

## Lecture 7: Exercises

**18.13 Transfer-pricing dispute** (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Gustavsson AB, manufacturer of tractors and other heavy farm equipment, is organised along decentralised lines, with each manufacturing division operating as a separate profit centre. Each divisional manager has been delegated full authority on all decisions involving the sale of that division's output both to outsiders and to other divisions of Gustavsson. Division C has in the past always purchased its requirement of a particular tractor-engine component from Division A. However, when informed that Division A is increasing its selling price to € 150, Division C's manager decides to purchase the engine component from outside suppliers.

Division C can purchase the component for € 135 on the open market. Division A insists that, because of the recent installation of some highly specialised equipment and the resulting high depreciation charges, it will not be able to earn an adequate return on its investment unless it raises its price. Division A's manager appeals to top management of Gustavsson for support in the dispute with Division C and supplies the following operating data:

C's annual purchases of tractor-engine component	1000 units
A's variable costs per unit of tractor-engine component	€ 120
A's fixed costs per unit of tractor-engine component	€ 20

### Required:

1. Assume that there are no alternative uses for internal facilities. Determine whether the company as a whole will benefit if Division C purchases the component from outside suppliers for € 135 per unit.
2. Assume that internal facilities of Division A would not otherwise be idle. By not producing the 1000 units for Division C, Division A's equipment and other facilities would be used for other production operations that would result in annual cash-operating savings of € 18000. Should Division C purchase from outside suppliers?
3. Assume that there are no alternative uses for Division A's internal facilities and that the price from outsiders drops € 20. Should Division C purchase from outside suppliers?
4. Assume that Division A can sell the 1000 units to other customers at € 155 per unit with variable marketing costs of € 5 per unit. Determine whether Gustavsson will benefit if Division C purchases the 1000 components from outside suppliers at € 135 per unit.

### Suggested solution:

1.

The company as a whole will not benefit if Division C buys on the outside market.

Purchase costs from outsider, 1,000 units x € 135	€ 135,000
Deduct: Savings in variable costs by reducing Division A output, 1,000 units X € 120	€ <u>120,000</u>
Net cost (benefit) to company as a whole by buying from outside	<u>€ 15,000</u>

2.

The company will benefit if C purchases from the outside supplier:

Purchase costs from outsider, 1,000 units x € 135		€ 135,000
Deduct: Savings in variable costs, 1,000 units x € 120	€ 120,000	
Savings due to A's equipment and facilities being assigned to other operations	€ 18,000	<u>€ 138,000</u>
Net cost (benefit) to company as a whole by buying from outside		<u>€ (3,000)</u>

3

The company will benefit if C purchases from the outside supplier:

Purchase costs from outsider, 1,000 units × € 115	€ 115,000
Deduct: Savings in variable costs by reducing Division A output, 1,000 units × € 120	120,000
Net cost (benefit) to company as a whole by buying from outside	€ (5,000)

The three requirements are summarised below (in thousands):

	(1)	(2)	(3)
Total purchase costs from outsider	<u>€ 135</u>	<u>€ 135</u>	<u>€ 115</u>
Total relevant costs if purchased from Division A			
Total incremental (outlay) costs if purchased from A	120	120	120
Total opportunity costs if purchased from A	<u>—</u>	<u>18</u>	<u>—</u>
Total relevant costs if purchased from A	<u>120</u>	<u>138</u>	<u>120</u>
Operating income advantage (disadvantage) to company as a whole by buying from A	<u>€ 15</u>	<u>€ (3)</u>	<u>€ (5)</u>

Goal congruence would be achieved if the transfer price is set equal to the total relevant costs of purchasing from Division A.

4.

The company would benefit in this situation if C purchased from outside suppliers. The € 15,000 disadvantage to the company by purchasing from the outside supplier would be more than offset by the € 30,000 contribution margin of A's sale of 1,000 units to other customers.

Purchase costs from outside supplier, 1,000 units × € 135	€ 135,000
Deduct variable cost savings, 1,000 units × € 120	<u>€ 120,000</u>
Net cost to company as a whole by buying from outside	<u>€ € 15,000</u>

A's sales to other customers, 1,000 units × € 155	€ 155,000
Deduct:	
Variable manufacturing costs, € 120 × 1,000 units	€ 120,000
Variable marketing costs, € 5 × 1,000 units	<u>€ 5,000</u>
Variable costs	<u>€ 125,000</u>
Contribution margin from A selling to other customers	<u>€ 30,000</u>

**18.15 Ethics, transfer pricing** (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

The Leipzig Division of Bohemia Industries makes two component parts, X23 and Y99. It supplies X23 to the Hanover Division to be used in the manufacture of car engines and supplies Y99 to the Bremen Division to be used in the manufacture of car gearboxes. The Leipzig Division is the only supplier of these specialised components. When transfers are made in-house, Bohemia Industries transfers products at full cost (calculated using an activity-based cost system) plus 10%. The unit cost information for X23 and Y99 is as follows:

	X23	Y99
Variable costs per unit	€ 11	€ 8
Allocated fixed costs per unit	€ 14	€ 7

The Hanover Division feels that the price for X23 is too high and has told Leipzig that it is trying to locate an outside vendor to supply the part at a lower price. Wilhelm von Kalkstein, Leipzig Division's management accountant, calls Eberhard Dunkelmann, his assistant, into his office. 'We can't afford to lose the Hanover Division business. Our fixed costs won't go away even if we stop supplying Hanover, and this means that the costs of supplying Y99 to Bremen will increase. Then they'll start wanting to buy from outside. We're seriously looking at possibly shutting down the entire division if we lose the Hanover business. See if you can find a different method of allocating fixed costs that will decrease X23's transfer price to € 23.65. I think Bremen will be willing to pay a somewhat higher price for Y99.'

Eberhard is uncomfortable making any changes because he knows that any other allocation method would violate corporate guidelines on overhead cost allocation. Still, he believes that changing the fixed-cost allocations is in the best interest of Bohemia Industries. Eberhard is confused about what he should do.

### Required:

1. Calculate the transfer prices for X23 and Y99.
2. Calculate the fixed cost per unit that Eberhard would have to allocate to X23 to enable Leipzig to transfer X23 at € 23.65 per unit.

### Suggested solution

1

Transfer prices for X23 and Y99 follow:

	X23	Y99
Variable costs per unit	€ 11.00	€ 8.00
Allocated fixed costs per unit	€ 14.00	€ 7.00
Full costs per unit	€ 25.00	€ 15.00
10% of full costs per unit	€ 2.50	€ 1.50
Transfer price per unit	€ 27.50	€ 16.50

2

For X23 to have a transfer price of € 23.65 per unit, its full cost would have to be € 23.65 + 1.10 = € 21.50, because the transfer price per unit is determined by adding 10% to the full costs per unit.

Full costs per unit of X23	€ 21.50
Add 10% of full costs per unit	€ 2.15
Transfer price per unit	€ 23.65

Fixed costs per unit that Eberhard would have to allocate to X23 can be calculated as follows:

Full costs per unit of X23	€ 21.50
Deduct variable costs per unit	€ 11.00
Fixed costs per unit to be allocated	€ 10.50

**18.16 Transfer-pricing methods, goal congruence** (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Ilmajoki-Lumber Oy has a Raw Lumber Division and Finished Lumber Division. The variable costs are:

- Raw Lumber Division: € 100 per 100 board-metres of raw lumber.
- Finished Lumber Division: € 125 per 100 board-metres of finished lumber.

Assume that there is no waste incurred in processing raw lumber into finished lumber. Raw lumber can be sold at € 200 per 100 board-metres. Finished lumber can be sold at € 275 per 100 board-metres.

## Required:

- Should Ilmajoki-Lumber process raw lumber into its finished form?
- Assume that internal transfers are made at 110% of variable costs. Will each division maximise its contribution to divisional operating profit by adopting the action that is in the best interests of Ilmajoki-Lumber?
- Assume that internal transfers are made at market prices. Will each division maximise its contribution to divisional operating profit by adopting the action that is in the best interests of Ilmajoki-Lumber?

## Suggested solution

1

Alternative 1: Sell as raw lumber for € 200 per 100 board-metres:

Revenue	€ 200
Variable costs	<u>€ 100</u>
Contribution margin	<u>€ 100</u>

Alternative 2: Sell as finished lumber for € 275 per 100 board-metres:

Revenue	€ 275
Variable costs:	
Raw lumber	€ 100
Finished lumber	<u>€ 125</u>
Contribution margin	<u>€ 50</u>

Ilmajoki-Lumber will maximise its total contribution margin by selling lumber in its raw form. An alternative approach is to examine the incremental revenues and incremental costs in the Finished Lumber Division:

Incremental revenues, € 275 – € 200	€ 75
Incremental costs	<u>€ 125</u>
Incremental loss	<u>€ (50)</u>

2

Transfer price at 110% of variable costs:

$$\begin{aligned}
 &= € 100 + (€ 100 \times 0.10) \\
 &= € 110 \text{ per 100 board-metres}
 \end{aligned}$$

	Sell as raw lumber	Sell as finished lumber
Raw Lumber Division		
Division revenues	€ 200	€ 110
Division variable costs	<u>€ 100</u>	<u>€ 100</u>
Division operating income	<u>€ 100</u>	<u>€ 10</u>
Finished Lumber Division		
Division revenues	€ 0	€ 275
Transferred-in costs	–	€ 110
Division variable costs	<u>–</u>	<u>€ 125</u>
Division operating income	<u>€ 0</u>	<u>€ 40</u>

The Raw Lumber Division will maximise reported divisional operating income by selling raw lumber, which is the action preferred by the company as a whole. The Finished Lumber Division

will maximise divisional operating income by selling finished lumber, which is contrary to the action preferred by the company as a whole.

3

Transfer price at market price = € 200 per 100 board-metres.

	Sell as raw lumber	Sell as finished lumber
<u>Raw Lumber Division</u>		
Division revenues	€ 200	€ 200
Division variable costs	€ 100	€ 100
Division operating income	€ 100	€ 100
Finished Lumber Division		
Division revenues	€ 0	€ 275
Transferred-in costs	–	€ 200
Division variable costs	–	€ 125
Division operating income	€ 0	€ (50)

The Raw Lumber Division will maximise divisional operating income by selling raw lumber, which is the action preferred by the company. The Finished Lumber Division will maximise divisional operating income by not further processing raw lumber, which is preferred by the company as a whole.

**18.19 Pertinent transfer price** (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

Liberaki SA has two divisions, A and B, which manufacture bicycles. Division A produces the bicycle frame, and Division B assembles the bicycle components onto the frame. There is a market for both the subassembly and the final product. Each division has been designated as a profit centre. The transfer price for the subassembly has been set at the long-run average market price. The following data are available to each division:

Estimated selling price for final product	€ 300
Long-run average selling price for intermediate product	200
Incremental costs for completion in Division B	150
Incremental costs in Division A	120

The manager of Division B has made the following calculation:

Selling price for final product	€ 300
Transferred-in costs (market)	€ 200
Incremental costs for completion	150
Contribution (loss) on product	€ (50)

### Required

- Should transfers be made to Division B if there is no excess capacity in Division A? Is the market price the correct transfer price?
- Assume that Division A's maximum capacity for this product is 1000 units per month and sales to the intermediate market are now 800 units. Should 200 units be transferred to Division B? At what transfer price? Assume that for a variety of reasons, A will maintain the € 200 selling price indefinitely; that is, A is not considering lowering the price to outsiders even if idle capacity exists.

3. Suppose Division A quoted a transfer price of € 150 for up to 200 units. What would be the contribution to the company as a whole if the transfer were made? As manager of Division B, would you be inclined to buy at € 150?

### Suggested solution

1

No, transfers should not be made to Division B if there is no excess capacity in Division A. An incremental (outlay) cost approach shows a positive contribution for the company as a whole.

Selling price of final product		€ 300
Incremental costs in Division A	€ 120	
Incremental costs in Division B	€ 150	€ 270
Contribution (loss)		€ 30

However, if there is no excess capacity in Division A, any transfer will result in diverting product from the market for the intermediate product. Sales in this market result in a greater contribution for the company as a whole. Division B should not assemble the bicycle since the incremental revenue Liberaki can earn, € 100 per unit (€ 300 from selling the final product - € 200 from selling the intermediate product) is less than the incremental costs of € 150 to assemble the bicycle in Division B.

Selling price of intermediate product	€ 200
Incremental (outlay) costs in Division A	€ 120
Contribution (loss)	€ 80

The general guideline described in the chapter is:

Minimum transfer price = Additional incremental costs per unit incurred up to the point of transfer + Opportunity costs per unit to the supplying division

$$= € 120 + (€ 200 - € 120)$$

$$= € 200, \text{ which is the market price}$$

Market price is the transfer price that leads to the correct decision; that is, do not transfer to Division B unless there are extenuating circumstances for continuing to market the final product. Therefore, B must either drop the product or reduce the incremental costs of assembly from € 150 per bicycle to less than € 100.

2

If (i) A has excess capacity, (ii) there is intermediate external demand for only 800 units at € 200, and (iii) the € 200 price is to be maintained, then the opportunity costs per unit to the supplying division are € 0. The general guideline indicates a minimum transfer price of: € 120 + € 0 = € 120, which is the incremental or outlay costs for the first 200 units. B would buy 200 units from A at a transfer price of € 120 because B can earn a contribution of € 30 per unit [€ 300 - (€ 120 + € 150)]. In fact, B would be willing to buy units from A at any price up to € 150 per unit because any transfers at a price of up to € 150 will still yield B a positive contribution margin.

Note, however, that if B wants more than 200 units, the minimum transfer price will be € 200 as calculated in requirement 1 because A will incur an opportunity cost in the form of lost contribution of € 80 (market price, € 200 - outlay costs of € 120) for every unit above 200

units that are transferred to B. The following schedule summarises the transfer prices for units transferred from A to B.

Units	Transfer price
0-200	€ 120-€ 150
200-1000	€ 200

For an exploration of this situation when imperfect markets exist, see the next exercise.

3

Division B would show zero contribution, but the company as a whole would generate a contribution of € 30 per unit on the 200 units transferred. Any price between € 120 and € 150 would induce the transfer that would be desirable for the company as a whole. A motivational problem may arise regarding how to split the € 30 contribution between Divisions A and B. Unless the price is below € 150, B would have little incentive to buy.

**Note:** The transfer price that may appear optimal in an economic analysis may, in fact, be totally unacceptable from the viewpoints of (1) preserving autonomy of the managers and (2) evaluating the performance of the divisions as economic units. For instance, consider the simplest case discussed above, where there is idle capacity and the € 200 intermediate price is to be maintained. To direct that A should sell to B at A's variable cost of € 120 may be desirable from the viewpoint of B and the company as a whole. However, the autonomy (independence) of the manager of A is eroded. Division A will earn nothing, although it could argue that it is contributing to the earning of profit on the final product.

If the manager of A wants a portion of the total company contribution of € 30 per unit, the question is: How is an appropriate amount determined? This is a difficult question in practice. The price can be negotiated upwards to somewhere between € 120 and € 150 so that some 'equitable' split is achieved. A dual transfer pricing scheme has also been suggested whereby the supplier gets credit for the full intermediate market price and the buyer is charged only with variable or incremental costs. In any event, when there is heavy interdependence between divisions, such as in this case, some system of subsidies may be needed to deal with the three problems of goal congruence, management effort and subunit autonomy. Of course, where heavy subsidies are needed, a question can be raised as to whether the existing degree of decentralisation is optimal.



**18.21 Question from the Chartered Institute of Management Accountants, Intermediate Level, Management Accounting - Decision Making, November 2003** (Adopted by Horngren, C.T., Bhimani, A., Datar, S.M. and Foster, G. (2012). Management and cost accounting. Prentice Hall, 5th eds.)

P Ltd has two divisions, Q and R, that operate as profit centres. Division Q has recently been set up to provide a component (Comp1) which division R uses to produce its product (ProdX). Prior to division Q being established, division R purchased the component on the external market at a price of £160 per unit. Division Q has an external market for Comp1 and also transfers to division R. Division R uses one unit of Comp1 to produce ProdX which is sold externally. There are no other products produced and sold by the divisions.

Costs associated with the production of Comp1 and ProdX are as follows:

	Comp1	ProdX
Fixed costs	£50000 per annum	£100 000 per annum
Variable costs		£250 per unit*
Direct labour	£15 per hour	
Materials	£25 per unit	
Variable overheads	£3 per labour-hour	
*The variable cost for ProdX excludes the cost of the component.		

The first unit of Compl will take 20 labour-hours to produce. However, it is known that the work of direct labour is subject to a 90% learning curve. The forecast external annual sales and capacity levels for the divisions are as follows:

<i>External sales</i>		
Division Q	Compl	5000 units at a price of £150 per unit
Division R	ProdX	10000 units at a price of £500 per unit
<i>Production capacity</i>		
Division Q	Compl	13 000 units
Division R	ProdX	15 000 units

**Required:**

1. State, with reasons, the volume of Comp1 which division Q would choose to produce in the first year and calculate the marginal cost per unit of Comp1 at this volume.
2. Explain the criteria an effective system of transfer pricing should satisfy.
3. Discuss one context in which a transfer price based on marginal cost would be appropriate and describe any issues that may arise from such a transfer pricing policy.
4. Identify the minimum transfer price that division Q would wish to charge and the maximum transfer price which division R would want to pay for the Comp1. Discuss the implications for the divisions and for the group as a whole of the transfer prices that you have identified.

## Suggested solution

1

If its objective is to maximise the profit of its division, then division Q will wish to maximise the number of Comp1s it sells at the best possible price, while satisfying both its external (5000 units) and internal market (8000 units). The marginal cost for producing 13,000 Comp1s is shown below:

	£	£
Materials	$25 \times 13000$	325,000
Labour	$15 \times 61,620(W1)^*$	924,300
Overheads	$3 \times 61,620$	184,860
Total marginal cost		1,434,160
Units produced		13,000
Marginal cost per unit		110

\*Working 1

$$Y = ax^b$$

$$Y = (20) (13,000 \text{ to the power of the log of the learning curve rate/log of } 2)$$

$$Y = (20) (13,000^{0.152})$$

$$Y = 4.74 \text{ hours per unit}$$

$$\text{Total labour hours } 13,000 \text{ units} \times 4.74 \text{ hours per unit} = 61,620$$

2

An effective transfer-pricing system should conform to the following criteria.

*Enable divisional and managerial performance measurement*

The verdict on divisional managers is predominantly determined by their divisions' performance. In order for it to serve as a reasonable indicator of managerial performance, transfer-pricing system is required to be *robust*.

*Promote goal congruence*

As divisional managers are judged on their divisions' performance, it is in their interest to seek the best transfer price for their division. Consequently, a transfer-pricing system is sought which is favourable for each division as well as the company as a whole.

*Maintain divisional autonomy*

The right to set their divisional transfer price without the interference of head office will ensure that managers aren't undermined and de-motivated and made to feel they have no control over their divisional performance. There is little point in granting autonomy to divisions if they are not free to set their transfer price.

*Record transfers between divisions*

A practical application of transfer pricing is to aid in recording the transfer of goods and services between divisions.

*Minimise the global tax liability*

In multinational companies, the transfer-pricing system can assist in transferring profits around the globe and therefore minimise the global tax liability.

3

Imperfect or non-existent markets for the intermediate product means that the marginal cost transfer prices can motivate both the supplying and receiving division managers to operate at output levels that will maximise over all company profits. Therefore, the correct transfer price to encourage optimum profits for the company as a whole (assuming there are no production constraints) is the marginal production cost of the intermediate product. However, if the transfer price for the intermediate product is set at marginal cost, the supplying division will be seen to under-perform and will report losses on the interdivisional transfers because of the total production costs having been deducted from a transfer price based on marginal cost. Obviously, the supplying division in this instance will not be happy with this transfer price, but of course the receiving division will be. The receiving division will obtain the intermediate product at marginal cost and therefore, all of the profit from the final output will be reported in its division.

4

The minimum transfer price that division Q would wish to charge would be equal to the external market price, that is, £150 per unit. Division Q's objective will be to charge as high a transfer price as possible and division R's objective will be to pay as little as possible for the components. Clearly, division R would wish to buy from division Q if the transfer price is less than £160 per unit.

If division Q sets a transfer price equal to £160 per unit, then division R will be indifferent as to whether it purchases internally or externally. However, from a group point of view, profit will be maximised from utilising the spare capacity within division Q and not purchasing the components from the external market. Therefore, agreement will need to be reached between division Q and division R and a transfer price negotiated, which is less than £160 per unit.

Agreement on the transfer price of Comp1 will depend on the strength of the managers' negotiation skills and whether or not equal bargaining power exists for the divisional managers.