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**USING OF COST-VOLUME-PROFIT ANALYSIS IN A  
MANUFACTURING COMPANY**

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## **ABSTRACT**

The emerged competition has created the increased need for the analysis of relationship among costs, volume and profit. Accounting for internal purposes has an important role for nowadays' companies to stay in a competitive position. Understanding the cost structure and its effects on the strategic decisions is an essential tool when analyzing the future prospects of the company. Cost-volume-profit (CVP) analysis is a vital tool for estimating the outcomes of current and possible assessments. The analysis also helps with performance evaluation and profit planning. For pricing decisions, CVP analysis provides vital information of the product costs which are the key elements when selecting the selling prices for products.

This study is conducted with quantitative methods. The data used for the research is taken from a manufacturing company. The results indicate that the implementation of cost-volume-profit analysis shows clearly areas where activities must be changed or re-evaluated, and what impacts certain managerial decisions have on the profitability. The execution of CVP analysis is rather simple in small enterprises by using an Excel spreadsheet. The importance of an appropriate sales mix is highlighted both in the theoretical part and the results of the analysis.

Keywords: cost accounting, cost-volume-profit analysis, profitability, pricing

# **INTRODUCTION**

## **SIGNIFICANCE OF THE TOPIC**

Globalization has made the competition grow within the manufacturing industry and companies need to pay even more attention to the key factors such as costs, prices and profit. Companies need to re-evaluate their costs in order to increase the value provided for customers. A healthy economy is one of the most vital assets for every company. Cost-volume-profit analysis (CVP) provides the managers with information of the products' profit margins and overview of the relationships between cost, volume and profit. CVP analysis shows the effects of changing a product mix and how the costs behave with variations in sales volume. Previous studies compiled by Alnasser, Shaban and Al-Zubi (2014); Abdullahi, Sulaimon, Mukhtar and Musa (2017), and Cafferky (2017) show that small business enterprises could benefit from implementing CVP analysis to increase productivity and improve management decisions. The analysis can be used as a complementary to budget planning which is one of the most common methods to planning and evaluating the activities of a company.

## **PURPOSE OF THE STUDY**

Quantitative methods were used when conducting the study. The purpose of this thesis is to examine the application of cost-volume-profit analysis. The analysis includes the evaluation of into which degree the implementation helps with profit maximization. The evaluation was done by studying the interrelation of CVP analysis elements. The information CVP analysis provides can be used by the managers to evaluate how much a decrease in production volume affects the profit. Cost accounting helps to clarify the cost structure, which enables correct pricing and provides more data of the company's viability. In small enterprises, CVP analysis is simple to execute using an Excel spreadsheet.

The main goal of the thesis was to examine the costs, pricing and profitability of the case company under different scenarios. This information was used to provide precise contribution margin calculation as well as cost calculation models for the company which all would be easy to control. Applying the knowledge acquired from the models into decision making, it becomes easier for the

managers to keep track on the costs used for production and administrative expenditures. Thus, the pricing decisions become more accurate if all costs are monitored. The second goal was to provide acquaintance of different pricing methods and to choose the most suitable method for the case company for the computations. The thesis is not focusing on the functionality of all pricing methods, but centralizes to the method which is selected for the methodological part. This thesis has been made as an assignment for the case company in spring 2018.

## **RESEARCH QUESTIONS**

- I) How the implementation of cost-volume-profit analysis can support the development and profit planning of a company?
- II) Is CVP analysis useful in decision making and accurate pricing decisions?

## **HYPOTHESES**

- H<sub>0</sub>: The suggested variations for strategic decisions in cost-volume-profit analysis are useful.
- H<sub>1</sub>: The increase in fixed costs and sales revenue simultaneously increase net income.

## **LIMITATIONS**

The format of cost-volume-profit (CVP) analysis is for a single product. In reality, most companies do not have only one particular product but many diverse products. CVP analysis can be applied for a multiproduct company by utilizing product mixes to simplify the equation. CVP analysis also includes several assumptions which need to be fulfilled in order to conduct the analysis properly.

The thesis consists of six main chapters and a summary. The first chapter introduces the concept of cost accounting briefly. In the second chapter, some necessary terms for understanding the CVP analysis are explained. The third chapter illustrates and clarifies the main points used in the CVP analysis. Different pricing methods and possibilities to increase profitability are discussed in the fourth and fifth chapters. In the sixth chapter, an empirical research was compiled to evaluate the hypotheses. The main results and summary of the research are composed together in the final chapter.

## **1. COST ACCOUNTING**

Every company must have a system for accounting information. The data in the system is divided into two major segments: the financial accounting system and cost accounting system. The information for external entities such as investors and creditors is provided through the financial accounting system. Hansen and Mowen (2006) have argued that cost accounting is practiced too frequently only to fulfill the requirements of financial accounting. Cost accounting is necessary for a company as it is used for internal purposes, measuring cost data of all business activities. The data is furthermore used for strategic actions, therefore increasing the value and profitability of the company. As a well-known statement, in order to stay competitive, the company needs to develop continuously. This can be reached by analyzing costs and sales of the company's products and changing the activities if necessary.

The aim of cost accounting is to provide cost-related information for financial –and management accounting which supports the planning of new products and services of a company (Horngren, Datar, Rajan, 2012). Cost accounting is aimed at assigning costs to products as specified by management. A cost accounting system should be dependable and adaptable as it is used for collecting proper information of costs. This information can be further used for making different decisions regarding a company's activities, thus the importance of a reliable cost accounting system.

The main goal in cost accounting is to track the products or product categories which are profitable for the company. Increased productivity of operations and efficiency of activities are goals for many companies. The data acquired from cost accounting assists the managers under the constant pressure of increasing competencies. Cost accounting has a significant impact on companies in manufacturing industry as generally the key objective of production is cost efficiency. Product-specified cost and profitability information assists product development, for example when seeking ways to lower product costs or launching a new product. (Martinsuo, Mäkinen, Suomala,



Lyly-Yrjänäinen, 2016). Not utilizing cost accounting can result in poor and inaccurate outcomes affecting the whole business.

When starting a new business, the company can make loss during the first years. Short-term loss is not always a cause for concern but long-term profitability is necessary for the business to keep operating. Consequently, one of the biggest challenges every company has is to keep the operations profitable as a whole. By utilizing cost accounting practices, the possible consequences of developing and launching new products can be more specifically analyzed.

## **2. COMPONENTS OF COST-VOLUME-PROFIT ANALYSIS**

Cost-volume-profit analysis is composed of five main factors which affect the variations in a company's profitability; sales price, sales mix, volume, variable costs and fixed costs. In addition to determining the previously mentioned factors, a relevant time period must be chosen. In this thesis, the period for the analysis is selected based on the preferences of managers, to meet the requirements that they have. The longer the period is, the more fluctuations there are in costs and sales. (Cafferky, Wentworth, 2010). Focusing on the behavior of costs and profit of a company helps to determine which products are profitable and which are not. With the help of CVP analysis, the manufacturing of products which constantly create loss can be stopped. This will naturally assist the managers to focus the production towards products that create value for the company. Moreover, the analysis shows which activities or product lines should be removed or improved.

When composing cost-volume-profit (CVP) analysis or any other cost calculations, the understanding of the cost structure is necessary as the study assumes that all costs are either variable costs or fixed costs. These costs are explained below in Subchapter 2.1. After acknowledging what the components are and how they behave, the analytical computations vital for the CVP analysis can be completed. Especially in manufacturing companies, the importance of unit costs measuring inventory value is significant. (Walther, Skousen, 2009). The cost information can be used for multiple purposes. Planning and control of management decisions could not be done without the knowledge of how much costs are required for each action. (Hansen, Mowen, 2006). Tracing and assigning costs to products can be done by using either traditional costing method or activity-based costing method.

### **2.1. Variable and Fixed Costs**

CVP analysis application's first step is to determine the behavior of costs. The time period for measuring costs must be chosen as under a long time period all costs can be classified as variable costs. The dimension of the time horizon is defined based on the needs for which the estimates of

cost behavior are made. Variable and fixed costs behave contrarily when the operating ratio changes. Variable costs depend on the amount of production or activity which the company has. If the sales increase, variable costs increase and vice versa. Assuming that the company does not have any production at all during a period, there will not be variable costs for that period either. Typically, variable costs include for example raw materials and direct labor costs.

Fixed costs are not dependable on the company's production, and they cannot be changed or affected in a short-term period. Fixed costs remain standard even if there was no production or activities. Examples of fixed costs are rent, depreciation and interest.

Some costs cannot be defined as variable or fixed costs and are therefore called as mixed costs. Mixed costs include elements from both variable and fixed costs, making it difficult to evaluate them. The extrication of mixed costs into variable costs and fixed costs can be done by using the high-low method, the scatterplot method or the method of least squares. (Hansen, Mowen, 2006). In a long-run, all costs can be classified as variable costs, thus the importance of selecting a relevant time period for cost calculations.

## **2.2. Direct and Indirect Costs**

Costs can be divided into direct and indirect costs when considering whether the cost can be directly allocated to some cost object. Direct costs are easy to target directly to certain activities. Because of these costs are directly traceable, the costs can be directly assigned to products. Indirect costs occur from activities that are necessary for the company to operate, but which cannot be directly linked to the production. Indirect costs are common for different cost objects and they need to be assigned to the products using an effective cost allocation method. Allocation of indirect costs requires the use of cost drivers in order to divide them equally between the units. (Alhola, Lauslahti, 2002). Using false cost drivers can be seen in wrong unit costs. Traditional costing, activity-based costing (ABC) or a combination of these two are used for unit costing purposes, providing differences in the allocation of indirect costs. Generally speaking, traditional costing method is more suitable within a company producing a similar product while ABC is more suitable in more complex business environments.

Direct materials are directly linked to the product which is produced. Similarly, direct labor means the labor which is directly allocated with producing the goods. The quantity of both direct materials

and direct labor can be calculated by the amount used for each product. (Hansen, Mowen, 2006). Materials that cannot be identified or allocated directly to the products are called indirect materials. Prime costs are the sum of direct material and direct labor costs. The amount of all indirect costs are called as overhead.

Manufacturing overhead costs (MOH) are not directly linked to any part of the process and they need to be allocated to cost objects based on chosen cost driver (Herman, 1991). Examples of MOH are depreciation and supplies which are essential for production but are not a part of the finished product. Selling, general and administration overhead contains the expenses that are not related directly to production. Companies should take into account the percentage of MOH compared to the whole cost structure, as the increased overhead costs grow the business risk. This is discussed more detailed in Chapter 3.6.

Normal costing measures overhead costs on a preset basis. The overhead rates are calculated in the beginning of the year and are applied to production during the year. Generally, all companies use normal costing as it is difficult to trace several overhead items, such as depreciation, directly to units produced. (Hansen, Mowen, 2006). In manufacturing companies producing more than one product, activity drivers are generally used to assign overhead costs to products.

### **3. COST-VOLUME-PROFIT ANALYSIS**

Cost-volume-profit analysis (CVP) studies the connection between variations in sold units, sales mix, sales price, variable costs and fixed costs compared to a company's total costs and revenue. The main goal of CVP analysis is to determine the optimal level of production to maximize profitability of a company. It is vital for managers to understand how costs behave in order to conduct budgets and profit planning. Information acquired by CVP analysis can be used for evaluating the business profitability.

#### **3.1. Usage of Cost-Volume-Profit Analysis**

The cost-volume-profit analysis determines the contribution margin of a product, and thereafter the break-even point, target profit and degree of operating leverage. These components of the CVP analysis are discussed later in the subchapters. The information acquired from these sections can then be used to conduct a sensitivity analysis for the company. (Hansen, Mowen, 2006). Analyzing cost, volume and profit of a product helps managers to understand why the product behaves in a certain way when there are variations in selling price, costs or output (Horngren, Datar, Rajan, 2012). Variable costing has been proved to be very useful when conducting CVP analysis or making managerial decisions which include contribution margin.

The CVP analysis is based on estimations in order to measure the costs of manufacturing a certain product or a product mix (Kee, 2007). Analyzing cost data by each calculation target simplifies the planning and tracking of a company's expenses. The information allows companies to verify the efficiency of their strategy and focuses on the problematic sectors. The company's overall performance could be positive although one product might be creating loss. Conducting the cost-volume-profit analysis assists also with maximizing the efficiency of production.

Even though cost-volume-profit analysis is most advantageous in a single-product setting, it can be applied in companies with multiple various products. A sales mix needs to be defined before

the utilization can be completed. The product mix is described as a package, and the package values are implemented for the calculations. (Hansen, Mowen, 2006). Defining the product mix is crucial and one of the most important management decisions because it directly impacts the results achieved from the analysis. Evaluating the balance between risks and profitability within a defined product mix can be done by utilizing CVP analysis (Kee, 2007). Therefore, managers must pay close attention to the preferred mix as it affects the company's revenue and profit (Walther, Skousen, 2009). With the right combination of sold products the profit from operations can increase and be further used for developing new products or investing.

### **3.2. Cost-Volume-Profit Analysis Assumptions**

Utilizing the cost-volume-profit analysis, managers must take into account several assumptions that CVP analysis expects. Not taking the suppositions into consideration could lead to false results and wrong managerial decisions. The conditions under which CVP analysis can be practiced are described below.

1. Total costs can be classified as variable costs or fixed costs. Variable costs fluctuate with changes in the production output whereas fixed costs remain constant whether there are variations in the units sold or not.
2. The variable cost per unit, selling price and fixed costs are identified and remain constant under a relevant time period. Thus, the total revenue is only affected by changes in quantities of units sold and the revenue function is linear;
3. The product mix is unchanging. Companies with multiple products manufacture goods according to the projected product mix ratios.

### **3.3. Contribution Margin**

Contribution margin calculation is one of the valuable methods when evaluating, managing and planning the company's profitability and profit planning. The formula for calculating contribution margin is practical and simple, providing results that support short-term decisions. (Jormakka, Koivusalo, Lappalainen, Niskanen, 2015). Contribution margin alongside with production is an essential factor when developing the business.

A necessity before conducting contribution margin (CM) calculation is to divide costs between fixed and variable costs. CM equals sales revenue minus total variable costs, and it is commonly used for internal analysis. The CM does not indicate profit; it is the amount of money left to cover fixed costs. Higher contribution means increase in profit or reduction of loss. (Walther, Skousen, 2009). When pursuing profitability, managers need to make sure that the contribution margin covers all fixed costs and the target income they want to achieve. The structure of contribution margin income statement is presented in Table 1.

Table 1. Contribution Margin Income Statement

Sales
Less: Variable Costs
Contribution Margin
Less: Fixed Costs
Operating income or loss

Contribution margin calculations are used for example when reviewing variations in the cost structure of a company. The concept of CM calculation is that the assessment and management of the viability of the company is focused on analyzing variable costs and volume of operations. Each sold product increases the company's contribution margin. As fixed costs remain at the same level, an increase in contribution margin increases the amount of profit correspondingly. (Jyrkkiö, Riistama, 2004). The author suggests companies to produce goods that have a high contribution margin as it would result in higher contribution for covering fixed costs.

$$\text{Contribution margin ratio} = \frac{\text{CM}}{\text{Sales}} \quad (1)$$

The contribution margin ratio, also called the profit-volume ratio, indicating the rate of profitability is one of the most vital ratios for businesses. It expresses the relationship between changes in sales volume and profit, therefore being particularly important when examining the effectiveness of the company's operations. Unless the fixed costs of the company increase, a higher CM ratio means greater profits. (Aurora, 2009). Using the contribution margin approach, target income can be calculated by adding the targeted profit to fixed costs and dividing the result with the contribution margin ratio.

### 3.4. Break-Even Point

Break-even point shows how many units should be sold in order for the total costs to equal total sales revenue, thus, the point where there is no gain or loss. Analyzing the break-even point is used to study the relationship between cost, volume and profit. (Aurora, 2009). Achieving break-even is not satisfactory for most companies as it means generating zero profit. Therefore, the break-even point is commonly used for calculating target income. Break-even point can also be further applied for pricing decisions.

Monitoring the operations and profitability of a company, break-even point is an important indicator, signaling whether the business is going in a right direction. If the sales decline below the break-even point, it indicates that the company can no longer cover its fixed costs without additional funding from external financiers. Methods for determining the break-even point are expressed in Subchapter 4.6. Especially in small companies or in companies which are in their start-up phase, the analysis of break-even point is crucial. Without the analysis it is impossible for the managers to know how many units must be sold to cover all costs, or to generate profit. If the break-even point is reached and exceeded, the excess money can be used for improving the working environment. This can also motivate employees as they have a clear picture of what needs to be achieved.

Margin of safety shows the units sold or the sales revenue earned above the break-even point. Thus, if the company has a large margin of safety, it can still make profit even if sales decrease. Generally, low fixed costs improve the margin of safety. The evaluation can be made by predicting future probabilities by using estimated units or revenue or assessing current risks by taking actual numbers from ongoing processes into consideration. (Aurora, 2009). Analysis of the margin of safety is important since the results show towards which direction the company is moving. A declining margin of safety indicates that either the costs are increasing or sales are decreasing.

$$\text{Margin of Safety (units)} = \text{Actual or Estimated units} - \text{Units at breakeven point} \quad (2)$$

$$\text{Margin of Safety (sales)} = \text{Actual or Estimated units} - \text{Revenue at breakeven point} \quad (3)$$



### 3.5. Target Profit

Achieving the break-even point does not generally fulfill the managers' needs. This creates the demand for calculating the target income. Target profit can be determined by the sales revenue or number of units necessary to sell in order to reach the target point. It is calculated by adding the desired profit to fixed costs. (Hansen, Mowen, 2006). Accepting or applying a certain strategic decision without making loss creates a need for expanding the CVP analysis with the computation of target profit (Guidry, Horrigan, Craycraft, 1998). The target profit should not be an absolute figure but more of a directive for the managers to follow as it assumes that fixed costs remain constant.

$$\text{Number of units to be sold} = \frac{(\text{Fixed costs} + \text{Target profit})}{\text{CM per unit}} \quad (4)$$

$$\text{Sales revenue to be earned} = \frac{(\text{Fixed costs} + \text{Target profit})}{\text{CM ratio}} \quad (5)$$

For small business owners, the calculation of target income gives a valuable insight for planning operations. For a manufacturing company, the number of units to be sold allows the managers to plan their production more precisely. Sales revenue to be earned shows whether a certain decision is too expensive or if it can be implemented.

### 3.6. Operating Leverage

An accurate cost structure is essential for any company. CVP analysis utilizes the degree of operating leverage which indicates to what amount total costs are consisting of fixed costs. Distinctive companies in different industries have dissimilar cost structures. Generally, higher operating leverage leads to a larger risk of loss if sales decrease as their costs structures are mostly composed of fixed costs. (Horngren, Datar, Rajan, 2012). Variations in sales have a direct impact in companies which have a cost structure consisting mainly of fixed costs (Guidry, Horrigan, Craycraft, 1998). Even though the risks with fixed costs are existing, companies with larger proportion of fixed costs would generate more profit if the sales increase. As a downside to that, the higher the degree of operating leverage, the higher the target income becomes. (Hansen, Mowen, 2006). The author of this thesis would suggest small companies to have a cost structure

mainly consisting of variable costs since the actual outcomes of future operations are impossible to predict.

Guidry, Horrigan and Craycraft (1998) suggest that the operating leverage assumes the contribution margin to increase linearly with the sales volume, whereas the alteration of net income rate is inconsistent due to persistent fixed costs.

$$\text{Degree of Operating leverage} = \frac{\text{Contribution margin}}{\text{Operating income}} \quad (6)$$

Calculating the degree of operating leverage is one of the most important methods to evaluate the risks of the company. It brings value to the company by presenting the degree of usage of fixed costs and therefore the level of risk. A suggestion for small or new companies would be to focus on a cost structure mostly consisting of variable costs as they do not occur if there is no activity in the company.

### **3.7. Sensitivity Analysis**

The variations in the cost structure affect viability of a company, thus, the changes need to be analyzed thoroughly. (Walther, Skousen, 2009). Sensitivity analysis is a vital tool when conducting cost analysis as it observes the impact of possible changes in operations. The analysis can be used to change the data from CM calculations, for example sales volume or sales mix, and therefore look at the impact of alterations on the contribution margin, profit and other key indicators. Studying the impact of a change the selling prices and estimating its effect on profitability by using sensitivity analysis is suggested by Alhola and Lauslahti (2002). Altering one or more factors which affect profitability shows whether the change generates profit or results in a loss. (Jormakka, Koivusalo, Lappalainen, Niskanen, 2015). Managers can further utilize the sensitivity analysis by recognizing the trends and predicting the effects of the variations.

Examining the effects of changing the product mix on profitability is one of the key features of sensitivity analysis. Thus, the analysis uses and adjusts previously described methods of improving viability, examining their impact on the company's profitability. Sensitivity analysis is especially helpful when planning changes and estimating their effects on future operations. (Hansen, Mowen, 2006). The degree of operating leverage must be taken into consideration as an essential factor

when studying the consequences of different product mixes as it measures the relationship between variable costs and fixed costs (Guidry, Horrigan, Craycraft, 1998). Sensitivity analysis allows the managers to make decisions rapidly as it is not a too complicated method and it clearly shows whether a change is beneficial to make or not.

### 3.8. Methods for Determining Break-Even Point

#### 3.8.1. Equation and Contribution Margin Method

The equation method is useful when determining operating income for specific quantities of units sold. The data for computing break-even point according to the equation method is derived from the CVP analysis formula for calculating operating income. It is calculated by deducting variable costs and fixed costs from revenue. (Horngren, Datar, Rajan, 2012).

$$\text{Operating income} = \text{Sales} - \text{Total costs} \quad (7)$$

$$\text{Breakeven point (units)} = \frac{\text{Fixed costs}}{(\text{Price per unit} \times \text{Variable costs per unit})} \quad (8)$$

$$\text{Breakeven point (sales)} = \text{Price per unit} \times \text{Breakeven sales in units} \quad (9)$$

As described earlier, the contribution margin equals to the variance between sales revenue and variable costs.

$$\text{Breakeven point (units)} = \frac{\text{Total fixed costs}}{\text{CM per unit}} \quad (10)$$

$$\text{Breakeven point (sales)} = \frac{\text{Total fixed costs}}{\text{CM ratio}} \quad (11)$$

The author suggests using the CM method for calculating breakeven point, CM being one of the most important factors in decision making. Each sold unit contributes to covering fixed costs, providing therefore a good basis for the breakeven computation.

### 3.8.2. Graphical Method

The graphical method is most useful for visual presentation of the correlation between costs, sales and profit. It is useful as it illustrates the relationships visually, therefore being more understandable than plain numbers. A version of the graphical presentation of break-even point is shown in Figure 1. The horizontal axis represents units sold and vertical axis equals to revenue. The intersection of the two lines is the break-even point; where total costs equal to revenue. The left side of the BEP indicates loss as the total cost line is higher than revenue, whereas the right side shows profit.

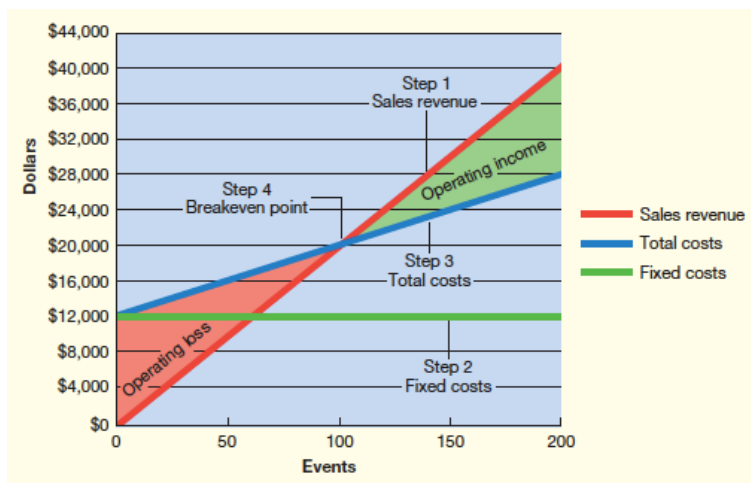


Figure 1. Break-even point graphical method  
Source: Horngren, Harrison, Oliver (2012)

Using the graphical method for illustrating the break-even point is very convenient in any company. It would be beneficial to present the graphical method to each employee each month, to get everyone to understand the cause-and-effect relationship between activities and costs. If the reasons for costs are not explained in a simple way, it might be difficult to explain reasons for cost reductions or other changes.

## **4. PRICING**

Successful pricing is the foundation for a profitable business. It is one of the company's most important decisions, directly affecting sales and therefore profit. (Viitala, Jylhä, 2013). Even the smallest changes in sales prices have direct effect on the viability of a company which makes the sophistication of prices difficult. Too low selling prices do not generally cover all incurred costs whereas too high prices expel customers. Companies can estimate the prices of their products by using different pricing methods. The basis of determining selling prices can be done according to the pricing of competitors or based on product costs. Still, pricing is always contingent on cost information because the supply is directly affected by costs. When developing a new product, it is essential to determine a correct price that covers all costs and generates required amount of profit.

### **4.1. Importance of Correct Pricing**

The upper limit for selling prices is commonly adjusted by the market structure. The selection of a selling price is affected by the market prices. Selling products with much higher prices than competitors could result in zero or very low sales. Consequently, the lowest limit for setting the price is the total of the unit's costs (Koski, Virtanen, 2005). Generally, the minimum amount that can be considered to be the selling price must be larger than the contribution margin of the product. Noble and Gruca (1999) stated that pricing based on costs is generally used in industries where it was complex to determine the demand. The cost-based pricing provides rather valid selling prices from the company's point of view. A problem with cost-based pricing is that it does not commonly take into account the price levels assumed by a customer. When choosing selling prices, the managers need to arrive to a result that covers needed costs and is still within the relevant price range for the target market.

As the competition in manufacturing industry is constantly increasing, companies need to define the value they want to deliver to customers (Ekegil, 2017). This is the reason for controlled and carefully considered pricing. Although costs are an important factor when determining future

decisions, pricing the products does not only rely on the cost information. In assistance with the cost information derived from cost accounting practices, the selling prices must be equal to the market value expected by customers. If the selling prices need to be decreased, cost accounting is a convenient tool through which the managers can find the points where to develop their activities. Focusing the pricing to wrong market groups or choosing an incorrect selling price can weaken the competitiveness of the company. As mentioned earlier, the company must know its costs specifically, in order to perform accurate pricing decisions. CVP analysis is a useful tool for creating a pricing strategy as it provides information of the maximum amount of loss the company can afford (Hinterhuber, 2003). The selling price of a product directly affects the profit per unit sold through demand. Prosperous pricing decisions are comprehensive means of affecting the profitability of the company. The choice of selling prices is a dynamic and versatile way to influence the profitability positively. Pricing assessments must be controlled and carefully analyzed, taking into account customers and potential market shares, competitors, and production costs.

## 4.2. Cost-Plus Pricing

Determining the price of a product can be done by using cost-plus pricing. The method is quite simple, the product cost is calculated and a markup is applied to that, equaling to the final selling price of the product. (Hansen, Mowen, 2006). Table 2 illustrates the calculation of selling price by using cost-plus pricing.

Table 2. Example of cost-plus pricing

Full unit cost of a product	€50.0
Add: Desired markup	25.0%
Potential selling price	€62.5

Source: Hansen, Mowen, (2006)

Before cost-plus pricing can be applied, the total cost of manufacturing a product must be calculated using a reliable costing method. In cost-plus pricing, the selling price of a product needs to cover all costs related to the product and its distribution, including value-added taxes and the desired profit. Cost-plus pricing is commonly used in manufacturing industry and in the field of trade. (Jormakka, Koivusalo, Lappalainen, Niskanen, 2015). Implementing cost-plus pricing

provides selling prices that are plausible estimates (Horngren, Datar, Rajan, 2012). A research of pricing methods made by Noble and Gruca (1999) revealed that cost-plus pricing was the most frequently used pricing method. Also Hansen and Mowen (2006) argued that almost every European company uses cost-plus method to determine selling prices for their products. A recent article written by Cafferky (2017) stated that the cost-plus method could be valuable in new companies doing CVP analysis without historical data.

### **4.3. Contribution Margin Pricing**

In contribution margin-based pricing method the anticipated profit is added to the variable costs of a product. The targeted amount must be set high enough to cover all fixed costs and create profit. If the target or estimation is too low, therefore not covering all costs connected to the product, using contribution margin pricing can lead to too low selling prices and losses companywide. (Jormakka, Koivusalo, Lappalainen, Niskanen, 2015). It is important to remember to add the value-added tax to the selling price (Alhola, Lauslahti, 2002). A disadvantage of contribution margin pricing method is that it will most probably not provide accurate pricing decisions if the company's cost structure is not mostly consisting of variable costs (Järvenpää, Länsiluoto, Partanen, 2013). Especially in smaller companies, this would very seldom be the situation as all new investments and hiring employees increase the proportion of fixed costs.

Problems with both cost-plus pricing and contribution margin pricing are that in reality, the cost structure of a product seldom can determine the selling price. Suomala (2012) and Siikavuo (2016) argued that the costs must be adapted to the relevant price which is determined by the target market and competitors. Managers should keep the selling prices constantly updated to meet the demand of the market and the price level of the industry. If the pricing is forgotten and left in the background, cutting costs or re-organizing the cost structure would not help with the possible decrease in sales due to unsuitable selling prices.

### **4.4. Target Pricing**

According to Viitala and Jylhä (2013), the most common pricing method in manufacturing industry is target costing. Target costing constitutes permissible production costs by subtracting the desired profit from a market selling price. One disadvantage associated with this method is that to adapt

the production costs to the desired amount is occasionally done by decreasing the quality of the product. The target pricing method may also cause disadvantageous effects within the relationships between employees and management. Another shortcoming of the target costing or target pricing method claimed by Hansen and Mowen (2006) is that the method requires much more additional work than cost-plus pricing. Horngren, Datar and Rajan (2012) have illustrated the method in another way. As described by them, the target cost is determined by deducting target operating income from the desired selling price. The target operating income is calculated by subtracting operating expenses and depreciation from the gross profit. The author would thereby conclude that the method defined by Horngren, Datar and Rajan (2012) would generate more appropriate results as it takes into account all expenses, not only the costs of goods sold.



## **5. PROFITABILITY**

Every business is based on profitability. Improving profitability is an ongoing development target, requiring a comprehensive overview of the company. The CVP analysis providing valuable and detailed insights of the connection between costs and profit can increase the value of decisions regarding profit planning. For reviewing and analyzing profitability, there are different perspectives which use diverse financial indicators. Traditionally, expenses and profit have been used as the measure of a company's productivity. Nevertheless, looking only at profit is not sufficient enough when analyzing profitability. The income must furthermore be compared with the investments made to generate the profit. (Jyrkkiö, Riistama, 2004). Operating cost-effectively long-term, the revenues must exceed all expenses. To reach the point of becoming profitable, the company needs to analyze the operations which generate either revenue or costs. This way the managers can notice any activities that would need improvements. Profitability does not come effortlessly, everyone within the company must focus on getting there by analyzing and improving the company's operations.

The profitability of a manufacturing company is determined by the ability of the company to manufacture products at sufficiently low costs and to sell them with adequate contribution margin. Improving profitability is one of the constant targets of developing a business. Efficient usage of capacity can increase the value of a company's operations significantly. (Jyrkkiö, Riistama, 2004). Although profit and costs are main components of profitability, experienced and motivated employees play a key part in it. The level of knowledge among the personnel influences the quality of business operations which are directly connected to the profitability (Alhola, Lauslahti, 2012). Productivity creates conditions for improving profitability. With excess financial resources the company can for example buy new machinery, improve working conditions, increase research and development activities and hire more employees. (Viitala, Jylhä, 2013). These improvements can engage attention within employees as the working environment becomes better and it is easier to focus on future development targets.

A business can be either profitable or making loss. New companies can generate loss due to the investments necessary to be made in order to get the business running. Thus, making loss does not automatically mean a negative thing, but it can be inevitable in that situation. Implementation of cost-volume-profit analysis and efficient control of costs can increase the profitability. Being profitable in one segment of the business does not guarantee total profitability of the company. (Alhola, Lauslahti, 2012). In order to increase profitability, the company should reduce the number of activities performed and increase the efficiency of the remaining processes. Adopting and constantly pursuing continuous improvement reduces waste and demand for resources. (Cooper, Kaplan, 1992). Activities performed in order to make the business profitable and competitive can be divided into short-term and long-term activities. Under a short time period, the company can mostly achieve cost savings from having versatile operations and applying new pricing strategies and sales campaigns. If the interval for making changes is long, new product innovations, investments into reforming the business model and modifying the corporate structure can be beneficial for the company. (Martinsuo, Mäkinen, Suomala, Lyly-Yrjänäinen, 2016). Investments for new machinery can increase the quality of products and the speed of production as the work becomes more automated. In manufacturing industry automation affects the ergonomics of employees positively as the work becomes less manual and more supervisory. Modifying the corporate structure to a leaner structure with less layers in between the managers and employees eases the information flow and coordination of activities, resulting in a more productive working environment.

Alhola and Lauslahti (2012) have stated that utilizing the following factors can develop the business into being more profitable:

1. Increasing sales by targeting advertisements and sales more specifically to customers.
2. Changing product range or sales mix in order to eliminate unprofitable products.
3. Decreasing costs, for example by negotiating on purchase prices of raw materials or by enhancing production activities.
4. Increasing selling prices. Companies need to carefully evaluate whether the new price would actually generate more profit and not result in reduction in sales.
5. More effective usage of capital by paying attention to the credit terms of accounts receivable.

One of the most vital factors affecting profitability is productivity. Generally, profitability is directly linked into productivity; an efficient company is more profitable than its competitors are.

The reduction of production costs can be done by employing effective procurement planning. Decreasing the cost and quantity of operations used for manufacturing a product increase the efficiency of activities, consequently increasing the profitability of the product. (Kee, 2007). Still, productivity alone does not ensure profit. Increasing productivity is not simple, it requires significant efforts from both the managers and employees working within the production. In manufacturing industry, one quite easy method to increase both productivity and profitability is to decrease material waste and focus on increasing the quality of materials. The development of productivity needs to be systematically monitored over equal time periods. The monitoring should focus on targets that have the greatest impact on long-term profitability. (Viitala, Jylhä, 2013). CVP analysis is very important when focusing on improving efficiency, as cost fluctuations provide critical information of whether the improvement assessments are efficient or not.

## **6. CVP ANALYSIS FOR THE CASE COMPANY**

### **6.1. Description of the Case Company**

Rapid growth in a new company is not only positive but it is also associated with risks. The growth requires investments, and focusing on smaller companies, the investments are commonly done on debt terms. This increases the financial expenses of the company. Subsequently, progressing demand and supply construct a need to acquire more employees, thus increasing the vulnerability of the company. (Jylhä, Viitala, 2013). The case company started operating in food manufacturing industry in 2015, and met a quickly increasing demand from the beginning. At the current moment, the company produces eleven different flavors of a similar confectionery product, utilizing parallel activities to produce them. The company employs 30 workers both on the administrative and production side. The procrastinations in production due to the lack of employees has now and then hindered the sales volume. Still, the company has maintained its position in the confectionery market, and has even managed to increase their market share because of the unique design of the products. The data for conducting the CVP analysis was acquired from the company.

Even though research and development activities require a lot of investments, R&D is vital and indispensable for the case company. Launching new products and improving the existing ones allows the company to compete with rivals within the same industry. Because the competition in food manufacturing industry is hard, the company would not survive without constant product and process developments. Increased demand, production and expenses have created the need to examine the company by using the cost-volume-profit analysis which can help with enlarging the production efficiency. As the case company has grown and expanded rapidly during the last years, the risks for the business have increased. The further the case company expands geographically, the more risks are tied within the operations. Jylhä and Viitala (2013) describe this type of growth as innovative growth.

## **6.2. CVP Analysis in a Multiple Product Setting**

To illustrate the propositions described in the previous chapters of this thesis, the case company is analyzed. Since the CVP analysis does not require complex equations but provides valuable information for the company's operations, it is a simple and useful tool for the case company. Moreover, the analysis offers realistic predictions based on the historical or current information and manager's opinions about future operations.

The CVP analysis requires a single-product setting. As the case company produces multiple products, an assumption of an expected sales mix needed to be made. The following questions were discussed and solved with the analysis:

- 1) How changing of the selling mix would affect the profitability?
- 2) How much the company needed to sell in order to earn net income of €100,000?
- 3) Would the selling prices need to be changed to increase profitability?
- 4) Could the company afford hiring three employees with a two percent increase in sales?

### **6.2.1. Changing of Selling Mixes**

One of the most challenging tasks in any manufacturing company is the selection of a selling mix. It can be difficult to determine which products to manufacture, which to produce later and which to abandon completely. The utilization of a sensitivity analysis provides valuable information of different outcomes with diverse selling mixes.

Results from changing of the selling mixes are presented in Table 3 below. The company has not calculated contribution margins per flavor before. This has led to not focusing the sales to the flavors that deliver the highest contribution into covering the fixed costs of the company. Since the company is facing a rapid increase in demand, the emphasis should be on selling products with the highest contribution margin. Selling the same amount of units with a changed sales mix could increase the sales revenue if it is done by emphasizing the value-increasing flavors.

Table 3. Current and suggested sales mix percentages by flavor

Flavor	Current sales mix	Suggested sales mix	Contribution margin €
1	5%	8%	2.21
2	19%	10%	1.96
3	10%	16%	2.23
4	6%	8%	1.98
5	15%	12%	2.04
6	6%	10%	2.55
7	10%	4%	1.53
8	11%	16%	2.58
9	14%	4%	1.79
10	2%	4%	2.06
11	2%	8%	2.44

Source: Author's own calculations based on data from Appendices 1 and 2.

The current sales mix was calculated based on the last year's sales. The data from which the information for analyses was derived can be seen in Appendix 1. The new, suggested sales mix was selected by emphasizing the flavors which have the highest contribution margin. As the table shows, the changes in the sales mix were rather large. The biggest variation was on flavor nine, decreasing its' proportion of the sales mix to four percentages. The purpose of this can be seen in the contribution margin column; the CM for flavor nine is only €1.79 whereas the average CM of all the flavors equals to €2.12 (Formula 12).

$$\text{Average CM} = \frac{\sum \text{CM Per flavor (Table 1)}}{\text{Number of flavors}} = \frac{€23.37}{11} = €2.12 \quad (12)$$

A contribution margin income statement shows the company's overall contribution margin. The case company's CM income statements with both the current sales mix and suggested sales mix are illustrated below in Table 4 and Table 5.

Table 4. Contribution margin income statement with current sales mix

Revenue	3,580,103
VC	903,006
CM	<b>2,677,097</b>
FC	2,813,409
NI	<b>-136,313</b>

Source: Author's own calculations.

The net income (loss) with the current sales mix presented in Table 4 shows that the company's operations are resulting in a loss. This is due to rather high fixed costs when compared to the contribution margin. With the current sales mix, the company would need generate more revenue in order to cover both variable and fixed costs.

In Table 5, the CM income statement is composed using the suggested sales mix to be able to compare the effects of changing a sales mix to net income.

Table 5. Contribution margin income statement with new sales mix

Revenue	3,794,472
VC	924,112
CM	<b>2,870,360</b>
FC	2,813,409
NI	<b>56,951</b>

Source: Author's own calculations.

From the Tables 4 and 5, which the author composed, can be stated the following. The new adjusted sales mix was constructed in a way that the company would sell more units which have higher contribution margin, and less products with lower contribution margin. As shown in Table 5, the net income would increase by 193,264 euros if the adjusted sales mix was applied to actual business. Even such a small variation as changing the sales mix has a great, rather positive effect on the profitability of the company. Although the company is young, it would be important to become profitable as soon as possible. Creating loss for too many years can form damaging operating conditions from which it could be very difficult if not impossible to recover. This leads to one of the most important calculations of every company, the break-even point. Knowing how

much the sales can decrease or which point must be reached to break even gives the employees a secured feeling as they can clearly see and follow the development to the point which must be met.

Table 6. Break-even point and margin of safety

	Current sales mix	New sales mix
Break-even point (units)	1,341,038	1,272,581
Break-even point (€)	3,754,204	3,719,186
Margin of safety (units)	-42,696	25,761
Margin of safety (€)	-174,101	75,287

Source: Author's own calculations based on data from Appendix 3.

Comparing the break-even points expressed in Table 6, it can be concluded that the new sales mix would be better for the company. The lower amount of units needed to be sold to break even with the new sales mix indicates that reaching the break-even point would be within a closer reach compared to the sales mix the company is currently using. Contrariwise, the current sales mix does not require as much sales in the financial side than the new sales mix. Even though the differences between the mixes are not too large when focusing on break-even points, comparing the break-even calculation with the CM income statements it can be said that applying the new sales mix would be more profitable. Applying the new sales mix would decrease the break-even point by 35,018 euros. While the decline is not very large, it would definitely be easier to reach the break-even point of the new sales mix than the current one.

Calculations of margin of safety show clearly that the current sales mix generates loss for the company. With the new mix, the company has an adequate margin between the sales and break-even, indicating that it could face a decrease of €75,287 in sales and still be able to cover the expenses. The increase in margin of safety with the new sales mix is not too high even though it is much better than with the original sales mix. A low margin of safety means that the company would suffer from even the smallest reductions in sales. Nevertheless, it must be kept in mind that the company being rather new and small it is financed largely by external investors which affects the cost structure and therefore the net income.



### 6.2.2. Target Income Calculation

The results for earning a target income of €100,000 are presented in Table 7.

Table 7. Target income calculation

To earn €100,000	Current sales mix	New sales mix
Target income (units)	1,388,703	1,317,813
Target income (€)	3,887,644	3,851,381

Source: Author's own calculations.

This part of the CVP analysis shows that the company would need to sell 70,890 more units with the current sales mix to cover all fixed costs and achieve the targeted income, compared to the new suggested sales mix. The weighted-average contribution margin ratios for calculating target income are found in Appendix 2.

Examining the results, the outcomes indicate that the focus should be placed on planning the product mix which is produced and sold rather than on sales prices. Decreasing fixed costs and concentrating on manufacturing products that have a high contribution margin would increase the profitability of the company. If more flavors with a higher contribution margin are produced, a larger part of the sales revenue will be contributing to cover the fixed costs. The lower the fixed costs are, the simpler it is to become profitable. Thereby it can be said that the decrease in fixed costs and increase in contribution margin would increase the profitability of the company. Still, as discussed earlier by Hinterhuber (2003), ignoring pricing as a value-increasing factor for customers and only focusing on both effectiveness and profitability can create major risks for the business.

### 6.2.3. Changing of Selling Prices

The current selling prices of the company were analyzed, and a cost-plus pricing method was decided to be used to determine new selling prices for the flavors. As the cost structure of the company mostly consists of fixed costs, the contribution margin method for pricing was rejected. The markup was calculated in a way that the new selling prices would cover all costs companywide and increase profitability without too excessive price changes. Presented in Table 8, the results indicate that the selling price should be increased for 70% of the flavors. As mentioned by Alhola and Lauslahti (2002), the pricing decisions are strategic decisions determining the profitability of the company. The competition within both the manufacturing industry and markets affect the

pricing greatly. Thus, the selling prices of the company need to be compared with the market selling prices in order to see whether the price is applicable. When there are multiple rival companies providing the same or similar products, it becomes very difficult for the company to determine selling prices that differ largely from the competitors (Stenbacka, Mäkinen, Söderström, 2016). The case company benefits from its original design and ingredients that are nowadays highly respected among customers. This way the company’s managers can increase the selling prices by a small markup without losing customers or facing a decrease in demand.

Table 8. Cost-plus pricing and comparison with current selling prices

Flavor	TC	Markup €	New selling price	Current selling price	Variation
1	1.84	1.24	3.09	3.00	0.09
2	1.70	1.24	2.95	2.70	0.26
3	2.08	1.24	3.32	3.20	0.12
4	1.55	1.24	2.80	2.60	0.23
5	1.64	1.24	2.88	2.70	0.19
6	1.75	1.24	3.00	3.20	-0.20
7	1.61	1.24	2.85	2.30	0.60
8	1.73	1.24	2.97	3.20	-0.23
9	1.51	1.24	2.75	2.40	0.37
10	1.66	1.24	2.90	2.70	0.18
11	1.74	1.24	2.98	3.10	-0.12

Source: Author’s own calculations based on data from Appendix 1.

#### 6.2.4. Increase in Number of Employees and Sales

In addition to the previous analyses with variations in the sales mix and selling prices, another evaluation was made. As the demand for the company’s products is constantly growing, the managers of the company would need to hire three more employees. The increase in labor force was estimated to increase the sales by two percent as the production output would increase due to these additional workers. The impact of hiring the employees was studied together with the new suggested sales mix as it was proved to increase the net income in Table 9.

Table 9. Contribution margin income statement with new employees and sales growth

	New sales mix with more employees	Difference compared to	
		Current sales mix	New sales mix
Revenue	3,870,362	290,259	75,889
VC	942,594	39,588	18,482
CM	2,927,768	250,671	57,407
FC	2,896,209	82,800	82,800
NI	<b>31,558</b>	<b>167,871</b>	<b>-25,393</b>

Source: Author's own calculations (Appendix 4).

The results in the contribution margin income statement showed that the increase in fixed costs due to the salary expenses would decrease the net income by €25,393 compared to the new sales mix. It can be argued that even though the new sales mix increases the net income, the company cannot afford additional labor unless the sales would increase more than two percent. The hypothesis  $H_1$  can be said to be correct as it suggested that the variations in fixed costs and sales revenue would increase net income. The increase in net income with the changes compared to the current sales mix was equal to €167,871 (Table 9). As it can be seen from the Table 9, the sales mix would not be preferred. The company could utilize part-time workers when there are peaks in the production, a method which would not increase the costs permanently but could help to increase the production output now and then.

### 6.3. Findings

The contribution margins for each flavor are high, being a positive factor for the case company. From the CVP analysis conducted for the case company can be concluded that with its current sales mix it will not be able to become profitable, unless the fixed costs decrease radically. Otherwise it is not possible to cover all costs with the revenue earned from sales. The suggestion of a new sales mix focusing on the products with higher contribution margins appeared beneficial. Using it showed a decrease in the break-even point, in other words, making it somewhat simpler to turn the company profitable. The contribution margin of €2,870,360 was large enough to cover the relatively high fixed costs and generate profit for the company.

In reality it can be difficult to apply a certain sales mix as the distributors choose which products they want to sell or buy, based on the demand of the customers. The customers do not choose the products they want to sell based on product contribution margins. The case company could direct the customers into a certain direction by using marketing campaigns. Also there the CVP analysis becomes useful as the managers need to calculate the cost-benefit relationship of the campaign.

As the contribution margin of each flavor is rather positive, an increase of selling prices would not be necessary. The increase might decrease the sales, therefore being too big of a risk for the company. Other aspects that the company could consider would be cutting down the administrative expenses, as the company's cost structure is mostly consisting of fixed costs. As a relatively new and small company, it would be important to keep the costs under control, and not spend too much financial resources on matters that might not be required immediately. The CVP analysis can be considered useful for the company as it pointed out costs that might have otherwise been left without attention. Thus, the hypothesis  $H_0$  assuming that the suggested variations for strategic decisions would be useful can be said to be correct. Applying the suggested changes would result in making better choices in production planning, therefore increasing the profitability of the company.

## CONCLUSION

The importance of cost accounting practices for internal purposes is increasing. Due to the high competition and improved technological advantages in manufacturing industry, the evaluation and precise knowledge of costs used for production is vital.

Cost-volume-profit analysis is a mathematical method used to determine the correlation between strategic decisions and economic consequences. It is one of the key methods to study and understand the behavior and relationship between activities, costs, sales and profitability. Generally, CVP analysis is used to identify the products that increase the value of the company and to examine the effects of possible changes by developing sensitivity analyses. Emphasizing the impact of fixed costs by conducting the CVP analysis helps with an effective profit planning. Break-even analysis and target income calculation aim at determining the sales volume and forecasting revenue needed to generate. Decision making of both selling prices and price mixes can become less time-requiring with the help of CVP analysis.

As the cost-volume-profit analysis is a single-product format, applying it in companies with multiple products might not provide as accurate results as desired. When conducting sensitivity analysis for a company that manufactures multiple products, it must be taken into account that the profitability increases when focusing on products that have higher contribution margin than the average. The selected product mix has direct effect on the profit of the company. Therefore, it is essential to pay attention to the choice of the mix which is sold as the possible growth in profitability can be used for improving the activities companywide. The limitation of CVP analysis within product mixes is that it assumes that the mixes and their prices are constant.

For the case company, the cost-volume-profit analysis appeared to be useful, revealing points where the managers could re-evaluate the activities in order to possibly create more profit. The hypothesis  $H_0$  was therefore correct and research objectives were achieved. As a rather young company, paying attention to value-adding factors as early as possible helps to affect the long-term profitability more simply. One part that the case company should focus more on, is the product

mixes manufactured. Currently, the production and sales are not concentrating on the commodities which have the highest contribution margin. The increase in the net income with the suggested sales mix clearly showed the influence of valuing products with higher CMs. The analysis was considered as a simple method which does not take too much time to conduct, therefore being well applicable to the quickly growing company without excess time or managerial resources. Based on the research and analysis of the calculations, it can be argued that the CVP analysis is a proper decision making tool for helping a small growing company to evaluate its activities more detailed. To improve the effectivity of the strategic decisions, implementation of CVP analysis would be beneficial. A limitation of CVP analysis in the case company would be the assumption of constant selling prices. This condition is not always fulfilled in an industry where the goods are sold to distributors, therefore there is always conversations and agreements for different selling prices under different circumstances.

It can be concluded that CVP analysis generates valuable awareness of the behavior of costs under different circumstances. The information can be furthermore used when considering the outcomes of various management decision effects, improving the quality of decision making.

Further research would be important to make on how accurate the CVP analysis, especially break-even analysis part, truly is in multi-product environments.

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## APPENDICES

### Appendix 1. Current Data of the Case Company

Flavor	% of total sold units	Selling price (€/unit)	Variable costs (€/unit)	Contribution margin per unit	Contribution margin ratio
1	5 %	3.00	0.79	2.21	74 %
2	19 %	2.68	0.72	1.96	73 %
3	10 %	3.20	0.97	2.23	70 %
4	6 %	2.57	0.59	1.98	77 %
5	15 %	2.69	0.65	2.04	76 %
6	6 %	3.20	0.65	2.55	80 %
7	10 %	2.25	0.72	1.53	68 %
8	11 %	3.20	0.62	2.58	81 %
9	14 %	2.38	0.59	1.79	75 %
10	2 %	2.72	0.66	2.06	76 %
11	2 %	3.10	0.66	2.44	79 %

Source: Kallio (03.04.2018), author's own calculations

## Appendix 2. Contribution Margin Ratios for The Sales Mixes

Current sales mix					New sales mix			
Flavor	Price (€)	Product sales to sales mix ratio	Product CM ratio	Weighted-average CM ratio	Price (€)	Product sales to sales mix ratio	Product CM ratio	Weighted-average CM ratio
1	9	0.064	0.738	0.047	12	0.082	0.738	0.061
2	24	0.172	0.732	0.126	13	0.092	0.732	0.067
3	19	0.137	0.697	0.096	26	0.175	0.697	0.122
4	8	0.055	0.769	0.042	10	0.070	0.769	0.054
5	19	0.135	0.758	0.102	16	0.110	0.758	0.084
6	13	0.091	0.797	0.073	16	0.109	0.797	0.087
7	9	0.064	0.679	0.044	5	0.031	0.679	0.021
8	19	0.137	0.806	0.111	26	0.175	0.806	0.141
9	14	0.102	0.751	0.077	5	0.033	0.751	0.024
10	3	0.019	0.756	0.015	5	0.037	0.756	0.028
11	3	0.022	0.788	0.017	12	0.085	0.788	0.067
Total	140			0.749	146			0.756

Source: Kallio (03.04.2018), author's own calculations



#### Appendix 4. Calculation of The Third Sales Mix and The Differences

	New sales mix	Increase in sales (2%)	New sales mix with	Current sales mix	Difference (1-2)	New sales mix (3)	Difference (1-3)
Revenue	3,794,472	x 1.02	3,870,362	3,580,103	290,259	3,794,472	75,889
VC	924,112	x 1.02	942,594	903,006	39,588	924,112	18,482
CM	2,870,360	x 1.02	2,927,768	2,677,097	250,671	2,870,360	57,407
FC	2,813,409	x 1.02	2,896,209	2,813,409	82,8	2,813,409	82,8
OI	56,951	x 1.02	31,558	-136,313	167,871	56,951	-25,393

Source: Kallio (03.04.2018), author's own calculations