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Research Article

Build Operational Performance Matrix to Identify Product Survivability Using Throughput Accounting Principles

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Abstract: This research aimed to develop operational performance matrix using throughput accounting principles of XYZ company. The matrix developed strategies for prioritizing improvements and operational performance was formed by combining threshold zones calculated from throughput, inventory, and operating expense. In this context, the company was allowed to understand product performance in safe, comfortable, alert and danger zones. Each zone possessed different considerations, and the research was carried out in three stages. The first stage built three main components of financial reports using throughput accounting principles. The second stage prepared the thresholds of product based on productivity and inventory turnover, while the third stage evaluated operational performance. After testing the financial statement, operational performance of assessments and formal education services was categorized in the danger zone for 3 consecutive years. XYZ needs to improve survivability of product through better resource usage. This promoted product operational performance from danger to alert zone. An operational performance matrix to identify the survivability of a product based on financial statements has been successfully developed in this study. Practical application has also been demonstrated, which will open up opportunities to be tested in more companies.

Keywords: Inventory turnover; Operating expense; Performance matrix; Productivity; Throughput accounting

1. Introduction

Significant changes have been experienced since the declaration and outbreak of COVID-19. In this context, the pandemic has impacted business reduction and infrastructure disruption (Sydnor et al., 2017), supply chain interruption, postponed payment, and inability of workers to work (Silva et al., 2018). However, the impact can be different depending on the characteristics of the company (Chen et al., 2021). Different emergency management measures have been implemented to control business performance. This disaster requires company to downsize or close operations or workforce (Candra et al., 2021; Juergensen et al., 2020). Previous research showed that different challenges were faced in financial and operational aspects to sustain business.

Revenue is used as an indicator of sustainable business (Brouwer, 2012) and the loss resulting from the inability to compete is the primary reason for business failure (Mungal, 2014). Every

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decision is dominated by actions for maintaining the cash flow through increased revenue and reduced expense.

There has been a fundamental change in the business environment and company needs to re-identify performance components to be measured using standard costing, activity-based costing, theory of constraints, and throughput accounting. These methods do not need to compete but can be harmonized because of the similarities in objectives (Mehra et al., 2005). In addition, the expenditure of economic resources and activities can be measured (Cokins, 2001) to obtain the data required for understanding company performance (Parkhi et al., 2016).

Company performance is measured on a financial basis using throughput, inventory, and operating expense (Goldratt and Cox, 2004). Throughput is defined as revenue earned by a system through sales (Gusnardi, 2010) or values generated by the company (Widjanarko, 2020). Meanwhile, inventory represents the amount of money invested in physical goods that are intended for sale. Product is still in the form of inventory when money has not been generated (Kadhim et al., 2020; Widjanarka et al., 2018) even though there is a purchase agreement. In this context, company is expected to possess product preferred by customers to stay in business. Operating expense is incurred to meet demand with the right product and attract the necessary customers. This can be in the form of salaries and wages, rent, utilities, and any other cost that does not vary directly with units of product or service produced (Gupta and Boyd, 2008). Therefore, the research question is how can company quickly and easily understand product performance and formulate strategies to respond effectively?

Section 1 of the research reports the use of throughput, inventory, and operating expense as elements to analyse performance level of product. Section 2 describes the methodology that focuses on the application of throughput accounting, and introduces performance analysis indicators. Meanwhile, section 3 focuses on the analysis of operational performance from the financial statement and discusses the results. Section 4 presents a conclusion and identifies further research directions.

2. Methods

2.1. Performance measurement

In a dynamic business environment, operational performance of product needs to be assessed regularly. This may fluctuate from time to time, as showed by the financial performance. The primary and most visible indicator of survivability is the ability to generate revenue. Product performance must be understood and managed in a dynamic business environment (Hirsch, 2000). However, failure to make the right decisions and lack of radical innovations can push a company over the edge into bankruptcy (Tatiana and Mikhail, 2020). Managers are aware of the critical issues and challenges but are not taking proper actions (Bencsik, 2020). According to the American Bankruptcy Institute, the number of bankruptcy filings increased by 26% compared to the last performance with only a small amount of revenue generated (Miller and Berk, 2020).

A company must operate effectively and implement production cost reduction programs to overcome financial problems (Nadezhina et al., 2021; Hummel and Hörisch, 2020; Kim and Kim, 2010). Every action should be measured in terms of expenses and revenue, showing the need for performance measurement system focused on processes (Supriatna et al., 2020). This type of system improves operational performance with minimal focus and effort (Jukka, 2023; Lizarondo et al., 2014). Throughput accounting principles are often considered in answering the requests (Şimşit et al., 2014). Previous research showed that there was a relationship between throughput accounting and other managerial accounting (Al-Zu'bi and Khamees, 2014; Şimşit et al., 2014; Utku et al., 2008; Lea and Min, 2003). Therefore, this research aims to develop a simple tool for assessing performance of product using throughput accounting principles, which can act as a warning system. The question addressed is related to the use of the tool in assessing product operational performance and the role in assisting management to make proper decisions.

2.2. Throughput accounting

Management needs tools to better understand product performance since several conditions show difficulty in improving financial performance (Kadhim et al., 2020; Gupta and Boyd, 2008; Pretorius, 2004). In this context, throughput accounting is less complex than other cost accounting (Islam, 2015). The variable has been designed to be a short-term method and long-term decision-making can be supported when combined with other accounting information. Additionally, throughput accounting is performance measurement method proposed by Goldratt at the beginning of the 1980s, where production costs depend on product and resources (Garrison, 2010). The attention of the management is only focused on product with high profitability in the bottleneck process. The production is carried out through the transformation of labour and capital, which are optimized for maximum results (Woodhead and Berawi, 2020). Throughput accounting provides better decisions for system optimization when compared to other conventional costing (Pretorius, 2004). For short-term decision-making, the variable is used to determine product mix based on market demand (Islam, 2015). Meanwhile, the misuse of capital can also be minimized in finite activities (Kadhim et al., 2020) to measure the efficiency and effectiveness of performance based on revenue and costs.

The three components used to achieve performance objectives within a certain period are throughput, inventory, and operating expense. Performance indicators that show the ability to maintain cash flow are productivity and inventory turnover (Goldratt and Cox, 2004). Productivity is measured by comparing the company's throughput with the operating expense incurred. Meanwhile, inventory turnover affects the flow of money within the company and determines the level of survivability. The money flowing into the company is directly proportional to the level of survivability and respond to susceptibility.

The examination of throughput, inventory, and operating expense is reportedly implemented in the manufacturing industry (Fontenelle and Sagawa, 2021; Sheu et al., 2003). Optimizing profits can be obtained through product mix based on customer demand and throughput accounting (Islam, 2015). The company obtain new product mixes that are more profitable and provide increased revenue using the method. In addition, throughput is estimated on each product as the difference between price and material costs (Elsukova, 2015). A manufacturing company in Russia found that three products made a loss in the financial statements even though a positive profit level was obtained in a certain period.

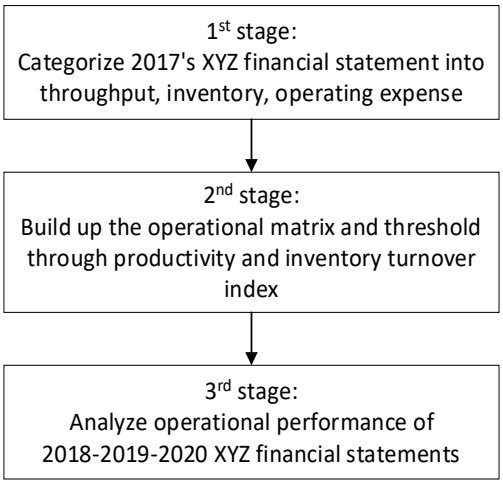

Figure 1 Research Framework

Throughput accounting is the fastest-growing method used in empirical investigations (Islam, 2015; Mehra et al., 2005). However, most research is carried out in the manufacturing industry (Fontenelle and Sagawa, 2021; Sheu et al., 2003). This research tries to apply throughput accounting principles to service company and has been grouped into three stages as shown in Figure 1. In the

first stage, 2017 financial statement elements are grouped into monetary variables to identify throughput, inventory, and operating expense. For the second stage, the threshold is obtained as operational performance. In this context, the two times two performance matrix was developed to easily understand product's performance position and analyse the survivability. For the third stage, the 2018, 2019 and 2020 financial statements are used to test the tool and identify the zone of each XYZ product.

2.3. Operational performance matrix

The two times two performance matrix is developed from productivity and inventory turnover. Productivity is obtained from throughput and operating expense while inventory turnover is calculated from throughput and inventory. These elements are also used to identify the baseline with four performance zones, namely safe, comfort, alert, and danger.

The safe zone shows that the company has ideal conditions where productivity and inventory turnover cross the threshold. Company still has high survivability and maintains susceptibility for a long time. Meanwhile, company needs to keep pace and focus on the future. The comfort zone shows a high productivity with low inventory turnover below threshold. This condition provides short survivability because the company cannot maintain the susceptibility. In addition, the voice of the customer must be understood to maintain loyalty. The alert zone reports low productivity with a high inventory turnover across the threshold. Even though susceptibility can be defended, the level of survivability is inefficient. Uniqueness in product should also be created to add value more than others. The danger zone shows that the elements are below the threshold. Previous research reported that serious efforts were required to maintain a business and make different products. The level of vigilance should be increased within a comfort-alert zone to prevent the danger zone.

Figure 2 shows performance matrix, where X-axis and Y-axis represent inventory turnover and productivity, respectively. The threshold line divides the square into a two-by-two matrix, which has four types of zones:

1. In the safe zone, inventory turnover and productivity yield a high ratio.
2. In the comfort zone, inventory turnover has a low ratio while productivity obtains a high ratio.
3. In the alert zone, inventory turnover has a high ratio while productivity obtains a low ratio.
4. In the danger zone, inventory turnover and productivity result in a low ratio.

Thresholds and operational performance ratios are formed from monetary variables (Goldratt and Cox, 2004).

$$\text{Productivity} = \frac{\text{Throughput (T)}}{\text{Operating Expense (OE)}} \quad (1)$$

$$\text{Inventory turnover} = \frac{\text{Throughput (T)}}{\text{Inventory (I)}} \quad (2)$$

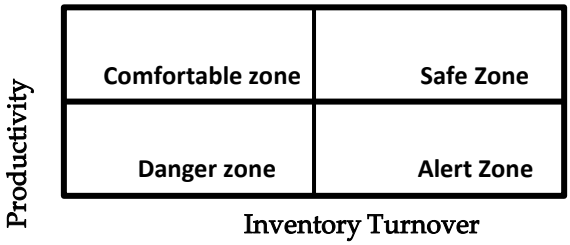

Figure 2 Operational Performance Matrix

2.4. Materials

This research uses the financial statements of service company XYZ to verify the matrix. Table 1 shows the financial statement and threshold from 2017 until 2020. Other financial statements are analysed to determine annual performance fluctuation.

XYZ, founded in 1967, is one of the oldest business schools and has made significant contributions to management fields such as marketing, human resources, operation, strategy, and finance. A wide

range of services is offered within the business school. Public training, company training, consulting and assessment are services developed during the 54 years of establishment. In providing the services, XYZ is supported by 100 and 200 professional and operational staff. The business model is less complicated but has a variety of services.

Table 1 XYZ's Financial Statement** (in USD)

	2020	2019	2018	2017
Throughput				
Assessment Centre	2,959,085	4,237,759	3,733,334	3,733,148
Public Training	1,894,289	3,397,053	2,797,532	2,372,991
In-House Training	2,447,893	3,016,642	2,500,705	1,824,894
Formal Education	2,602,088	2,830,939	3,068,504	2,830,939
Consulting Services	741,781	1,037,607	758,610	693,780
Inventory				
Assessment Centre	193,713	207,584	226,337	182,271
Public Training	393,172	368,151	397,666	260,604
In-House Training	259,676	208,107	238,568	148,758
Formal Education	399,180	468,895	420,033	389,083
Consulting Services	111,431	87,700	118,055	76,062
Operating expense				
Assessment Centre	2,230,375	2,945,953	2,908,184	2,486,532
Public Training	497,169	1,174,982	970,522	941,510
In-House Training	478,956	1,031,778	869,407	711,840
Formal Education	1,790,689	2,052,740	1,776,818	1,597,866
Consulting Services	271,786	341,498	278,843	267,365

**Already classified using throughput accounting principles

Every service provided contributes to revenue and expenses. Revenue is earned from clients who have received services, while expenses are incurred to produce the services required by customers. In this context, XYZ has financial statement to evaluate performance. Revenue and expense elements are obtained from the statement and classified into throughput, inventory, and operating expense. Direct fixed and direct costs are described by throughput, inventory, and operating expense. Meanwhile, other income, working capital, assets, debt, and taxes mentioned in the statement are excluded from the analysis.

3. Results and Discussion

From the financial statements, a matrix is made for each product, assessment centre, public training, in-house training, formal education, and consulting services. In this context, the service compares operational performance on an annual basis.

3.1. Assessment service

Infrastructure is required in the provision of the service. Assessment is performed using a classroom equipped with Closed Circuit Television (CCTV). Clients who want to be assessed, need to come to XYZ and follow some processes in classroom. The behaviour within the classroom is monitored and the process requires a lot of resources. However, the COVID-19 pandemic has brought global changes in many aspects. To prevent the spread of the disease, social distancing and stay away from the crowd protocols are established. The assessment process needs to be changed following the health protocol. From demand perspective, the pandemic causes company to postpone the need for assessment services.

Figure 3 shows that the service performance index assessment in 2020 tends to be the worst compared to previous years. Assessment services in 2019 and 2018 also did not perform well due to low productivity and turnover inventory.

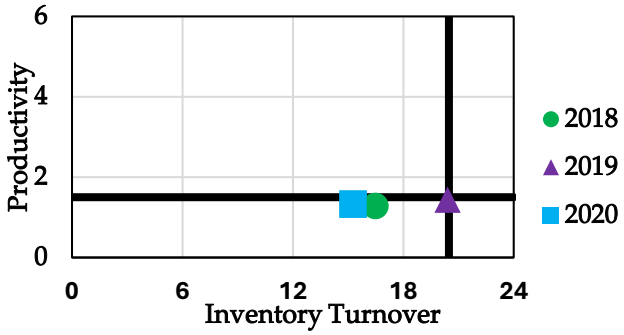

Figure 3 Assessment's Performance Matrix

3.2. Public Training

Public training has a standard learning schedule and topics, offering certifications outside bachelor, master, and doctorate. In this context, demand is obtained from various customer segments and XYZ must compete with many similar providers in providing the services. The variable has decreased since COVID-19 outbreak and the condition occurs in all training service providers. To follow health protocols, many customers postpone the need for training that requires mobilization and meetings. In early 2020, XYZ started using virtual training mechanisms to serve training demand. Despite declining revenues, virtual training methods reduce operating expense. Figure 4 shows public training operational performance based on productivity and turn-on-inventory. In 2019, performance tends to be the best in productivity and inventory turnover.

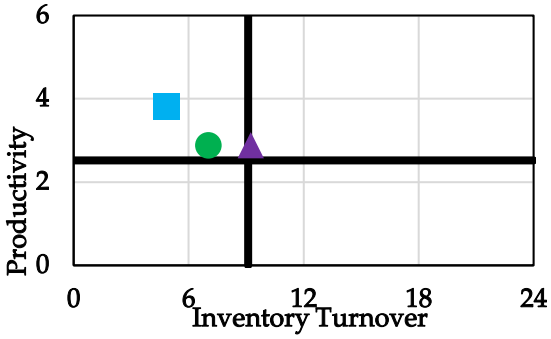

Figure 4 Public Training's Performance Matrix

3.3. In-House Training

This service offers certifications instead of degrees but does not have a learning schedule. In this context, training is customized based on the demands of the customers. Even though there are limited competitors, XYZ cannot serve because the competence does not match the demand.

The demand for In-house training has decreased since pandemic and customers are expected to avoid onsite training. In-house and public training share the virtual training mechanisms. Performance of the service was similar to public training and the best result was achieved in 2019. See Figure 5.

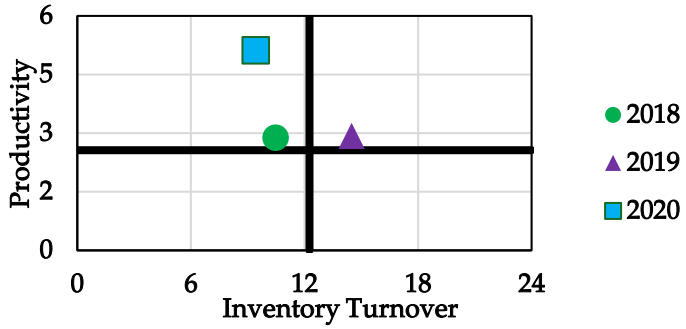

Figure 5 In-House Training's Performance Matrix

3.4. Formal Education

The service offers bachelor's, and master's degrees, and follows regulations issued by the Ministry of Education. In this context, the demand for the services is relatively stable and unchanged. However, Figure 6 shows that formal education does not exceed the threshold. Compared to other years, 2019 had the worst performance.

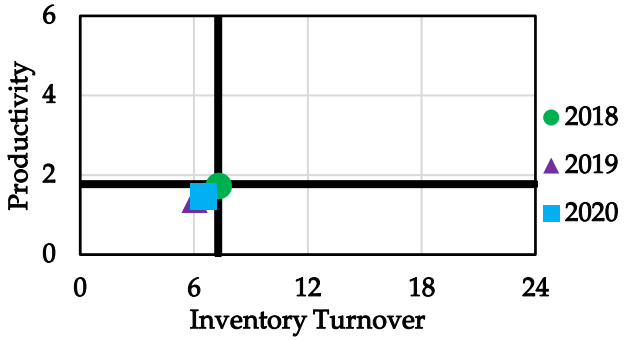

Figure 6 Formal Education's Performance Matrix

3.5. Consulting Services

Consulting provides services to company rather than individuals since the demand is random and difficult to predict.

Figure 7 shows the best consulting performance in 2019. In other years, the service's performance tends to be slightly better on productivity.

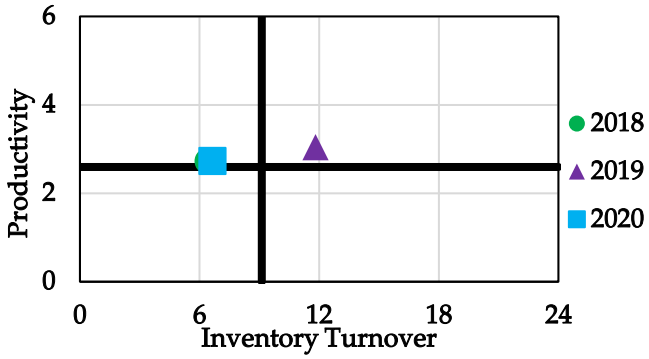

Figure 7 Consulting's Performance Matrix

3.6. Discussion

This research proposes throughput accounting to set up company performance baseline and promote accurate management concerns. To understand performance position, a baseline must be prepared based on previous throughput accounting and expressed as a threshold zone.

Table 2 shows that performance index from assessment and formal education is below the threshold. This product has low survivability and the priority strategy is used to leverage productivity or inventory turnover (Thirumalai et al., 2022). XYZ is expected to review the resources and increase inventory turnover rather than productivity.

For long-term survivability, optimizing resource usage is an appropriate method for minimizing susceptibility to changes in the industrial environment. In the post-pandemic era, the market is more careful in spending money. Additionally, the increase in service rates is susceptible to being rejected (Wirjodirdjo et al., 2021). Product performance index will be above the threshold without changing its service rates when resource usage is increased.

Table 2 XYZ's Product Performance Index

	2017 (as Threshold)		2018			2019			2020		
	Productivity (P)	Inventory Turnover (IT)	P	IT	Zone	P	IT	Zone	P	IT	Zone
Assessment Centre	1.5	20.5	1.3	16.5	Danger	1.4	20.4	Danger	1.3	15.3	Danger
Public Training	2.5	9.1	2.9	7.0	Comfortable	2.9	9.2	Safe	3.8	4.8	Comfortable
In-House Training	2.6	12.3	2.9	10.5	Comfortable	2.9	14.5	Safe	5.1	9.4	Comfortable
Formal Education	1.8	7.3	1.7	7.3	Danger	1.4	6.0	Danger	1.5	6.5	Danger
Consulting Services	2.6	9.1	2.7	6.4	Comfortable	3.0	11.8	Safe	2.7	6.7	Comfortable

Note: "Danger" is an indication for priority improvements

4. Conclusions

In conclusion, a tool was developed to analyse operational performance of product. This tool could be used when the components of the financial statements have been classified into throughput, operating expense, and inventory. The three components were used to measure productivity and inventory turnover index of product. In this context, the management was able to improve product. This was tested in a service company with a variety of products. Formal assessments and education performed poorly compared to other products, and improvements were prioritized to obtain product out of danger zone. Therefore, XYZ did not use resources optimally with several product in the comfort zone. The limitations certainly came from financial information which was only based on data from a service company. As a recommendation, information should be expanded from several industries. Further research must be carried out to produce a better understanding of matrix performance. In this context, the tangible benefits of throughput accounting in measuring costs and evaluating company performance must be considered.

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Author Contributions

Alain Widjanarko conducted the research, developed the matrix, performed the simulations, and prepared the initial draft of the manuscript. Ade Supriatna reviewed the manuscript thoroughly, provided critical revisions, and made significant contributions in revising and improving the manuscript. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflicts of interest regarding the publication of this article.

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