

# **The Institute of Finance Management**



## **Department Accounting and Finance**

### **Lecture Notes**

#### **Management Accounting**

#### **Throughput Accounting**

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### **Learning Objectives**

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- After studying this chapter, readers will be able to understand
  - Optimized production technology
  - Theory of constraints
  - Throughput Accounting
  - Calculate and interpret a throughput accounting ratio (TPAR)
  - Suggest how a throughput accounting ratio (TPAR) could be improved
  - Apply throughput accounting to a multi-product decision-making problem
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## 1.1 Optimized production technology (OPT)

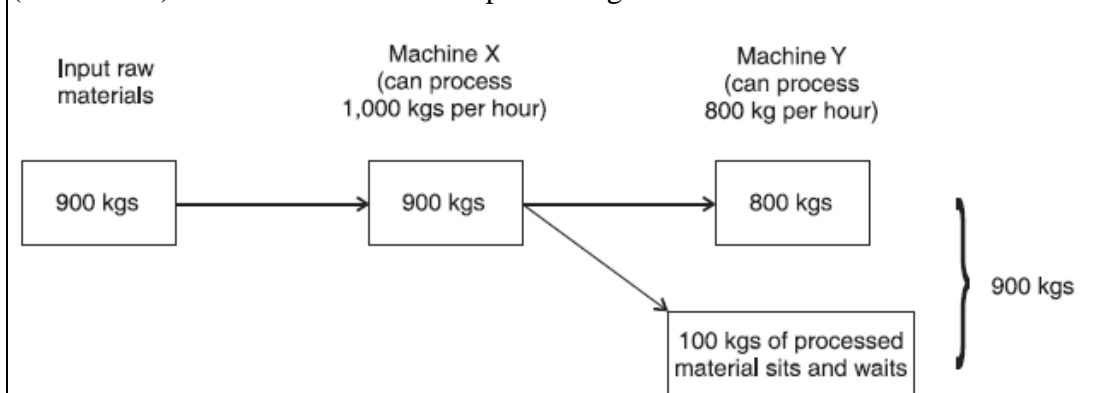
- 1.1.1 During the 1980s Goldratt and Cox (1984) advocated a new approach to production management called OPT. OPT is based on the principle that profits are expanded by increasing the throughput of the plant. The OPT approach determines what prevents throughput from being higher by distinguishing bottleneck and non-bottleneck resources.
- 1.1.2 A bottleneck might be a machine whose capacity limits the throughput of the whole production process. The **aim is to identify bottlenecks and remove them** or, if this is **not possible**, ensure that they are **fully utilized at all times**.
- 1.1.3 **Non-bottleneck resources** should be scheduled and operated based on constraints within the system, and should **not be used to produce more than the bottlenecks can absorb**. The OPT philosophy, therefore, advocates that **non-bottleneck resources should not be utilized to 100%** of their capacity, since **this would merely result in an increase in inventory**.

## 2.2 Theory of Constraints

- 2.2.1 Goldratt and Cox (1992) describe the process of maximizing operating profit when faced with bottleneck and non-bottleneck operations as the theory of constraints (TOC).
- 2.2.2 The TOC **aims to increase throughput contribution** while simultaneously **reducing inventory and operational expenses**. However, the scope for **reducing the latter is limited** since they must be maintained at some minimum level for production to take place at all. In other words, **operational expenses are assumed to be fixed costs**.
- 2.2.3 The TOC **adopts a short-run time horizon and treats all operating expenses (including direct labour but excluding direct materials) as fixed**, thus implying that variable costing should be used for decision-making, profit measurement and inventory valuation.
- 2.2.4 It emphasizes the management of bottleneck activities as the key to improving performance by focusing on the short-run maximization of throughput contribution.

### 2.2.5 Example 3 – Illustration of the TOC

Machine X can process 1,000 kg of raw material per hour, machine Y 800 kg. Of an input of 900 kg, 100 kg of processed material must wait on the bottleneck machine (machine Y) at the end of an hour of processing.



The **traditional view** is that **machines should be working, not sitting idle**. So if the desired output from the above process were 8,100 kgs, **machine X would be kept in continual use** and all 8,100 kgs would be processed through the machine in nine hours. There would be a **backlog** of 900 kgs [8,100 – (9 hrs × 800)] of processed material in front of machine Y, however. All **this material would require handling and storage space and create the additional costs** related to these non-value added activities. Its processing would not increase throughput contribution.

### 3.3 Throughput Accounting

#### 3.3.1 Introduction

‘Throughput’ is the rate at which the system generates money through sales

Throughput accounting aims to make the best use of a scarce resource (bottleneck) in a JIT environment. Throughput is a measure of profitability and is defined by the following equation:

Throughput = sales revenue – direct material cost

The aim of throughput accounting is to maximize this measure of profitability, whilst simultaneously reducing operating expenses and inventory (money is tied up in inventory).

The goal is achieved by determining what factors prevent the throughput from being higher. This constraint is called a *bottleneck*, for example there may be a limited number of machine hours or labour hours. In the short term the best use should be made of this bottleneck. This may result in some idle time in non- bottleneck resources, and may result in a small amount of inventory being held so as not to delay production through the bottleneck.

In the long term, the bottleneck should be eliminated. For example a new, more efficient machine may be purchased. However, this will generally result in another bottleneck, which must then be addressed.

#### 3.3.2 Main Assumptions:

- The only totally variable cost in the short term is the purchase cost of raw materials that are bought from external suppliers.
- Direct labour costs are not variable in the short term. Many employees are salaried and even if paid at a rate per unit, are usually guaranteed a minimum weekly wage

#### 3.3.3 The Throughput Accounting Ratio

When there is a bottleneck resource, performance can be measured in terms of throughput for each unit of bottleneck resource consumed. There are three interrelated ratios:

$$\text{Throughput (return) per factory hour} = \frac{\text{Throughput per unit}}{\text{Product's time on bottleneck resource}}$$

Where: Throughput = sales revenue – direct material cost

Cost per factory hour =	$\frac{\text{Total factory cost}}{\text{Total bottleneck resource time available}}$
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Note: The total factory cost is the fixed production cost, including labour. The total factory cost may be referred to as 'operating expenses'

Throughput Accounting Ratio (TPAR) =	$\frac{\text{Throughput (return) per factory hour}}{\text{Cost per factory hour}}$
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### 3.3.4 Interpretation of Throughput Accounting Ratio (TPAR)

- If  $TPAR > 1$  would suggest that throughput exceeds operating costs so the product should make a profit. Priority should be given to the products generating the best ratios.
- If  $TPAR < 1$  would suggest that throughput is insufficient to cover operating costs, resulting in a loss
- If  $TPAR=1$  then the business is not making or losing money(break-even)

### 3.3.5 Ways of Improving the Throughput Accounting Ratio (TPAR)

The following ways can be opted by management to increase the TPAR

- To increase the sales price for each unit sold, to increase the throughput per unit
- To reduce material costs per unit (e.g. by changing materials or switching suppliers), to increase the throughput per unit
- To reduce total operating expenses, in order to reduce the cost per factory hour
- To improve the productivity of the bottleneck, e.g. the assembly workforce or the bottleneck machine, thus reducing the time required to make each unit of product. Throughput per factory hour would increase and therefore the TPAR would increase.

### 3.3.6 Limitations of Throughput Accounting Ratio (TPAR)

- It concentrates on the short term when a business has a fixed supply of resources (i.e. a bottleneck) and operating expenses are largely fixed. However, most businesses can't produce products based on the short term only.
- It is more difficult to apply throughput accounting concepts to the longer term, when all costs are variable, and vary with the volume of production and sales or another cost driver. The business should consider this long-term view before rejecting products with a  $TPAR < 1$ .
- In the longer term an ABC approach might be more appropriate for measuring and controlling performance.

**Illustration**

Number of units Sold per Day 500

Sales Price Shs. 25,000

Direct Materials Cost per unit Shs 10,000

Other Factory Costs per Day Shs 6,000,000

No. Hours of bottleneck used per day 8

**Required**

- (a) Calculate the Throughput (Return) Per Factory Hour.
- (b) Calculate the Throughput Accounting Ratio.
- (c) Suggest how the ratio could be improved

**Solution**

- (a) Throughput(Return) Per Factory Hour

$$\begin{aligned}\text{Throughput} &= \text{sales revenue} - \text{direct material cost} \\ &= \text{Shs } 25,000 \times 500 - \text{Shs } 10,000 \times 500 \\ &= \text{Shs } 7,500,000\end{aligned}$$

$$\text{Throughput (Return) Per Factory Hour} = \frac{\text{Shs } 7,500,000}{8} = \text{Shs } 937,500$$

- (b) Throughput Accounting Ratio (TPAR)

- Cost per factory hour =  $\frac{\text{Shs } 6,000,000}{8} = \text{Shs } 750,000$
- Throughput Accounting Ratio (TPAR) =  $\frac{\text{Shs } 937,500}{\text{Shs } 750,000} = 1.25$

- (c) **Suggest how the ratio could be improved**

To improve the throughput accounting ratio a company may:

- Increase the selling price per unit
- Reduce material costs per unit if possible
- Reduce the time on the bottleneck process
- Redesign the bottleneck process
- Invest in capacity to increase the bottleneck

**3.3.7 Throughput Accounting with Multiproduct Decision making**

Throughput accounting may be applied to a multiproduct decision-making problem in the same way as conventional key factor analysis. The usual objective in question is to maximize profit. Given that fixed costs are unaffected by the production decision in the short run, the approach should be to maximize the throughput earned. The following steps will be involved

Step 1: identify the bottleneck constraint.

Step 2: calculate the throughput per unit for each product.

Step 3: calculate the throughput per unit of the bottleneck resource for each product.

Step 4: rank the products in order of the throughput per unit of the bottleneck resource.

Step 5: allocate resources using this ranking and answer the question.