall further? It may not because economies of scale are not always true you can just calculate it and then we will discuss. So, VC is now 17280, SVC will go up because now there are 4 buses, fixed cost is constant, total cost is now 52304 and you can just see that average cost has slightly gone up. Why has it gone up? Because SVC was gone up.

If you remember semi variable cost are step in nature. So, we have can have 1 bus, 2 buses, 3 buses, 4 buses, now because just for last 10 students you have to take one more bus that is why your average cost has gone up. Normally it is true that average cost will fall because variable cost per unit is same 108, fixed cost is constant at 12000 and gets

spread over more and more number of students; however, semi variable cost is unique, it has a step nature.

So, while increasing the level of operations we have to keep a close eye on semi variable cost are you getting ok, so these was a basic calculations. Now, let us go to what has been asked. Now, you were asked to calculate BEP and it was told that you can have more than one answer. Now, what is a formula BEP? Fixed cost upon in these case since its number of students we will go for fixed cost upon contribution per unit, now the selling price is known that is 500, so compute the contribution.

(Refer Slide Time: 15:32)

	A	B	C	D	E	F	G	H
28	VC	108						
29	CONTR	392						
30								
31	BEP							
32	FC		23512	29268	29268	35024	17756	
33	CONTR		392	392	392	392	392	
34	BEP		59.98	74.66	74.66	89.35	45.296	
35								
36	PVR							

So, 500 minus 108, so very high contribution 392 per unit. Breakeven point, so we go for FC upon contribution per unit. So, how much will be breakeven point, will it be 12000 upon 392? Let us check. So, I think you will have to apply your mind and then only we will get the answer are you able to apply your mind because the fixed cost is not going to be fixed here.

Normally we know that fixed cost is defined as a cost which does not change with level of activity, but in this case what is happening is the bus related cost are semi variable in nature and we are not including them in the variable cost. So, they are they have to be included in the fixed cost. So, what happens is if you have 2 buses the fixed cost becomes 23512 it is 12000 plus the cost of 2 buses that is 5756 into 2 are you getting it.

So, for 80 students the fixed cost is 23512 when the number of students touch in fact, when number of students cross 50 that is you have to go for sorry when number of students cross 100 that is you have to go for 3 buses. The fixed cost becomes 29268 and when you go for 4 buses the fixed cost becomes 35024, contribution is unchanged at 392. So, you get multiple break even points are you getting me.

Now, the breakeven points are 59, 74, 89 that is why there was a possibility of having 3 break evens. Can you have one more break even with just 50 students? I think we will need to calculate what happens for 50 students. If you just take 50 students that is only 1 bus the SVC is 5756 the total cost is 23000. So, average cost is 463 although it was not asked in the problem we have done this extra calculation because for these you will need to calculate BEP.

So, you will realize now it is just one bus, so fixed cost is 17756 and BEP is 45. So, in the first part of question it was asked that calculate the BEP and you can have up to four alternate answers. I hope you have got the answers now. So, possible answers are 45, 63 sorry 45, 59, 74 and 89 are you getting it.

Now, so far in earlier problems we never encountered with multiple BEP, but here you will realize that because of existence of semi variable cost you can approach a scenario where you can have more than 1 BEPs. If the cost structure is a straight line that is you have got same fixed cost and only one PV ratio or only one contribution per unit, then there will be only one BEP, but if the cost structure is a curve or if it is a step nature you can have more BEPs that is why while answering the first part of the question you will have to come out with four answers of BEP.

(Refer Slide Time: 20:22)

	A	B	C	D	E	F	G	H
31	BEP							
32	FC		23512	29268	29268	35024	17756	
33	CONTR		392	392	392	392	392	
34	BEP		59.98	74.66	74.66	89.35	45.296	
35								
36	PVR	0.7840						
37								
38	Conc fee							
39								

Now, what are the 4 PV ratios can you calculate? PV ratio all of you know the formula contribution upon selling price. So, how much is a PVR are you able to calculate PV ratio for each of the scenarios in the first case it becomes 0.7840 that is 5 392 upon 500. What will happen for 2, 3, 4 buses?

What will be the other PVRs, will they change? Actually no because PVR has nothing do with fixed costs or semi variable cost, it is purely a relationship between contribution and sales that is why I was repeatedly asking what could be other PVRs, they are just asked here to confuse you.

And mind well sometimes students are so intelligent that they come out with two three four PVRs because it is asked in the problem. Actually answer for the second part that is this PVR is only 1 because you can have just 1 PVR which is 0.7480 are you getting me. Now, let us go to the b part.

Now, in b part it has been asked that school wants to help out some Municipal school students and they would be taken with our normal students at a concessional fee because they may not be able to afford 500 rupees. We want to charge them just enough to cover incremental costs, we do not want to make any profit from them at the same time we do not want to subsidize them so whatever is their cost will be recovered. So, what will be the concessional fee from these students in scenario 1, 2, 3, 4?

Actually the concessional fee will be just 108 because we know that variable cost per student is 108, we want to cover from them just enough that is just enough to cover their

variable cost which is 108. Whether we have got 1 bus, 2 bus, 3 bus, 4 bus does not make any difference because we do not want to cover rent of the bus from them only difference will be whatever is our free seats that is whatever our vacant seats we may want to take those students that number may vary, but the fee will not change. So, again four answers have been asked is just to trick you, concessional fee the only one answer is there that is 108 are you getting me.

Now, the c part, now maybe there are some complaints from the students that they do not want to pay 500 rupees. So, the school has now decided to charge the fee at cost without taking any profit from students, they will just take fee at cost. So, what will be the lower fee in these four scenarios? So, what is the answer? I think we have already calculated the average cost now there will be no profit taking there are 4 possible scenarios, there are 4 possible fees.

So, for 80 students its 401, for 120 students 351, then 303 and 326 got it. So, what have we learned in this case? There are two three extra things you already knew how to calculate breakeven point, but in this case we have seen that there can be multiple break even points especially if cost structure is not linear. If you remember in my earlier session I had told you that some of the assumptions can be liberalized you can waive the assumption.

So, we have wave the assumption that cost structure must be linear and we have allowed semi variable cost that is why you have got multiple BEPs, but there is no multiple PV ratio. Unless and until the selling price and variable cost do not change there will be only one PVR.

Concessional fee if you remember we have discussed about special pricing say for government contracts in one of our earlier cases this is similar, this is also a special pricing for this for the municipal school students. So, that we can charge them lower fee and we are able to take them just at 108 without any loss to our own students.

And the c part was simple we had to just calculate the average cost and you can see that average cost normally goes down, but in some cases it can go up also like it has happened for 160 students when you compare with 150 students are you getting it ok. So, with this we will stop this case [FL].