Throughput Accounting

The key factor approach described in the previous section is very sensible, and the throughput approach is effectively the same. However, there are two main concepts of throughput accounting which result in us amending the approach.

The main concepts of throughput accounting are:
• in the short run, all costs in the factory are likely to be fixed with the exception of materials costs
• in a JIT environment then we should be attempting to eliminate stocks. Use of a limited resource in production of stocks should be avoided and therefore any work-in-progress should be valued at only the material cost

Definitions:
• Throughput = sales revenue – material cost
• Total factory costs = all production costs except materials
• Return per factory hour = $\dfrac{\text{Throughput}}{\text{Time on key resource}}$

• Cost per factory hour = $\dfrac{\text{Total factory cost}}{\text{Total time available on key resource}}$

• Throughput accounting ratio = $\dfrac{\text{Return per factory hour}}{\text{Cost per factory hour}}$

The TA ratio should be greater than 1 if a product is to be viable. Priority should be given to those products which generate the highest TA ratios.

Q1. Ride ltd is engaged in the manufacturing and marketing of bicycles. Two types of bicycles are produced. These are 'Roadstar' which is designed for use on roads and the 'Everest' which is a bicycle designed for use in mountainous areas. The following information relates to the year ending 31st December 2005.

(1) The following selling price and cost data is as follows:

	Roadstar	Everest
	£	£
Selling price	200	280
Material cost	80	100
Variable production cost	20	60

(2) Fixed production overheads attributable to the manufacturing of bicycles will amount to £4,050,000.
(3) Expected demand is as follows
       Roadstar 150,000
       Evereast 70,000
(4) Each bicycle is completed in the finishing department. The number of each type of bicycle that can be completed in one hour in the finishing department is as follows:
    Roadstar   6.25
    Everest   5.00
(5) Ride ltd operates a JIT manufacturing system with regards to the manufacture of bicycle and aims to hold very little inventory of WIP and no inventory of finished goods.

Required:
(a) Using marginal costing principles, calculate the mix (units) of each type of bicycle which will maximize net profit and sate the value of profit.
(b) Calculate throughput accounting ratio for each type of bicycle and briefly discuss when it is worth producing a producing a product where throughput accounting principles are in operation. Your answer should assume that the variable overhead cost amounting to £4,800,000 incurred as a result of chosen product mix in part (a) is fixed in the short term.
(c) Using throughput accounting principles, advice management of the quantities of each type of bicycle that should be manufactured which will maximize net profit and prepare a projection of the net profit that would be earned by Ride Ltd in the year ending 31st December 2005.

Q2. Thin Co is a private hospital offering three types of surgical procedures known as A, B and C. Each of them uses a pre-operative injection given by a nurse before the surgery. Thin Co currently rent an operating theatre from a neighbouring government hospital. Thin Co does have an operating theatre on its premises, but it has never been put into use since it would cost $750,000 to equip. The Managing Director of Thin Co is keen to maximise profits and has heard of something called 'throughput accounting', which may help him to do this. The following information is available:

1 All patients go through a five step process, irrespective of which procedure they are having:
- step 1: consultation with the advisor;
- step 2: pre-operative injection given by the nurse;
- step 3: anaesthetic given by anaesthetist;
- step 4: procedure performed in theatre by the surgeon;
- step 5: recovery with the recovery specialist.

2 The price of each of procedures A, B and C is $2,700, $3,500 and $4,250 respectively.

3 The only materials' costs relating to the procedures are for the pre-operative injections given by the nurse, the anaesthetic and the dressings. These are as follows:

	Procedure A	Procedure B	Procedure C
	$ per procedure	$ per procedure	$ per procedure
Pre-operative nurse's injections	700	800	1,000
Anaesthetic	35	40	45
Dressings	5·60	5·60	5·60

4 There are five members of staff employed by Thin Co. Each works a standard 40-hour week for 47 weeks of the year, a total of 1,880 hours each per annum. Their salaries are as follows:
- Advisor: $45,000 per annum;
- Nurse: $38,000 per annum;
- Anaesthetist: $75,000 per annum;
- Surgeon: $90,000 per annum;
- Recovery specialist: $50,000 per annum.

The only other hospital costs (comparable to 'factory costs' in a traditional manufacturing environment) are general overheads, which include the theatre rental costs, and amount to $250,000 per annum.

5 Maximum annual demand for A, B and C is 600, 800 and 1,200 procedures respectively. Time spent by each of the five different staff members on each procedure is as follows:

	Procedure A	Procedure B	Procedure C
	Hours	Hours	Hours
	per procedure	per procedure	per procedure
Advisor	0·24	0·24	0·24
Nurse	0·27	0·28	0·30
Anaesthetist	0·25	0·28	0·33
Surgeon	0·75	1	1·25
Recovery specialist	0·60	0·70	0·74

Part hours are shown as decimals e.g. 0·24 hours = 14·4 minutes (0·24 x 60).

Surgeon's hours have been correctly identified as the bottleneck resource.

Required:

(a) Calculate the throughput accounting ratio for procedure C.

Note: It is recommended that you work in hours as provided in the table rather than minutes. (6 marks)

(b) The return per factory hour for products A and B has been calculated and is $2,612·53 and $2,654·40 respectively. The throughput accounting ratio for A and B has also been calculated and is 8·96 and 9·11 respectively.

Calculate the optimum product mix and the maximum profit per annum. (7 marks)

(c) Assume that your calculations in part (b) showed that, if the optimum product mix is adhered to, there will be excess demand for procedure C of 696 procedures per annum. In order to satisfy this excess demand, the company is considering equipping and using its own theatre, as well as continuing to rent the existing theatre.

The company cannot rent any more theatre time at either the existing theatre or any other theatres in the area, so equipping its own theatre is the only option. An additional surgeon would be employed to work in the newly equipped theatre.

Required:

Discuss whether the overall profit of the company could be improved by equipping and using the extra theatre. Note: Some basic calculations may help your discussion. (7 marks)

(20 marks)

Q3. Yam Co is involved in the processing of sheet metal into products A, B and C using three processes, pressing, stretching and rolling. Like many businesses Yam faces tough price competition in what is a mature world market. The factory has 50 production lines each of which contain the three processes: Raw material for the sheet metal is first pressed then stretched and finally rolled. The processing capacity varies for each process and the factory manager has provided the following data:

Processing time per metre in hours

	Product A	Product B	Product C
Pressing	0·50	0·50	0·40
Stretching	0·25	0·40	0·25
Rolling	0·40	0·25	0·25

The factory operates for 18 hours each day for five days per week. It is closed for only two weeks of the year for holidays when maintenance is carried out. On average one hour of labour is needed for each of the 225,000 hours of factory time. Labour is paid $10 per hour.

The raw materials cost per metre is $3·00 for product A, $2·50 for product B and $1·80 for product C. Other factory costs (excluding labour and raw materials) are $18,000,000 per year. Selling prices per metre are $70 for product A, $60 for product B and $27 for product C.

Yam carries very little inventory.

Required:

(a) Identify the bottleneck process and briefly explain why this process is described as a 'bottleneck'. (3 marks)

(b) Calculate the throughput accounting ratio (TPAR) for each product assuming that the bottleneck process is fully utilised. (8 marks)

(c) Assuming that the TPAR of product C is less than 1:

(i) Explain how Yam could improve the TPAR of product C. (4 marks)

(ii) Briefly discuss whether this supports the suggestion to cease the production of product C and briefly outline three other factors that Yam should consider before a cessation decision is taken. (5 marks)

(20 marks)

Q4. Glam Co is a hairdressing salon which provides both 'cuts' and 'treatments' to clients. All cuts and treatments at the salon are carried out by one of the salon's three senior stylists. The salon also has two salon assistants and two junior stylists.

Every customer attending the salon is first seen by a salon assistant, who washes their hair; next, by a senior stylist, who cuts or treats the hair depending on which service the customer wants; then finally, a junior stylist who dries their hair. The average length of time spent with each member of staff is as follows:

	Cut Hours	Treatment Hours
Assistant	0·1	0·3
Senior stylist	1	1·5
Junior stylist	0·5	0·5

The salon is open for eight hours each day for six days per week. It is only closed for two weeks each year. Staff salaries are $40,000 each year for senior stylists, $28,000 each year for junior stylists and $12,000 each year for the assistants. The cost of cleaning products applied when washing the hair is $0·60 per client. The cost of all additional products applied during a 'treatment' is $7·40 per client. Other salon costs (excluding labour and raw materials) amount to $106,400 each year. Glam Co charges $60 for each cut and $110 for each treatment.

The senior stylists' time has been correctly identified as the bottleneck activity.

Required:

(a) Briefly explain why the senior stylists' time has been described as the 'bottleneck activity', supporting your answer with calculations. (4 marks)

(b) Calculate the throughput accounting ratio (TPAR) for 'cuts' and the TPAR for 'treatments' assuming the bottleneck activity is fully utilised. (6 marks)

(10 marks)

Q5. Solar Systems Co (S Co) makes two types of solar panels at its manufacturing plant: large panels for commercial customers and small panels for domestic customers. All panels are produced using the same materials, machinery and a skilled labour force. Production takes place for five days per week, from 7 am until 8 pm (13 hours), 50 weeks of the year. Each panel has to be cut, moulded and then assembled using a cutting machine (Machine C), a moulding machine (Machine M) and an assembly machine (Machine A).

As part of a government scheme to increase renewable energy sources, S Co has guaranteed not to increase the price of small or large panels for the next three years. It has also agreed to supply a minimum of 1,000 small panels each year to domestic customers for this three-year period.

Due to poor productivity levels, late orders and declining profits over recent years, the finance director has suggested the introduction of throughput accounting within the organisation, together with a 'Just in Time' system of production.

Material costs and selling prices for each type of panel are shown below.

	Large panels	Small panels
	$	$
Selling price per unit	12,600	3,800
Material costs per unit	4,300	1,160

Total factory costs, which include the cost of labour and all factory overheads, are $12 million each year at the plant. Out of the 13 hours available for production each day, workers take a one hour lunch break. For the remaining 12 hours, Machine C is utilised 85% of the time and Machines M and A are utilised 90% of the time. The unproductive time arises either as a result of routine maintenance or because of staff absenteeism, as each machine needs to be manned by skilled workers in order for the machine to run. The skilled workers are currently only trained to work on one type of machine each. Maintenance work is carried out by external contractors who provide a round the clock service (that is, they are available 24 hours a day, seven days a week), should it be required.

The following information is available for Machine M, which has been identified as the bottleneck resource:

	Large panels	Small panels
	Hours per unit	Hours per unit
Machine M	1·4	0·6

There is currently plenty of spare capacity on Machines C and A. Maximum annual demand for large panels and small panels is 1,800 units and 1,700 units respectively.

Required:

(a) Calculate the throughput accounting ratio for large panels and for small panels and explain what they indicate to S Co about production of large and small panels. (9 marks)

(b) Assume that your calculations in part (a) have shown that large panels have a higher throughput accounting ratio than small panels.

Required:

Using throughput accounting, prepare calculations to determine the optimum production mix and maximum profit of S Co for the next year. (5 marks)

(c) Suggest and discuss THREE ways in which S Co could try to increase its production capacity and hence increase throughput in the next year without making any additional investment in machinery. (6 marks)

(20 marks)