THROUGHPUT ACCOUNTING: PROFIT-FOCUSED COST ACCOUNTING METHOD

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Abstract

In the contemporary business environment marked by uncertainty and numerous risks, managers and decision makers use various cost accounting methods. There are many reliable methods; nevertheless, accounting scholars continually strive to improve the existing and devise new ones. Although Throughput Accounting has not yet become widespread, it is one of the contemporary cost accounting methods whose importance in decision making has been growing. Despite the many drawbacks, there is an increasing interest in its use as it focuses on increasing profits. The fact that the subject of the paper falls under the field of management accounting is a further indication that Throughput Accounting has become increasingly important in decision making. Given that this method has not yet been sufficiently explored in Croatian literature, the paper aims at presenting its basic concepts, characteristics, specificities, and ap-
plication. A historical overview of the development of Throughput Accounting is given in which the definition and the development of the method related to the Theory of Constraints are explained. The basic concept and the purpose of this method are described, followed by an example of its use, and main ratios. The purpose, advantages, and disadvantages of the method are discussed in a separate chapter. The most important insights gained from investigating this contemporary cost accounting method are presented in the conclusion.

**Key words:** contemporary cost accounting methods, Theory of Constraints, Throughput Accounting

JEL Classification: M41, M49

1. INTRODUCTION

Among the new management philosophies established in recent decades, the Theory of Constraints (TOC), which was developed by Eli Goldratt at the beginning of the 1980s, takes a vital position. Its main purpose is the revolving process of identifying, analysing and eliminating those constraints that restrict a firm’s value adding process. Although a constraint-oriented perception of management processes cannot solve every decision problem, it offers a fresh look towards gaining higher profits. Thus, many applications and management tools in different management fields have been developed based on the TOC philosophy. One of these applications is the Throughput Accounting (TA) approach.

Focused on constraints and designed to be a direct costing approach, it particularly supports short- and medium-term production decisions. Therefore, both in theory and practice, product mix decisions have been the main application area of TA (Souren, et al., 2005: 362).

The application of TOC to accounting is usually labelled Throughput Accounting. There are, however, some difficulties with the meaning of this term. In the United States and Central European countries, the term is used to refer to Goldratt’s recommendations for accounting techniques, and to practices developed within companies by graduates of ‘Jonah Programmes’ run by the Goldratt Institute. In the UK, the situation is rather different. The earliest reference to the term is found in an article by David Waldron (1988), who claims to have coined it in conjunction with his management consultancy partner David Galloway. This has aroused the hostility of the UK branch of the Goldratt Institute with UK Partner, Oded Cohen, arguing that the term has been applied to a
distorted version of early TOC thinking. Thus, in the United Kingdom, they avoid the use of the term Throughput Accounting giving preference to the term “TOC in accounting”. A second problem is the range of different techniques to which the term is applied. The theoretical propositions advanced by Galloway and Waldron have changed over time and many of the early techniques had been altered or abandoned by the time their management consultancy partnership was dissolved (Dugdale & Jones, 1998: 205).

2. DEFINITION AND CONCEPT OF THE METHOD

Throughput Accounting is a simplified management accounting approach that provides managers with support in decision-making aimed at increasing a company’s profitability. It is a relatively new method of management accounting that identifies factors that limit the company in achieving its goals and then focuses on simple measures that drive behaviour in key areas towards reaching organisational goals. This approach provides better cost data thus facilitating cost control and management, as opposed to assigning the tasks of improving business processes to workers. Throughput Accounting is characterised by a simplified approach, which any profit-focused accounting department will welcome (Northrup, 2004: 75). The table below shows the main differences between fundamental concepts of conventional cost accounting and new principles of Throughput Accounting (Dugdale & Jones, 1998: 207; according to Waldron, 1988).

**Figure 1. Differences between conventional methods and Throughput Accounting**

<table>
<thead>
<tr>
<th>Fundamental concepts of conventional cost accounting</th>
<th>New principles of Throughput Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are direct and indirect costs; direct costs are variable and indirect costs fixed.</td>
<td>Distinguishing between indirect and direct costs is no longer useful.</td>
</tr>
<tr>
<td>Summing component costs to derive a product cost and subtracting the result from the sales price is a good way to determine relative product profitability.</td>
<td>It is the rate at which the factory earns money that determines profitability, not the contribution of each product.</td>
</tr>
<tr>
<td>Inventory is an asset and working on material increases its value.</td>
<td>Inventory is not an asset. It is the product of unsynchronised manufacturing and stands between you and profit.</td>
</tr>
<tr>
<td>Reducing component costs directly increases profit.</td>
<td>Profit is a function of material cost, total factory cost, and throughput.</td>
</tr>
</tbody>
</table>

**Source:** Dugdale and Jones, 1998: 207
Throughput Accounting offers subtle simplicity in its approach to the complex tangle of misunderstanding and poor management decision-making tools developed by cost accountants and academia over the past sixty years. The three key elements of throughput accounting include throughput, operating expenses, and assets. Throughput is defined as the rate at which a system generates money, that is, the amount of products or services that an enterprise can produce and sell in a given period. It is calculated by deducting direct materials from sales revenue. Operating expenses are all costs incurred in achieving the throughput, other than direct material costs. They are largely related to the manufacturing overhead. Direct labour is included under operating expenses and is assumed to be a fixed expense. Assets in throughput accounting are identical to assets in conventional accounting except for inventory. Inventory is defined as the money that the system spends on things it intends to convert into throughput (Northrup, 2004: 76). It needs to be considered as the cost of acquired materials. Inventory does not have value until the product is sold because it does not generate throughput (ACCA, 2016: 50). The table shown in Figure 2 compares the differences between Throughput Accounting and variable costing and helps illustrate the differences between the two methods.

**Figure 2. Variable Costing versus Throughput Accounting**

<table>
<thead>
<tr>
<th>Variable Costing</th>
<th>Throughput Accounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>Revenue</td>
</tr>
<tr>
<td>(Direct Material)</td>
<td>(Direct Material)</td>
</tr>
<tr>
<td>(Direct Labour)</td>
<td></td>
</tr>
<tr>
<td>(Variable Overhead)</td>
<td></td>
</tr>
<tr>
<td>Contribution</td>
<td>Throughput</td>
</tr>
<tr>
<td>(Fixed Expenses)</td>
<td>(Operating Expenses)</td>
</tr>
<tr>
<td>Profit</td>
<td>Profit</td>
</tr>
</tbody>
</table>

**Source:** Northrup, 2004: 77

Variable costing assumes that contribution is sales less variable cost. Throughput is defined as revenue less totally variable cost. The difference lies in the categorisation of direct labour as a variable cost. Direct labour is supposed to represent a cost that varies with the level of sales volume. In practice and reality, direct labour has more attributes of fixed expense because workers will not be terminated in direct ratio with volume for a number of reasons. Management does not respond to fluctuations in demand that quickly and has
started to become sensitive to losing its trained workers. There are also many associated costs to the workforce such as healthcare and pensions. While there is some relationship to volume, the reality is that direct labour is not truly variable. Linkage of direct labour hours to enterprise resource planning (ERP) and determining the capacity of work centres is why profit-focused accounting classifies it as a variable cost. There are some industries that classify direct labour as truly variable along with variable selling and shipping costs. TOC categorises direct labour under operating expense because it is not 100 percent variable and to avoid the incentive to build inventories (Northrup, 2004: 77). Labour as a variable cost is one of the basic assumptions of the concept of value added and traditional approaches. However, Throughput Accounting constitutes a major departure from these views, which requires significant changes in the policies, procedures and measurement systems. The pioneers of the TOC state that this theory can be used in management and is not essentially a method of product cost calculation. However, accounting scholars state that the Theory of Constraints is certainly not a method that can be used for product cost calculation, except for the purpose of accounting practice. In this reasoning, the direct material cost is taken as it is by treating it as an external component that participates in the production while direct labour, manufacturing overhead and other costs (sales personnel, managers, administration, etc.) are evaluated together. This results from the way in which the theory of constraints approach treats direct labour. In contrast to the traditional accounting approach, the TOC approach does not consider direct labour as a variable. The tendency of traditional cost-based measures to consider direct labour as a variable cost stems from its extensive application. These measures were practiced and developed many decades ago when direct labour costs constituted a substantial part of production cost. This implies that qualified labour cannot be dismissed and hired whenever it is necessary. This approach considers direct labour as a fixed cost. Direct labour and manufacturing overhead costs are evaluated in the scope of activity costs. Studies demonstrate that firms in different industries that have applied throughput accounting with the TOC observed profitable outcomes (Utku, et al., 2011: 319). Throughput Accounting operationalises the key facets of TOC management and focuses management’s attention on three basic objectives:

1. increasing throughput;
2. reducing inventory; and
3. reducing operating expenses.
In Throughput Accounting, the main goal is growth in throughput, i.e. the ability to increase the profitability. Protecting and increasing Throughput Value Added (TVA), which is calculated as the difference between sales revenue and variable cost, is to be treated with higher priority than reducing inventory or reducing operating expense. Due to the higher importance of increasing TVA, decreasing operating expense should have a higher priority than decreasing inventory. Investment and operating expense levels should be controlled and, where appropriate, reduced whenever such reduction activities to do not interfere with efforts to increase current or future TVA (Management Accounting Committee, 1999: 25). Throughput Accounting is also closely related to the term Drum-Buffer-Rope (DBR), a scheduling method which is also based on Goldratt’s Theory of Constraints. It focuses on avoiding late orders and developing measurements that correlate to delays, known as throughput dollar days. This measure is calculated by multiplying the value of throughput times the number of days the commitment is overdue. It is used to measure the effect of what should not be done. Avoiding delays will require using inventory to buffer for the inevitable disruptions that always have an impact on the perfect plan, the inevitable “Murphy Law. This can be in the form of unexpected changes such as a machine breakdown or weather problems that produce excess waste. Buffers utilise time and inventory to protect capacity-constrained resources. Conceptually, DBR is predicated on providing a process of synchronizing the flow of product utilizing a production plan starting with the customer order. Then it creates a dynamic schedule utilizing TOC principles of protecting the constrained resource, which is the application of the basic concepts of profit maximisation. This scheduling approach includes providing a buffer at the constrained resource with both time and material. Success in this application lies in identifying the constraint utilizing the five focusing steps:

1. Identify the system’s constraint;
2. Decide how to exploit the system’s constraint;
3. Subordinate everything else to the above decision;
4. Elevate the system’s constraint; and
5. Do not allow inertia to become the system’s constraint.

If the constraint has shifted in any of the above steps, it is necessary to go back to step 1 (Northrup, 2004: 82). Only the first two steps (identify the system’s constraint and decide how to exploit the system’s constraint) support
short-term product mix decisions, while the other steps are aimed more towards the medium- or long-term capacity planning of the production system (Souren, et al., 2005: 363).

3. THROUGHPUT ACCOUNTING RATIOS AND MEASURES

Eric Noreen studied the application of Throughput Accounting techniques in 20 companies in the US and continental Europe. He provided a detailed discussion on 7 TA techniques that he finds can be of great use in decision-making despite numerous deficiencies (Dugdale, 1998: 206):

- Monthly internal throughput P & L reports;
- Inventory turns (throughput divided by inventory);
- Productivity (throughput divided by operational expense);
- Throughput per employee;
- Throughput per dollar of working capital;
- Incremental throughput with incremental operational expense;
- Estimated excess inventory-dollar-days.

The main throughput accounting ratios that are calculated in making product mix decisions are:

- Return per factory hour = Throughput per unit/product time on bottleneck resource (machine or facility),
- Cost per factory hour = Total factory costs/total time available on bottleneck resource (machine or facility),
- Throughput accounting ratio (TPAR) = Return per factory hour/cost per factory hour.

Return per factory hour is calculated for each product group. The total factory cost is simply the operational expense of the organisation. If the organisation was a service organisation, we would simply call it ‘total operational expense’ or something similar. The cost per factory hour is across the whole factory and therefore only needs to be calculated once. In any organisation, you would expect the throughput accounting ratio to be greater than 1. This means that the rate at which the organisation is generating cash from sales of this product is greater than the rate at which it is incurring costs. Therefore, if the ratio is less
than 1, changes in the production need to be made quickly (ACCA Paper F5 examining team, 2016).

Additional local performance measures that can be used by TOC-based companies and are consistent with the financial objectives of the organisation include (Management Accounting Committee, 1999: 23):

1. throughput-dollar-days,
2. local operating expense; and
3. inventory-dollar-days.

Throughput-dollar-days are a measure of due-date performance. This measurement deals with quantifying the magnitude of the deviation of the plant from its promised commitments to clients. It is computed by assigning to every late order a value equal to its throughput multiplied by the number of days the order is late. Ideally, throughput-dollar-days should be zero because there should be no late orders. The larger the throughput value of an order, the quicker this measure becomes large. It also increases the degree of lateness goes up. This measurement of throughput-dollar-days is not restricted to measuring just a plant’s deviation. It can also be very effectively used internally to measure the delivery performance of every production department, work centre, and even the performance of functions such as engineering and accounting (Management Accounting Committee, 1999: 23).

The local operating expense is a measure that simply compares variances between actual and planned spending in a responsibility centre. Use of this measure should reflect the fact that managers should not be held responsible for expenses that occur outside their area of control. The establishment of planned expense for an area remains an open question in TOC, but most advocates suggest some form of budgeting or planning as the basis for this measure (Management Accounting Committee, 1999: 24). Inventory-dollar-days are a measure of excess inventories. The cost of finishing early can be represented by the amount of money invested in the inventory and number of days early the order is completed. Usually, more than one unit (department or worker) is responsible for an order being completed prior to the time the customer will take delivery, or a part being completed before it is needed. Inventory-dollar-days are designed to measure the extent to which a department or worker contributed to the early finish of an order or part. The seriousness of the excess inventories
depends on how much has been invested in the inventories and how long that investment will last. Ideally, inventory-dollar-days should be zero (Management Accounting Committee, 1999: 24).

4. APPLICATION OF THROUGHPUT ACCOUNTING

In order to better understand this cost accounting method, the table below gives an overview of its application using a concrete example. Figure 3 provides the data for a (fictitious) production system, which will subsequently be used to describe the TOC-based product mix decision.

Figure 3. Data on a fictitious production company

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>Capacity restriction</td>
<td>Capacity demand</td>
<td>Capacity utilisation (%)</td>
</tr>
<tr>
<td>2</td>
<td>Machine I</td>
<td>15</td>
<td>15</td>
<td>10</td>
<td>2,400</td>
<td>3,200</td>
<td>133.3</td>
</tr>
<tr>
<td>3</td>
<td>Machine II</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>2,400</td>
<td>1,400</td>
<td>58.3</td>
</tr>
<tr>
<td>4</td>
<td>Machine III</td>
<td>14</td>
<td>14</td>
<td>5</td>
<td>2,800</td>
<td>2,770</td>
<td>98.9</td>
</tr>
<tr>
<td>5</td>
<td>Machine IV</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>2,400</td>
<td>2,050</td>
<td>85.4</td>
</tr>
<tr>
<td>6</td>
<td>Maximum sales</td>
<td>100</td>
<td>80</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sales price (in $)</td>
<td>65</td>
<td>71</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Material costs (in $)</td>
<td>20</td>
<td>35</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Throughput (in $)</td>
<td>45</td>
<td>36</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Souren, Ahn and Schmitz, 2005: 363

The plant produces three products (A, B, C) which are all processed on the four machines I, II, III and IV. The products’ maximum sales quantities (row 6), sales prices (row 7) and material costs (row 8) are also presented in the table. The processing times of each product on each machine are measured in minutes per unit and can be found in columns 2 to 4 of rows 2 to 5. The maximum capacity of machines I, II and IV is 2400 min, while machine III can be used for 2800 min (column 5). Column 6 provides the necessary capacity utilisation of the four machines in the case where the maximum sales quantities of all products are produced. Column 7 shows the (hypothetical) capacity utilisation rate, which is calculated by dividing the required capacity (column 6) by the available capacity (column 5) (Souren, et al., 2005: 363).
The Throughput of each product (row 9) is calculated as follows:

\[
\text{Throughput} = \text{sales price} - \text{material costs}
\]

The throughput provides a measure of the company’s added value. Since machine I am not able to produce the maximum number of products to be sold, the firm has to choose those products that promise the highest added value. For this decision, not only are the throughputs of the individual products alone relevant but the throughputs per unit of the binding constraint, its bottleneck. In this example, the only bottleneck is the insufficient number of minutes that machine I can operate in relation to the number of minutes needed to satisfy the demand. The throughput values per constraint unit (production time of each product unit) is calculated as follows (Souren, et al., 2005: 364):

- \( T_{A,I} = \frac{45}{15} = 3 \);
- \( T_{B,I} = \frac{36}{15} = 2.4 \);
- \( T_{C,I} = \frac{60}{10} = 6 \).

Therefore, the products should be produced in the following order: C, A, B. In other words, machine I should be used for the production of products that bring the highest throughput. First, only product C should be produced, then only product A and, finally, only product B, depending on capacity constraints. In this example the total sales quantity of products C and A can be produced by machine I. The maximum production quantity of product B then derives from the remaining capacity of 400 minutes divided by the production time of each product unit, which is 15 min. The obtained information and calculations relevant to the production mix decision concerning machine I am shown below (Souren, et al., 2005: 364):

- C: 50 units (maximum sales quantity) x 10 minutes (production time of each product unit) = 500 minutes of operation,
- A: 100 units (maximum sales quantity) x 15 minutes (production time of each product unit) = 1,500 minutes of operation.

Once the production of maximum sales quantity of products C and A has been completed, the remaining 400 minutes of operation is used to produce product B:

- B: 400 minutes (remaining): 15 minutes (production time of each product unit) = 26.67 units.
Considering the operating expenses that amount to $3,000, the company can calculate the profit (P) earned providing that the products are produced as described:

\[- P = 50 \times 60 + 100 \times 45 + 26.67 \times 36 - 3000 = 5,460 \, $.\]

The TOC-based approach leads to an optimal product mix decision, as reflected in the calculated product quantities that achieve the highest possible profit and comply with all production and sales constraints (Souren, et al., 2005: 364).

5. PURPOSE, CONTRIBUTION AND SHORTCOMINGS OF THROUGHPUT ACCOUNTING

Throughput accounting offers some different views of measurement relative to throughput and inventory. Its approach creates a focus on bottom-line results, i.e. profit or loss, using global operational measurements. These bottom-line measurements identify net profit as the absolute measure and look at its relationship with the amount of investment made by the owners or shareholders of the enterprise. Throughput accounting measures the cash flow generated by throughput less operating expenses and the investment in inventory. Goldratt recognised the need to make a profit, but also the ramifications of profit to the amount of investment needed to generate throughput and create the amount of cash required for survival. Northrup (2004: 75) identified the keys to achieving and maintaining a competitive edge as:

1. Superior quality,
2. Better engineering,
3. High profit margins,
4. Lower investment,
5. On-time delivery,
6. Shorter lead times.

Throughput accounting is focused on the goal of optimizing profitability and linking the relationship to the three components necessary for its achievement. The Goal was written at a time when maximum utilisation of productive capacity was a key issue. Throughput is defined as sales less direct materials,
so the emphasis was to maximise it in contrast to the “cost world” approach that focused on cost reduction. Throughput accounting is predicated on managing constraints to optimise inventory levels and control operating expenses, resulting in higher net profit and achievement of higher returns on investment (Northrup, 2004: 81). The Proponents of Throughput Accounting place the weight of their message on applying TOC as a management philosophy and a tool for decision making. One of the driving forces of throughput accounting is its predication on maximizing throughput and how it accomplishes its objective. Primary obstacles to maximizing throughput are scheduling and identifying constraints. It is not a sale until the product or service is delivered and ultimately not until it is paid for (Northrup, 2004: 81).

The TOC concept avoids cost allocation semantics and restructures the financial control system from one based on reporting entities, such as departments, to a company wide overview of value streams. It recognises that some non-critical machines or production facilities will not be used to capacity. Its proponents believe simple recognition is very advantageous because TOC prevents non-critical machines being run to capacity for no purpose if not all their total output can be used. The advantage lies in avoiding the accumulation of the associated excess stocks and work in progress. It also addresses the weakness of managers seeking to optimise production on particular machines if this is sub-optimal for the firm. As a pure optimisation tool, TOC and TA can never be better than a correctly formulated linear programming (LP) approach. However, the TOC-based approach has significant advantages over LP. It is easier to use, particularly for managers who are not familiar with operational research methods (Freeman, 2007: 5).

In practice, the specific applications of Throughput Accounting differ. Nonetheless, the two strengths of this method are its relative simplicity and ability to generate weekly and even daily reports. Given that Throughput Accounting is not accepted under Generally Accepted Accounting Principles (GAAP), it must be kept separate from the official financial statements, and therefore many companies do not consider using it (Stenzel & Stenzel, 2003: 159).

The main advantage of throughput accounting is that it yields the best short-term incremental profits if it is religiously followed when making production decisions. However, this can result in production mixes that seriously delay the completion of jobs for some customers, which is not good for customer rela-
It also provides a more realistic reporting of the effectiveness of the system in relation to its goal - making money now and in the future. Its disadvantages are the fact that it focuses mainly on short term performance and ignores strategic performance. Furthermore, it does not focus on specific costs but the whole cost of the operations (Sebastiao, 2013). TOC and TA have several specific drawbacks that limit its application (Freeman, 2007: 6):

1. They are short-term decision tools;

2. They may only be valid concepts if applied to the totality of the supply chain including management, production, resources, and support

3. Dependent on circumstances, operating expenses under TOC/TA are regarded as fixed, which is simplistic in the view of detractors. Therefore TOC and TA are basically the same things as variable costing.

6. CONCLUSION

Throughput Accounting is a combination of cost accounting and management philosophy developed by Eli Goldratt. Despite the fact that it was formulated almost three decades ago, this method has continually been improved, modified, and applied in an increasing number of companies and industries. It is based on the Theory of Constraints and its key aspects. Its simplicity stems from the use of three main elements in management decision making: throughput, operating expenses, and assets. Its primary goal is to maximise throughput, which is the rate at which a system generates money through sales, i.e. the number of products or services the company can produce and sell in a given period and eliminate delays. In order maximise profit and return on investment, it is necessary to optimise inventory levels and control operating expenses. Unlike many traditional methods that focus on cost reduction, Throughput Accounting is a profit-focused method predicated on maximizing throughput and how it accomplishes its objective. It looks at resource constraints (machines/facilities) and supports decisions on product mix and how products can be manufactured and sold without accumulation of excess inventory, and delivered to customers as fast as possible.

Due to its simplicity, the method has some drawbacks and weaknesses. The main drawback is the inability to make long-term decisions, and the assumption that operating costs are fixed, which is unacceptable in many situations. Never-
theless, Throughput Accounting is used by many managers and accounting departments in analyzing and meeting their goals, making product mix decisions as well as decisions about optimizing the overall value stream of the company.

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