LAMK Lahden ammattikorkeakoulu
Lahti University of Applied Sciences

PRICING INDUSTRIAL POWDER-COATING SERVICE

Case: Mittametalli Oy

LAHTI UNIVERSITY OF APPLIED SCIENCES
Faculty of Business and Hospitality Management
Degree Programme in International Business
Bachelor´s Thesis
Autumn 2016
Ulrika Mustonen

Lahti University of Applied Sciences
Degree Programme in International Business

MUSTONEN, ULRIKA:

Pricing Industrial Powder-Coating Service
Case: Mittametalli Oy

Bachelor's Thesis in International Business 55 pages, 2 pages of appendices

Autumn 2016

ABSTRACT

Powder-coating is an industrial surface finish method that has been constantly increasing its popularity due to the positive features it has compared to other metal surface finishes. This study investigates cost accounting and pricing of industrial service through a case company Mittametalli. The company under observation is a contract manufacturer operating in the field of metal industry and powder-coating. The aim is to create a clear understanding of industrial powder-coating´s cost structure. The knowledge is further employed to help the case company to achieve profitability through making right kind of pricing decisions. The final goal of this research is to create a cost structure and a pricing tool for them.

The author approached the topic inductively by using qualitative research method. The secondary data was collected from reliable published sources such as literature, articles and internet-based sources. Primary data was collected through author´s participant observations and semi-structured interviews.

The theoretical part consists of the concept of cost accounting in the service industry, which was first investigated to understand where costs come from. Also the concepts of profitability and budgeting were studied to demonstrate ways to measure and achieve profitability. Different types of pricing methods were also viewed to find a suitable pricing strategy.

The study results identify the biggest challenges in industrial service pricing. Pricing powder-coating service is a complex process requiring an adjustable pricing model, customized for the specific powder-coating unit under observation. Based on the findings, a cost structure was defined for Mittametalli and a user-friendly pricing tool was created.

Key words: cost accounting, industrial service, powder-coating, pricing

Lahden ammattikorkeakoulu

Kansainvälisen kaupan koulutusohjelma

MUSTONEN, ULRIKA:

Teollisen jauhemaalaamon hinnoittelu
Case: Mittametalli Oy

Kansainvälisen kaupan opinnäytetyö, 55 sivua, 2 liitesivua

Syksy 2016

TIIVISTELMÄ

Jauhemaalaus on jatkuvasti parantanut suosiotaan teollisena metallin pinnoitusmenetelmänä. Esimerkiksi märkämaaleihin verrattuna se on huomattavasti ympäristöystävällisempi pintakäsittelytapa.

Tämä työ tehtiin toimeksiantajalle Mittametalli Oy:lle, joka metallialan sopimusvalmistajana, sekä alihankintamaalausta tekevänä yrityksenä, koki hiljattain hankkimansa jauhemaalaamon hinnoittelun työlääksi ja haastavaksi ilman kattavaa kokemuspohjaa asiasta. Työn tavoitteena oli auttaa toimeksiantajaa ymmärtämään paremmin jauhemaalausprosessissa olevia vaiheita, sekä niiden kustannuksia ja sitä kautta hinnoittelemaan tuotteet oikein, jotta toiminta olisi kannattavaa.

Tutkimuksessa käytettiin induktiivista lähestymistapaa ja valittu tutkimusmenetelmä oli kvalitatiivinen eli laadullinen tutkimus. Työn ensimmäiset osiot koostuvat teoriapohjasta, joka perustuu julkaistuun kirjallisuuteen, sekä internet-peräisiin lähteisiin. Tutkimus suoritettiin empiirisenä tutkimuksena havainnoimalla, sekä haastatteluilla.

Teoriapohja koostuu kustannuslaskennasta, kannattavuuden hallinnasta ja budjetoinnista, sekä hinnoittelusta. Kustannuslaskentaa tutkittiin palveluyrityksen näkökulmasta, jotta saatiin selkeä kuva kustannusten synnystä. Kannattavuus ja budjetointi toimivat apuvälineinä kannattavuuden saavuttamisen- ja hallinnan ymmärtämiseksi. Myös hinnoittelutapoja tutkittiin sopivan hinnoittelustrategian löytämiseksi.

Työssä on käyty läpi kattavasti teollisen alihankintamaalauksen ongelmia hinnoittelun näkökulmasta. Työn tavoitteena oli myös luoda kustannuslaskentamalli, sekä mahdollisimman helppokäyttöinen hinnoittelulaskuri kohdeyritykselle. Työn tuloksena syntyi toimiva laskuri, jota yritys voi hyödyntää tarjouslaskennassaan, sekä hinnoittelussaan.

Asiasanat: hinnoittelu, jauhemaalaus, kustannuslaskenta, teollisuuden palveluyritys

CONTENTS

LIST OF FIGURES

1 INTRODUCTION

This chapter introduces the reader to the background of this study, the main research problems and the design of the research. Also the theoretical framework and thesis structure are shortly presented.

1.1 Research Background

Metal products and parts are coated to give the surface features that it does not originally have. The two most important ones of these are; (1) to create protection against corrosion and mechanical wear and tear; or (2) to give them the desired decorative finish. There are various types of surface finishes, but the most common ones are wet paint and powder-coating. (Jokinen, Kuusela & Nikkari 2012, 7.)

Powder-coating finish for metal products using electrostatics spray process is among the youngest surface finish techniques used today. It was first introduced in 1960s and ever since it has been increasing its popularity. (Pennisi 1997.) It is a technique where fine dry plastic powder is attached electrostatically to the surface of an electricity conducting item that is grounded. Items are then baked in the temperature of 200^{o}c for a suitable time. This heat treatment is called curing. The powder melts and sticks to the surface creating an even film that after cooling becomes a very hard and durable high-quality finish. The surface is resistant immediately after cooling down, thus compared to other types of surface finish methods, it is often cheaper option, as the process is a lot faster than liquid painting. Powder-coating is suitable for almost any kind of electricity conducting parts and products, as long as they endure the heat. This finish is suitable for both indoor and outdoor use and hence it can be used for typical household objects such as a washing machine or toaster, up to the sturdiest vehicles like snow plow. (Competitive Edge Coatings 2014; Jokinen et al. 2012, 176-179.)

As environmental issues have become a compulsory part of companies´ agenda, they constantly search ways to make their operations more

sustainable. One key factor behind the rising demand of powder-coating finish is that it has many eco-friendly features compared to other surface finish methods. For example solvents that can be found in many liquid paints are not used in powder-coating, so the coating process does not emit volatile organic compounds (VOCs) or hazardous air pollutants (HAPs). Powder or paint that misses the object is called overspray. In case of liquid paint this overspray is waste, but powder-coating overspray can be collected and re-used. Moreover the waste powder can be used for energy production. (Powder Coating Institute 2015.)

The powder-coating process includes many different stages such as hanging, pre-treatment, powder application and curing. As there are many activities to be completed before and after the actual coating stage, there are various costs related to the industrial powder-coating process that are hard to determine. That makes the service quite challenging to price. (Liberto 2013.) Because of that, the author approaches the topic starting from the cost accounting and moves on to profitability and pricing. Many studies have been made about pricing other types of services such as accounting service, but industrial services have their own features that make them very different from many other types of services. This work, among other things, aims to bring new insights and knowledge to the cost accounting and pricing decisions of industrial services.

The commissioner of this research is Mittametalli Oy. The case company has been operating as a contract manufacturer in the field of metal industry since 2012. Recently they also took control of a powder-coating paint shop located in the same premises of their manufacturing plant in Heinola. They have invested in improving the functionality of their automatic powder-coating line to better serve their own needs and all sizes of customers. They offer two types of powder-coating services: subcontracting powder-coating and designing and manufacturing of metal products with a powder-coating finish. Without previous experience in the field, pricing powder-coating service has proven to be challenging, especially because Mittametalli does not have their own product lines. As a contract manufacturer and a subcontractor, the products Mittametalli

processes are diverse; they come from various sources or are customized according to the clients' needs. Therefore the final purpose of this study is to provide them with an improved cost accounting model and a pricing tool.

1.2 Thesis Objectives, Research Questions and Limitations

The objective of this thesis is to understand the cost structure and pricing strategies of an industrial service company. In this work a special focus is put on the powder-coating service and the research is completed through a case company operating in the field. The goal is to gain deeper understanding on the matter and therefore to be able to help the case company with their cost accounting, profitability management and pricing. In other words, this research aims to help the case company to achieve profitability through understanding the costs occurring in this field of business and finding a suitable pricing method for them. The final goal of this thesis is to develop a budget and based on that, a pricing tool for the case company´s offer calculation and pricing.

Saunders, Lewis and Thornhill (2009, 20, 32-34) argue that it is not easy to plan a research without first being clear about the goal of the research. Defining a precise research question helps to give a clear direction to the research. The following research question was formed:

- How should Mittametalli price their powder-coating services in order to achieve profitability?

One main research question is defined, but there can also be additional sub-questions that help to find an answer to the main research question (Saunders et al. 2009, 32-34). To be able to answer the main question the following sub-questions were formed:

- What should be taken into account while pricing powder-coating service?
- What is the target sales level to break-even?

- What are the current problems of pricing powder-coating service in Mittametalli?
- How could Mittametalli improve their pricing strategy?

It is important to choose a topic that is specific enough to be feasible concerning the time and resources available for the research project. Limitations must be made for that reason. (Saunders et al. 2009, 32-36). The topic of this thesis is narrowed down to focus on the industrial powder-coating process of Mittametalli and the costs and sales target are only examined from that point of view, not from the entire company. There are many types of powder-coating paint shops and all of them have their special features that affect their capabilities and costs of operating a powder coating line. As this research will be conducted for this specific automatic powder-coating line unit, it does not directly apply to other type of powder-coating paint shop or other operations than powder-coating service in Mittametalli. However the pricing principles used in this work can be used for other types of industrial services as well. This work takes into account all the costs related to the powder-coating process except the unexpected costs, opportunity costs and sunk costs to make it clearer. These kinds of cost are for example the costs related to possible seizures caused by machinery failures or sick-leaves and need of re-painting certain products. Therefore, it is left to Mittametalli´s evaluation, how to include these risk factors in their pricing.

Armstrong and Kotler (2012, 48, 52-53) bring up that the price is an important factor in McCarthy's marketing mix. His classification is also called the 4 p´s of marketing, where the P´s stand for (1) product, (2) price, (3) place and (4) promotion. It can also be said that the costs determine the minimum price and the final price is set by the market (Burrow 2012, 409-410). However due to the limited time and resources available this work does not study pricing from the side of marketing. This thesis also defines the target customers for this kind of a powder-coating paint shop, but further research is needed to provide more profound image of company´s position in the market and to create a marketing plan.

This pricing tool takes into account the costs occurring in this powder-coating process and hence helps Mittametalli know the minimum price and adjustable target profit that Mittametalli can modify according to their evaluation of each specific case. As Mittametalli is a contract manufacturer, all the products to be painted are different from each other. Hence it is not possible to make a tool that gives correct prices without inserting the special features of each case separately.

1.3 Theoretical Framework

To be able to price products or services it is important to understand where the costs come from. There are various ways to price a product, but in general the costs determine the minimum price to be charged for producing a product or providing a service. (Burrow 2012, 410). For that reason the author starts the theoretical part from the concept of cost accounting in a service industry. This concept is introduced to the reader in order to give an idea where the costs in this kind of an industrial service come from.

The concepts of profitability and budgeting are also discussed to demonstrate how profitability can be measured and achieved. The reader is also introduced to different types of pricing methods to clarify the choice of costing and pricing methods used to define the case company´s cost structure and to develop the pricing tool.

Finally the case company Mittametalli is presented. The concept of contract manufacturer and the powder-coating process in the case company are explained to understand better pricing in this specific case, not only in general.

1.4 Research Methodology and Data Collection

While designing a research project, there are various things to consider. First the research approach should be defined. There are two types of research approaches: deductive and inductive reasoning. Employing

deductive approach, a theory and a hypothesis are created based on existing knowledge and they are then tested. Process starts from examining literature to identify theories to be tested. To put it another way, deductive reasoning aims to explain causal relationships between things. Inductive approach, however, moves from bottom-up, meaning that the process starts from data collection and based on the findings, a theory is created. In other words, inductive reasoning seeks to build a theory based on the analysis of the data collected. These two approaches might seem very different from each other, but they are not exclusive and it is completely possible or even beneficial to combine them both. (Saunders et al. 2009, 124-127, 489-492; Myers 2013, 23.) In this thesis inductive approach is mainly used, but yet it combines elements of both. The author moves from general information about cost accounting and pricing towards this specific case. The collected data is analysed and a theory grounded in the findings is developed and employed.

There are two types of research methods. They are called qualitative and quantitative based on their nature. Quantitative research normally investigates amounts: how much, how many, when qualitative methods focus on a phenomenon and answer questions why, how and what for? (Saunders et al. 2009, 151-154; Keegan 2009, 11-14.) The goal of this research is to investigate how the case company could improve their pricing in order to achieve profitability and create a functioning pricing tool. As the purpose is to investigate how something should be done, the author uses qualitative research method. Furthermore, it is often the method used for completing a case study (Saunders et al. 2009, 146).

Empirical data collection method gathers information and evidence through experiment and observations (Kothari 2004, 31). As the author worked in Mittametalli during the autumn 2015, it was possible for her to make direct observations about the functions of the powder-coating line, and the challenges of coating different types of parts and products. These observations and knowledge gained through this experience are used as the main primary data collection method in this research.

Even though the author has field experience from working in a powder-coating paint shop, it was thought that together with investigating the theory on the topic, external opinions from a professional in the field were needed. This would ensure that all the important factors of pricing a powder-coating service in this specific case are considered. Kyösti Mustonen, the owner of Mittametalli´s collaborator, Metapinta, was chosen to be interviewed. Kyösti Mustonen is a Process Engineer with a long experience being an entrepreneur in the field. He also knows well the challenges of pricing in this specific case, as he also participated in the start-up of this powder-coating unit as a specialist, together with the author. The language of this interview is Finnish.

To be able to set a minimum price, information about the cost structure of the powder-coating unit in Mittametalli is needed. It is also important to understand the current situation of the pricing in the company and what the main challenges are to create a functional pricing model. The CEO of the case company, Jari Kolehmainen, is interviewed to ensure that the pricing tool meets the expectations of the future users of this tool, and to gain understanding on the matters mentioned above. The language of the interview is Finnish.

Interview approach in both of the interviews was semi-structured meaning that the content of the interview is well planned beforehand, but the answers of the respondents can also guide the interview and additional questions can be made. This method was chosen as it is used when the interviewer wants to deeply examine the topic and it is important to understand the answers thoroughly. (Saunders et al 2009, 320.)

The following figure illustrates the research methods and data collection of this research:

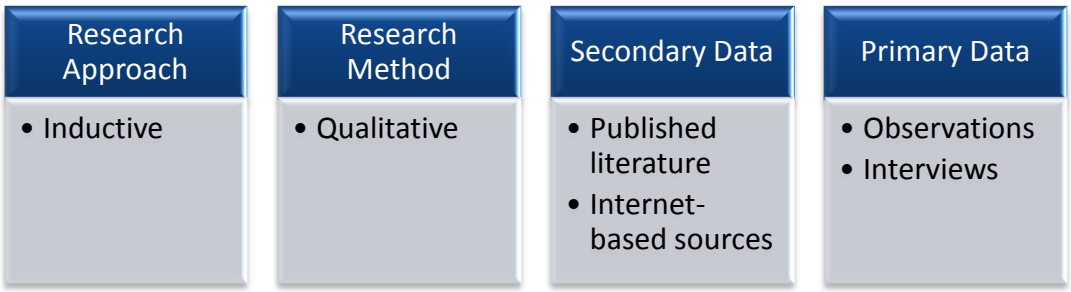

FIGURE 1. Research methods and data collection

1.5 Thesis Structure

This thesis is divided into a theoretical part and empirical part. Theoretical part investigates the cost accounting, pricing and profitability from secondary sources and the empirical part is strongly based on primary data such as interviews and observations. The thesis structure is presented in the following figure:

FIGURE 2. The thesis structure

As the figure illustrates, Chapter 1 introduces the reader to the background of this thesis, the main research questions, problems and limitations, the research design and data collection process and finally to the structure of the thesis. The purpose of this introduction is to familiarize the reader to the topic and reasons behind this research project. Chapter 2 examines theory on cost accounting from the service industry point of view, followed by Chapter 3 that focuses on pricing and profitability. Chapter 4 introduces the case company and this specific powder-coating line. Furthermore, the concept of contract manufacturer is explained.

Chapter 5 starts the empirical part of this research. It explains the planning and conducting of this research and the process of analysing the findings. Chapter 6 explains the steps be taken to create this pricing tool and instructions for it. These steps include defining costs and creating a cost structure. In Chapter 7 the author evaluates the results and their reliability and validity, as well as provides answers to the research questions. Lastly Chapter 8 summarises the research process.

2 COST ACCOUNTING IN THE SERVICE INDUSTRY

This chapter introduces the reader to the concept of cost accounting. First the concepts of service industry and cost structure of the industrial powder-coating process are shortly discussed in order to demonstrate their special features compared to manufacturing, merchandising and different types of service organizations. Costs terms and concepts and their classifications are then explained to give the reader an introduction to costs and their behavior. Different costing systems from the side of view of a service organization are presented and lastly the challenges of cost accounting are shortly discussed.

2.1 The Concept of Cost Accounting

A branch of accounting that examines the cost structure of a company is called cost accounting. The actual costs of the company´s operations that occur while executing an activity are observed and calculated. This data is then analysed in order to understand and control the costs and measure and improve efficiency. The most common use of cost accounting is product and service profitability calculation. (Horngren, Datar & Rajan 2012, 4-5.)

The main role of cost accounting is to provide information for internal use, which can be used in service and investment planning, budgeting and assessing the company´s performance. Cost accounting data can be used for example to set a minimum price for a product or service or to find a way to cut costs and make savings. Hence the concept is often mistakenly confused with the concept of managerial or management accounting as managers of a company use this information in their decision making process. (Drury 2012, 16-17; Horngren et al. 2012, 3-5.) Some newer publications (e.g. Drury 2012; Horngren et al. 2012) also talk about the concept of *cost and management accounting* without trying to distinguish them as it seems that these two terms are used very often synonymously. The author also makes no attempt on trying to separate them in order to keep it simple.

2.2 Special Features of the Service Industry

Cost accounting was traditionally used by manufacturing industries, but it has spread to cover service industries as well. To start with the costs, it is important to guide the reader through the differences of manufacturing, merchandising and service organisations as their cost structures are very much different. The main features of service, merchandising and manufacturing industries are displayed in the following figure:

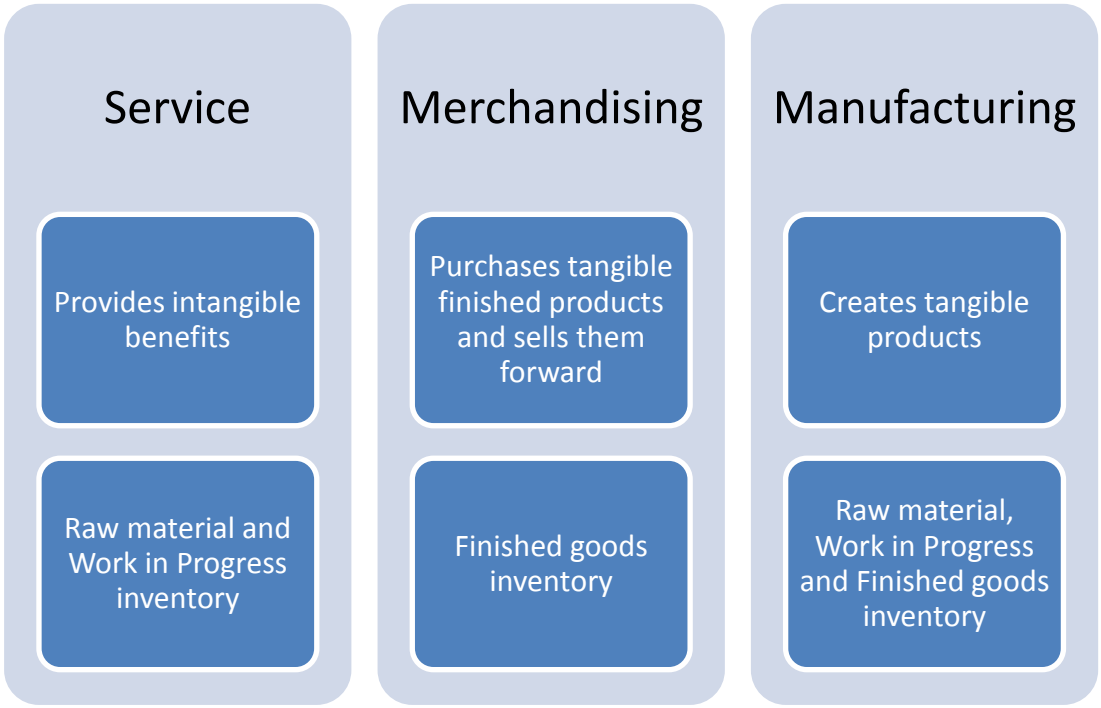

FIGURE 3. Special features of service, merchandising and manufacturing organisations (Horngren et al. 2012, 36).

As we can see from the figure above, service companies are often defined as *providers of intangible benefits*. Many times while talking about a service business, it is forgotten that not all the service industries only provide completely intangible services. Part of the service might be still in tangible form, for example a restaurant provides the customer with food that naturally is tangible, but restaurant is still classified as a service

organization. Raw materials can be the major part of costs for a manufacturing company, but in service industry labor plays more important role than raw materials. This however does not mean that there cannot be costs of raw materials needed to produce a service. In the previous example, restaurant is also considered to be a service organization, despite the fact, that the result of the service exists in tangible form and hence this kind of service also requires raw material inventory to deliver this service. In comparison to merchandising industry that has only finished goods inventory, service organization has either only work-in-progress inventory (WIP) or raw material and WIP inventory, but ready outputs cannot be stored. The fact that services are consumed immediately has been used as a method to distinguish the concept of service from other type of products. (Drury 2012, 24-25; Horngren et al. 2012, 36-38.)

It is hard to define service industry based on certain features. Many businesses have features, which are considered to be characteristics of manufacturing or retail organizations despite providing only services. Widely accepted classification of service industries has not been established. (Horngren et al. 2012, 36). In this case it is important to differentiate the industrial service business from other types of service organizations. Industrial service companies are many times very much like industrial manufacturing ones. Contract manufacturing for example is one form of being a service company and a manufacturing company at the same time. The process of manufacturing products can be physically exactly the same in both. The major difference in this case is that industrial service company does not produce goods to be sold, but offers manufacturing service instead.

2.2.1 Industrial Powder-Coating Service

Industrial powder-coating paint shop provides a powder-coating service. However, this kind of service business differs from many other types of service organizations that are providing intangible services such as

accounting office or marketing company. One of the greatest differences is that the labor costs are only a part of the total costs in industrial coating service. The process requires a lot of machinery and also some raw materials, when in other types of service businesses labor might be the major cost factor. Hence, powder-coating service is in many ways even closer to manufacturing industry than service industries. In that sense the traditional knowledge of cost accounting in a service company does not apply in this case without consideration. In automated powder-coating process there are costs of running the machinery just like in manufacturing organisation and also raw material costs of the paint and detergents and other equipment used in the pre-treatment process.

2.3 Classification of Costs

In a service industry, a cost is a resource that has been used to deliver a service. It is often measured as a monetary value of the resource used to produce this specific service. Costs can be classified by the type of expense such as direct labor, direct materials or indirect costs or by cost behaviour like variable and fixed costs (Drury 2012, 24).

All the pricing decisions start from the process of defining cost objects. Cost object is simply something to which costs are assigned. For example if you wish to know the cost of a certain product, that product becomes a cost object. Cost object could be hence a service, project, customer or activity to mention a few. (Horngren et al. 2012, 27-28.)

2.3.1 Direct and Indirect Costs

It is not always easy to assign cost to a specific cost object. For example Horngren et al. (2012, 28) argue that the cost of raw material is easier to assign to a product than costs of supervision. That is why costs are classified into direct and indirect costs. This division depends on the type of the cost object and in some cases the same cost can be treated as a direct cost in one case, when in another case it is seen as an indirect cost.

Also the same cost can be indirect cost of one cost object and direct cost of another cost object. (Drury 2012, 24-26; Horngren et al. 2012, 28, 30.)

Direct costs are costs that can easily be traced to a specific cost object. This process is called *cost tracing*. Direct costs are further divided into *direct material costs* and *direct labor costs*. As discussed before, in a service industry the costs of labor often play the most significant role. However in a service industry, that requires material purchases to provide a service, there are direct material costs as well. (Drury 2012, 24-25; Horngren et al 2012, 28-30.) In powder-coating paint shop these costs come from the powder or copper hooks to hang the products to the line to give an example. However sometimes it is more cost effective to treat some of these costs as indirect costs if the expense of tracing them exceeds the benefits of calculating more accurate service or product cost. In case of the powder-coating paint shop the cost of copper hooks could be treated as indirect cost; although it could be easy to trace this cost to a specific service, the impact is not likely to be significant. Direct labor costs for example cover the costs of production such as the working hours of the person using a machine that converts raw materials into a product. In service industry direct labor costs are the labor costs of providing a service that can be easily traced to a specific service. (Drury 2012, 25.)

Indirect costs on the other hand are related to the cost object, but they cannot be specifically traced to them or tracing them is not cost-effective. This kind of costs can be for example the costs of electricity or management. The process of assigning indirect costs to a cost object is called *cost allocation*. (Horngren et al. 2012, 29.) Indirect costs include indirect labour, materials and expenses. As mentioned above, indirect costs are not so easy to identify with a specific cost object like particular product or service. Hence the term *overheads* is often used instead. Overheads are divided into different categories like manufacturing, administration and selling overheads. (Drury 2012, 25.)

2.3.2 Fixed and Variable Costs

One of the most common methods divides the costs into *variable* and *fixed costs* based on their behaviour. Roughly said, variable costs are costs that change proportionally with each unit produced, when fixed costs stay the same despite the amount of goods or services produced. However both of these claims are only true up to a certain point. In the long run all the costs change and hence they are variable. Because of that the division into fixed and variable costs should be made for a specific activity and for the time period under observation. (Jyrkkiö & Riistama 2008, 46-50; Horngren et al. 2012, 30.) Examples of variable costs are the costs of raw material or direct labor. Fixed costs are for example the rent or leasing expense. Sometimes this division into fixed and variable costs is hard to make and for that reason some costs are actually called semi-fixed, semi-variable or mixed as they contain features of both, fixed and variable costs. Whether a certain cost is considered to be fixed or variable also depends on the features of the goods or services produced. Labor is many times considered to be variable cost if we think about service industry, but in manufacturing for example it could be more often treated as a fixed cost. The sum of fixed and variable costs is the amount of total costs (Jyrkkiö & Riistama 2008, 50-52; Horngren et al 2012, 31-32.).

2.4 Cost Accounting Systems

As mentioned above, the first step is to define cost objects. After the cost objects have been defined, the costs are accumulated and they are classified into direct and indirect costs. The second step is to assign costs to cost object that can be for example a product or a service. As mentioned earlier, the process of assigning direct costs to cost object is called cost tracing, and in case of indirect costs the term cost allocation is used. The process of assigning costs to cost object is demonstrated in the following figure:

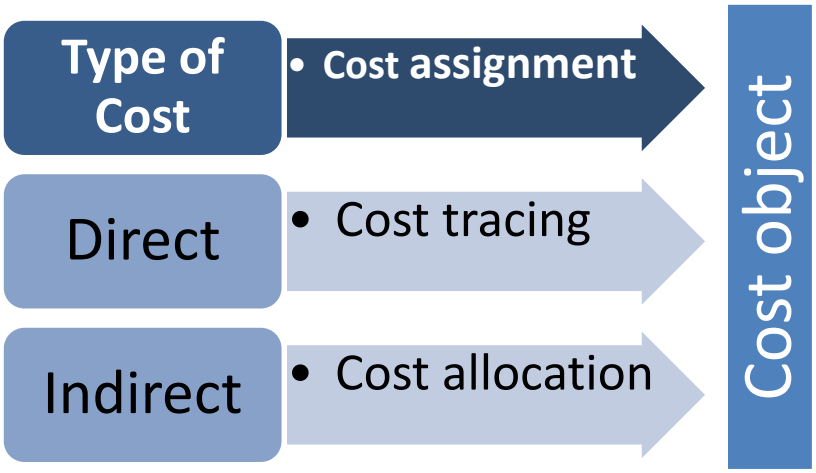

FIGURE 4. Cost assignment to a cost object (Horngren et al. 2012, 29).

There are many ways to classify costing systems and these divisions might even be a bit confusing at times. According to Kimmel, Weygandt and Kieso (2011, 798-799), the primary traditional cost accounting systems are: (1) *Job order cost system;* and (2) *Process cost system*. Information can be accumulated based on one of these systems or using *hybrid system* that combines them both. Drury (2012, 252) classifies costs systems into: (1) *direct costing systems*; (2) *traditional absorption costing systems*; and (3) *activity-based costing systems* (ABC). This classification is made based on their level of sophistication and the way the costs are assigned to cost objects. Level of sophistication refers to the level of simplicity of the costing method. In the latter division, job order costing and process costing are included in the second category; traditional absorption costing systems.

Direct costing systems only take into account the direct costs and hence they are good tools to define the negative or low contribution products. They should only be used if the indirect costs are insignificant portion of organizations costs. (Drury 2012, 252-253.) Absorption costing systems assign both, indirect and direct costs to cost objects. Traditional and ABC systems are both absorption costing systems, but they have some

differences. Drury (2012, 253-254) argues that the main ones are that ABC has more cost centres and more variety of second-stage cost drivers.

Cost drivers (or costs allocation bases) are variables that can cause change in the costs of an activity. These factors are resources that the cost objects are consuming. Thus more of them are consumed, if the activity level or volume increases. This kind of relationship between variables is called cause-and-effect relationship. (Horngren et al. 2012, 32.) To give an illustration, if a product is consuming a lot of machine hours, costs allocation base could be direct machine hours of that product. In other words, overhead costs could be allocated to our cost object, which is this product in question, based on the proportion of direct machine hours it consumes. In this case the cost driver would be direct machine hours. The base to which the costs are first assigned to, before allocating them using cost drivers is called *cost pool* (also called cost center). Cost pool is a grouping of individual indirect costs that could be for example a department. (Drury 2012, 45-51.)

2.4.1 Activity-Based Costing

Activity-based costing (ABC-costing) is a relatively new costing method. It uses activities that are needed to produce the product or service as a base for pricing. On other words the overhead costs are allocated to an activity that is part of the process of providing a service or a product. ABC-costing is a method that is often used as a supplementary method for another type of costing method, not as a replacement. For example job costing method can be used to accumulate and assign direct material and direct labor costs and the overheads are allocated using ABC-costing. It can be hence said that ABC is often more like an accurate overhead allocation approach than a costing system, although it can be used for that as well. To start implementation of ABC-system can be quite complex and costly process as it requires identifying various activities. (Kimmel et al. 2011, 766, 888-905.)

2.4.2 Job Costing

Job order costing system or job costing system accumulates information about costs of a specific job or batch produced. The goal is to determine the cost per job meaning that costs of each completed job are measured. In industrial service company this could be a batch of products with the same color coated. This system is mainly used if products or services produced are significantly different from each other. (Kimmel et al. 2011, 799-800.) Job costing can be used in pricing industrial service as well as it is a lot easier to calculate costs for a batch of products than for a single unit; there are many batch related special features that cause costs.

2.4.3 Process Costing

Process costing system is used if the products or services are identical or very similar and they all are produced the same way. For example, this method is commonly used in food processing or brewing, as it is hard to allocate costs to an individual unit. When using this method, costs are allocated to a process instead. Hence also an average unit cost can be calculated when using this system; Total costs allocated to the process are divided by the amount of units produced. (Kimmel et al. 2011, 799-800.)

2.5 Problems of Cost Accounting

Sometimes it is hard to define the costs that should be taken into an account while completing calculations. Some costs are more relevant to the decision making process than others. Drury (2012, 60, 195) argues that only the costs that are affected by the decision to be made are relevant. The relevancy of the costs and revenues of each case should be evaluated separately, as the same factor might be relevant to one decision and completely irrelevant to another. It should also be evaluated how accurate calculations of costs are the most cost effective. Sometimes time and resources used for implementing a very complex and accurate costing system are exceeding the benefits received from the accurate product cost

data provided. (Jyrkkiö & Riistama 2008, 56-59; Drury 2002, 195, 259-270.)

3 THE CONCEPTS OF PROFITABILITY AND PRICING

Too often companies pay little attention to the costs occurring in their business as long as they are doing fine. However, in terms of maintaining and improving profitability, understanding the costs structure is very important. The impact of high fixed costs can be well noticed in case of sales going down and then it could already be too late to do something about it. (Horngren et al. 2012, 26-27.)

As the previous chapter gave an introduction to cost accounting, this chapter will now demonstrate how to use that knowledge in decision making. The chapter examines the concepts of profitability and pricing.

3.1 Profitability

The profitability of a company is measured by the amount of profit that it yields. To be profitable, the revenue must be higher than the costs. There is no fixed value how much a company should yield profit. Measuring profitability can only be done by comparing the company´s performance with other same sized companies operating in the same field of business, or to their own past performance. (Andersson, Ekström & Garbrielsson 2001, 40-44; Jyrkkiö & Riistama 2008, 38-39.)

3.1.1 Cost-Volume-Profit Analysis

Cost-volume-profit (CVP) analysis is an important planning tool in decision making. It studies behaviour and relationship of the amount of units sold, selling price and variable cost per unit with a purpose to demonstrate the changes on profit if one variable is changed and others stay the same. With this method it is possible to estimate the impact of different choices such as reducing selling price. CVP analysis consists of various *"what-if"* calculations. One of them is calculation of unit contribution margin that is used to define the *break-even point* (BEP). Also calculations included in the CVP analysis are *target net income* or *operating income*, *sensitivity*

analysis and *margin of safety*. (Horngren et al. 2012, 62-75; Kimmel et al. 2011, 947-958.)

Break-even analysis focuses on the minimum sales level needed to cover fixed costs. Break-even point hence means the sales level, where there is exactly the same amount of revenue than total costs, and hence the operating income equals to zero. BEP can be calculated also in amount of units needed to be sold in order to break-even. (Horngren et al. 2012, 68-69; Kimmel et al. 2011, 951-954.)

As break-even point determines the level were sales are not yielding any profit, that calculation can be altered by adding the target income to the amount of fixed costs. If for example target of 1,000€ operating income is set, the results of the calculations illustrate the amount of sales needed that there will be either; operating profit of 1,000€; or the corresponding amount of units to be sold to achieve that. (Horngren et al. 2012, 70-72; Kimmel et al. 2011, 954-956.)

Sensitivity analyses measures the impact, if estimated target is not achieved. Margin of safety is the difference between the actual or expected sales and the BEP. It demonstrates the amount, how much the estimated or actual sales could be lower without making loss. (Horngren et al. 2012, 73-75.)

3.1.2 Budgeting

Revenue can be calculated for a coming period. It is then displayed in a form of a budget. It can use a same form as operating profit report; revenues are first displayed and then the costs are deducted. The figures of the budget indicate the expected operating profit and costs that are based on the target values that the company aims to achieve. This kind of set target value might be based on the expected increase of sales, changing prices or reduced costs. Budget is often made for a quarter of a year or for one month. (Andersson et al. 2001, 29-36.)

As mentioned before, budgeting is a tool that companies can use while setting goals for their sales and important function of the budget is to work as a measure on how well the targets were reached. If the budget was made for a month, the budgeted values are compared to the real values of the month under observation, when information of the actual values is available. (Drury 2012, 361-362.)

3.2 Pricing

Cost information is important for all the companies, but some types of businesses use that information more than others in pricing decision making. Drury (2012, 227-228) argues that especially companies that sell products or services with high diversity and complexity or are market leaders, base their pricing on costs. He divides the companies into two categories; *price takers* and *price setters*. Price takers have less influence over their pricing as the prices are set by the forces of overall market, supply and demand. These kinds of companies are often operating in industries with few operators and the products are hard to distinguish from the others on market. The other group, price setters, can influence their pricing up to a certain point; in their case also some external factors such as competition alter the final price. As the purpose of this study is to provide a pricing model in a form of pricing tool to a case company, the author focuses on price setters.

3.2.1 Pricing Strategies

While making pricing decisions, *long-run* and *short-run* strategies must be considered separately. Coverage of total costs has less impact on decisions made in special individual cases, when it is very important factor to clarify and consider in long-term decisions.

3.2.2 Long-Run Pricing Decisions

According to Kimmel et al. (2011, 436), *long-run* pricing strategy aims to provide stable and predictable selling prices to build long-term customer relationships. In long-run pricing it is important to know all the costs that the prices will be set accordingly to cover the costs. Target selling prices can be calculated using various approaches such as cost-based pricing and market-based pricing. A pricing approach that sets the selling price by calculating the product costs and then adding the desired profit margin is called *cost-plus pricing*. Its reverse method*, target pricing* (also called target costing) starts the price setting process by considering the customer and the markets. The target selling prices, however, rarely end up being the actual selling prices of the products or services. The price is often adjusted upwards or downwards, depending on the management´s consideration. Price can be increased if it seems that the customer is prepared to pay more, and correspondingly decreased if it seems too high. (Drury 2012, 229-234; Kimmel et al. 2011, 436-439.)

3.2.3 Short-Run Pricing Decisions

As mentioned before, price-setting companies aim to price their products accordingly to cover their costs. In some cases it still might be beneficial to consider an exceptional pricing strategy. For example, if the organization is having lower capacity utilization temporally, and there is a change to give an inexpensive bid to beat the competitors' bids for one-time special order, it could still consider taking the project despite the fact that it does not fully cover the costs. This kind of decision should be made with consideration. One important factor is that the bid-price will not affect the future selling prices as the customer expects to get the same price next time as well. Other factors that the company should consider are the *incremental costs.* They consist of extra material, labor or energy consumption or any other extra costs that incur from completing the project. The offered price should be higher than the incremental costs, but it can still be lower than company´s normal price. The amount that

exceeds the incremental costs still give partial cover to the fixed costs that otherwise would not have been received. This kind of pricing strategy does not work in the long run and should only be used to compensate fixed costs if there are no more profitable opportunities in sight. (Drury 2012, 228-229)

4 CASE: MITTAMETALLI

In this chapter the relevant information about the case company is presented as well as the acquisition process of this powder-coating unit. This chapter also further explains the challenges of pricing in a contract manufacturing company. Powder-coating process in Mittametalli´s unit is shortly presented to create a clear picture of the different stages of the process in this specific case. That information is needed to understand the cost structure of Mittametalli that is used as a base while creating this pricing tool.

4.1 Company Overview

Mittametalli is a contract manufacturing company operating in the field of metal industry. The company was established in 2012, but the management has a long experience in working in manufacturing business before that. Being a contract manufacturer in this case means that Mittametalli does not have their own product line at all. All the goods manufactured are customized for their customers, meaning that they are done according to their needs. They offer design, assembling, packaging, storing and powder-coating services, from which the customers can choose the ones they need. So basically, the customer could get a ready product from just one place, drafted from the scratch, or use only one of their services such as powder-coating for their own products. (Mittametalli Oy 2016.)

If a company wants to outsource a part of their production they normally do it through a competitive bidding process, which means that they invite bids for a certain project from various service providers. In terms of pricing this means that the subcontracting company needs to price their services correctly beforehand to make the best offer and win this competitive bidding to get the job in the first place. On the other hand the service cannot be offered with a too low price or the company will not be profitable in the long run. (Kolehmainen 2016.)

4.2 The Acquisition of the Powder-Coating Paint Shop

Pro Pinta had been running a powder-coating unit in the same premises where Mittametalli has their metal product manufacturing plant. In early September 2015 they decided to shut down the unit. Mittametalli decided to purchase the unit as they had a need for powder-coating finish of their products. The CEO Jari Kolehmainen (2016) estimates Mittametalli´s need of coating services to increase in the near future. There is also space for growth as the unit is fairly large and the capacity is not yet fully utilized.

No former powder-coating paint shop workers stayed in the service of Mittametalli. Despite the long experience in the field of metal industry, the management of the company had not sufficient experience to start this business on their own. With this in mind, Mittametalli had to hire external help to start with business and train their workers. The author participated in the early stages of Mittametalli`s start-up of this unit in autumn 2015, with an experienced team.

In the start-up process the functionality of the paint shop was evaluated and improvements were made to the automatic line. The evaluation of this line showed that it is best used for big batches of products with simple shape so that the full capacity of the line is used. However, as a contract manufacturer, Mittametalli tends to coat also smaller batches of products and more demanding designs. Additional manual powder-coating booth was added to the line to improve its efficiency and functionality, making powder-coating of small batches more cost-effective and coating of parts with a difficult shape possible.

4.3 Powder-Coating Process in Mittametalli

Mittametalli has an automatic powder-coating line that has different stages such as wash and powder application. The items are hanged up to the circular line manually, but then the line takes them all the way through these stages independently, until they are taken down manually. Therefore powder-coating is a continuous process in Mittametalli. The line has a

speed of one meter per minute that is slow enough to be able to hang parts and unload the line while it is running. The line with all the stages is demonstrated in the following figure:

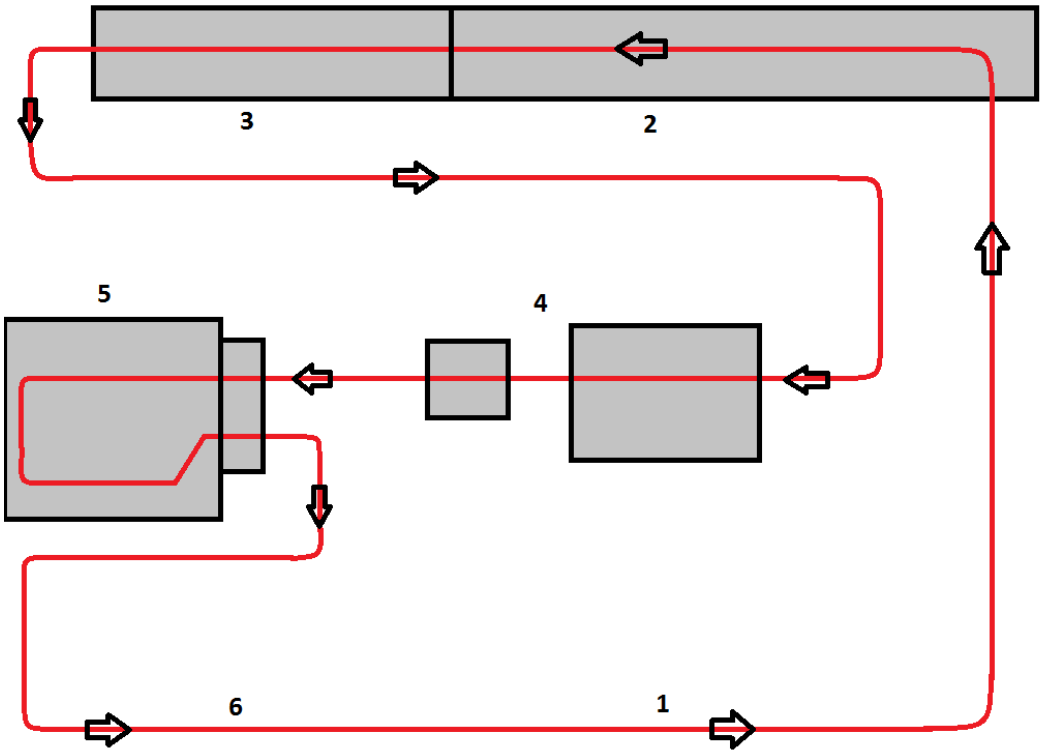

FIGURE 5. Powder-coating line of Mittametalli

1. Hanging area
2. Pre-treatment including wash, application of corrosion coating and rinse
3. Drying oven
4. Powder application (Automatic and manual booth)
5. Curing oven
6. Unloading area

At the beginning, the items arrive in pallets from the manufacturing area or directly from the customer, together with all the information regarding the requested colour and delivery time. Using the given data, the team plans the workday and decides which parts will be primarily taken to the coating line, considering different factors such as the amount of parts, their shape, colour and requested delivery time. There are all kinds of colors with various shades and special features available in powder-coating. In order to optimize the process, the team aims to coat as many batches of products that use the same colour, as possible in a row. The process of changing color takes a while and hence it is an additional cost. The line must be either stopped, or sufficient line meters should be left empty in between the batches, so that there is time to change the color before the next batch of items arrives to the powder application part of the line. To optimize the capacity utilization, batches of items to be painted with the same shade should be collected, and all coated on the same day. By doing this they can minimize the number of times the painting booth needs to be cleaned, and prepared for the next colour, and avoid having long empty gaps in the line. As often being the last stage of the production process, many products arriving to the surface finish process are in a hurry due to production delays or otherwise very tight schedule and it is not always possible to plan the coating order optimally.

4.3.1 Hanging Design

Once the parts are chosen, the respective pallets are taken to the hanging section of the line marked with number 1 in the Figure 5. At this stage the parts need to be inspected to determine the best way to hang them, considering that they cannot exceed the maximum dimensions of the line. As it can be seen from the figure, the line goes up and down, around corners and through the machinery, so there must be enough space for the products to move accordingly. Hanging design is also important to avoid liquid accumulation during the washing process. If the items have complex shapes, such as corners that can create a cup, they might collect water there during the wash, if they are not hanged correctly. The items

are not inside the drying oven long enough to all that water to vaporise. The curing process is longer, and the oven temperature is higher. The accumulated water would have time to vaporise there, but it would leave the surface uneven, as it bubbles under the paint.

Copper hooks are used to hang the items on the line; these can be different in length and thickness, and the team will have to decide which is the most suitable for each specific case. The hook has to be thick enough to stand the weight of the part, but it cannot be excessively thick, as it would leave a bigger mark on the surface of the product. These hooks also get coated in the process, and they are hence disposed after every use. There are also various types of racks and hangers available for powder-coating line. The use of these should be considered case basis.

In certain occasions, the use of silicon plugs or masking tape is necessary to keep some areas of the parts clean from the coating. Reasons for that are, for example; need of electric conductivity of the area; or glue is used to connect the parts with other pieces after the coating process. The plugs and tape need to be placed by hand and removed after the coating is ready.

4.3.2 Pre-Treatment

After the parts are hanged on the line they go immediately into an automated cabinet spray washer marked with number 2 in Figure 5. They are washed with chemicals that remove effectively grease and soils that the parts might have on their surface. The washer also contains Bonderite NT-1 conversion coating, which is applied to the surface of the parts during the wash, to improve corrosion protection of the parts. It is very important to clean the parts thoroughly, as any existing dirt that stays between the metallic surface and the coating, might cause quality issues during the curing process. After the wash, items are rinsed with water in the same cabinet, and finally they continue along the line into a drying oven, that uses a strong flow of heated air to dry, and remove the remaining liquids, that the items might have.

4.3.3 Powder Application

As mentioned earlier, Mittametalli has two different powder-coating booths: an automated booth and manual powder-coating booth market with number 3 in Figure 5. The automatic painting booth must be prepared with the requested colour before the parts reach this stage of the line. Furthermore, the motion of the automatic powder spray guns is adjusted depending on the dimensions of the parts. In case that there is only a small batch of parts, or pieces that cannot be coated using the main automatic painting booth due to their complex designs, there is a secondary booth that uses a manual powder spray gun. That allows the team to paint these types of parts, and guarantee the quality of the finish, or reduce the costs caused by the color changing process in the main booth.

When the line takes the parts close to the painting booth, a detector will automatically start spraying the powder-coating onto the hanging objects. Different parts and colours require different quantities of powder in order to get best results: for instance, some yellow colours have the tendency to be easily translucent, meaning that the metallic surface underneath the coating is still slightly visible, if the quantity of powder sprayed is insufficient, whereas other colours like grey or blue normally cover the surface more efficiently. Although most of the surface is coated using the standard layer thickness, a thicker coating layer is sometimes requested for parts that need extra resistance against corrosion. This can also be adjusted from the control panel of the painting booth.

The first items that go through the painting booth must be always inspected to assure that the amount of powder sprayed is optimal, and that the object has been fully covered. If there are some areas that need more powder, they can be fixed manually using an auxiliary manual powder spray gun and the settings in the computer should be adjusted so that the following parts will not require any extra spraying. If the layer is too thin it might be translucent at parts and the finish is uneven.

4.3.4 Curing

After the line takes the items through the painting booth, they go into the oven market with number 5 in Figure 5. In the oven the powder-coating melts and fuses together, creating a uniform layer. This process of baking the parts is called *curing*. Thicker parts need more time to heat, so they also need more time in the oven to ensure that the paint sticks to the surface well enough to be resistant. In case of Mittametalli the speed of the line must be set accordingly, as the process is continuous. The curing oven must be heated in advance up to the optimal temperature of 200^{o}c. Both ovens of Mittametalli (drying oven and curing oven) use gas to heat.

When the items come out of the oven they need to travel along the line some meters before they can be taken down, as they have to cool down to ensure that the curing is complete; when the coating is hot, it is susceptible to damage by touch, because the material is not hard enough. However, the coating reaches its full resistance immediately after cooling down. For that reason, powder-coating is faster surface finish method than liquid paint.

4.3.5 Unloading and Packaging

As soon as the parts cool down, the team examines them carefully to discard any flaws on the finish. If the result is satisfactory, they begin unloading them from the line and start the packing process. The unloading area is marked with number 6 in Figure 5.

Usually ready coated parts cannot be packed same way as they were before the coating; this is because the surface needs to be protected from scratches and hits that may happen through the transportation. For this reason, it is necessary to use plastic foam sheets, paperboard, cling film and other materials. The parts are finally arranged in pallets, and taken to the separate sending area, from where they are sent to the customer or customer´s requested location.

5 EMPIRICAL RESEARCH AND DATA ANALYSES

This chapter introduces the empirical research completed in this study. Chapter starts from revising shortly the design and formulation of the research explained in more detail in Chapter 1. Then the data collection process is presented and data is analysed, meaning that the findings from data collection are discussed.

5.1 Design and Formulation of the Empirical Research

As mentioned earlier in Chapter 1, qualitative method was chosen for this research. Qualitative research method is often used to study a phenomenon; hence it is often used to complete a case study. Typical research questions for qualitative research aim to answer questions why and how to give an example. (Saunders et al. 2009, 151-154; Quinlan 2011, 108-110.) As this thesis aims to provide deeper understanding on a specific case, qualitative method serves the objectives set for this research project better than quantitative method.

Empirical research uses observations and experiment rather than theory to collect information (Kothari 2004, 31). The data collection techniques employed in this thesis are semi-structured in-depth interviews and participant observations. The interview questions can be found as appendices of this study. The author also used her former knowledge gained working in a powder-coating paint shop to complete this study. The data collection process is further discussed in the following sub-chapter.

5.2 Data Collection

This chapter further demonstrates the data collection process of this thesis. Data was collected from two interviews and author´s observations. The figure illustrates the data acquisition process:

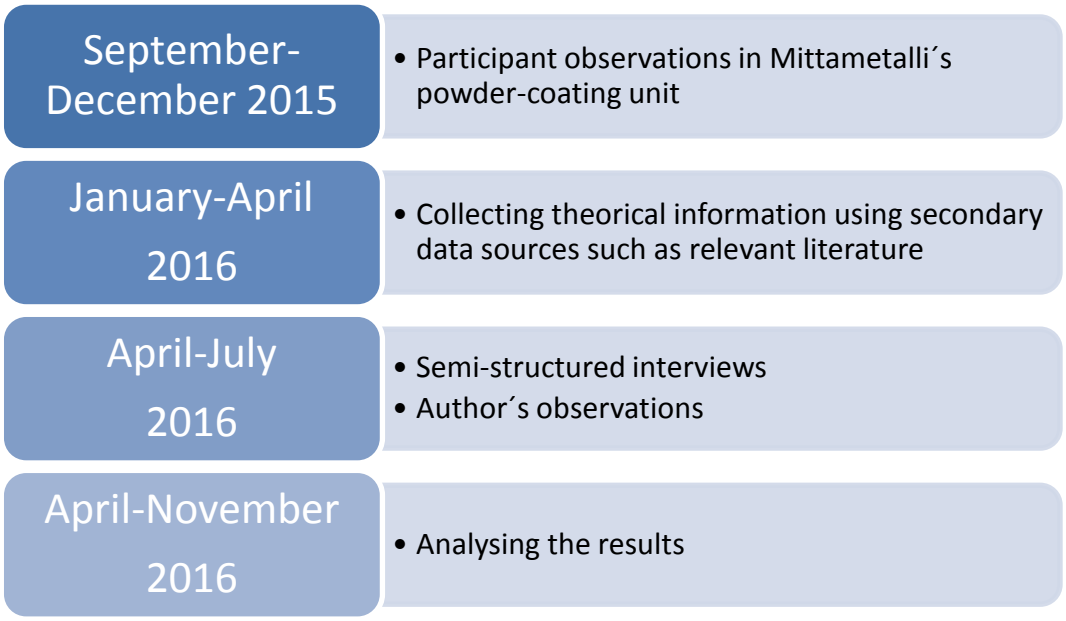

FIGURE 6. Data collection process

As we can see from the figure above, the data was collected through the author´s participant observations in the field during the autumn 2015 and in late spring 2016, when the new line was ready in Mittametalli.

The CEO of Mittametalli and future user of this pricing tool, Jari Kolehmainen, was interviewed in April 2016 to get a proper understanding on the expectations of the case company and current situation of the company pricing and cost accounting.

A person with a long experience in the field of powder-coating industry as an entrepreneur, Kyösti Mustonen, was interviewed as well. He has worked as subcontractor, as well as, ran a powder-coating unit as a part of a metal product factory. The author will compare his recommendations and suggestions to her own knowledge obtained through experiment and observations in the paint shop of Mittametalli. This way a more profound and reliable image of the possible challenges of pricing powder-coating can be achieved.

5.3 Data Analyses

In this section the results of the research completed are explained shortly. Findings from observations and interviews support each other so well that there was no need to separate those two. Hence they are analysed in the same subchapter. The findings are then further discussed in context of creating the pricing tool in Chapter 6.

5.3.1 Interviews and Observations

The users of this pricing tool were hoping that the tool would be simple enough, that it is easy to use. If it is too complicated, there is a risk that the personnel will not be willing to learn to use it and rather stick to the old methods. The tool should take into account the major costs occurring in the powder-coating process while defining a price and set a viable occupancy level and target profit accordingly. Mittametalli expects to use the tool in their offer calculation and pricing. One factor that was considered important was that it would be adjustable in case of changing variables, which affect the costs, such as the price of the powder-coating shade used, or the batch size. The pricing tool should be easily adaptable in terms of changes in fixed costs as well; even though these do not change so frequently, it is still important to be able to adjust them, so that the tool will not become obsolete.

The interviews provided valuable information about the current situation of controlling the costs and challenges of pricing in this specific case. Mittametalli has been pricing their products without set standards and coherent method, and various persons have been making pricing decisions in individual cases. At the current state, the company often uses too general approach; many important factors that generate extra costs are not considered. On top of that, the pricing process is time consuming. This is due to the limited knowledge of the factors affecting the costs of the powder-coating unit and influence of the mood is also present in pricing decisions. The company is facing problems in differentiation of products in their pricing and this is very important factor as almost all the parts coated

in Mittametalli have special features that affect the costs and hence the price. The interviews also provided important information concerning the cost structure of Mittametalli´s powder-coating unit that will be further discussed in Chapter 6 as a part of the process of designing the cost structure model and the pricing tool. The information was mainly provided in oral form as Mittametalli does not differentiate the data of different units inside the company and therefore the statistical information would have been hard to provide for the powder-coating unit. The estimates given were evaluated to be accurate enough to provide reliable results. Also there is a possibility to adjust those figures used in this tool if Mittametalli differentiates the accounting of the powder-coating unit from the accounting of the whole company at some point.

Another key thing to remember is that Mittametalli does not have its own product lines, but all the products are customized. It is much harder to price powder-coating service in a contract manufacturing or subcontracting company than in a normal manufacturing company that produces certain goods. When the company repeatedly coats similar types of parts, they can measure the time used to complete the process and other resources used. This data can be then collected and used for the costing purposes of the second batch of the same product. In case of Mittametalli, only some items are standard and have multiple batches. That is to say, most of the products coated are customized, so the pricing process must be started from the scratch. Usually subcontracting company cannot influence the schedule of the parts arriving and their requested delivery times. Naturally this has its influence on capacity utilization planning and hence reduces possibilities to reduce costs by optimizing operations.

As explained in the Chapter 4, the outsourcing process often starts from a competitive bidding process. Contract manufacturing and subcontracting companies easily give too low bids in order to win the bidding, and make a deal, but in the long run it would cause serious problems if the service is sold with a too low price, that in the worst case does not even cover the costs.

Common mistake is also to underestimate the costs of the small batches. The powder-coating unit in Mittametalli is large. Now with the new improvements, it is suitable for all sizes of batches and parts up to length of 3 meters, height of 1.4 meters and width of 0.7metres. The optimal situation would be that the items to be coated come in big batches and are simple enough not to need special arrangements for hanging design. On top of that they should have a good filling rate of the line; meaning that they can be hanged in such way, that they cover the line as fully as possible. Hence the projects that suit best for Mittametalli are for example of big batches of sheet metal products.

6 CREATING THE PRICING TOOL

In Chapter 4 the powder-coating process in Mittametalli was shortly explained and the different processes involved in that were presented. Based on that information, the costs of Mittametalli´s powder-coating unit can be identified and a calculation of costs can be completed. This chapter explains the process of creating this pricing tool based on the findings of the theoretical framework and the empirical research completed. The important factors that need to be taken into account while pricing this process can be identified from the previous parts of this research. This chapter still further discusses the challenges of the pricing in this specific case. The process starts from defining the specific costs in this case and based on those the cost estimate at current activity level is defined.

To simplify things, a separate pricing model is created for powder-coating process, even though as mentioned in Chapter 4, in case of Mittametalli it can also be part of the manufacturing process of a product if the customer chooses that finish. Separate model works in this case as well: the price of the powder-coating finish is added to the price of the manufacturing costs of the product to get the total. This also makes it easier to divide the costs of different units inside the company.

6.1 Challenges

The author first thought that activity-based costing method would be a good system to use for costing in this case, as the process can be easily divided into activities. Further investigation on the topic, however, showed that it was very hard to assign costs to activities for various reasons. The main ones being: lack of statistics on important factors such as the occupation rate and complicated product-mix. As a contract manufacturer does not have its own product line, resources consumed by each unit or batch cannot be easily monitored, since the products change constantly. Activity-based costing offers accurate costing information, but starting the usage of this method can be time consuming and costly (Drury 2012, 266). Also as mentioned before, Mittametalli has not been controlling its costs

accurately enough to start using activity-based costing system. Moreover, it must not be forgotten that the powder-coating unit of the company has been only operating for a year and the line was just recently renewed in February 2016.The challenges of creating this tool are further discussed below.

Although already mentioned in previous parts of this study, it must be pointed out that one of the biggest challenges in creating this tool was the fact that Mittametalli is a contract manufacturer, so they do not have their own product lines. They offer two types of powder-coating services: subcontract powder coating and powder-coating finish to contract manufactured products. That makes pricing in this case more challenging than for example in a production plant, where they produce certain products and know all the parts to be coated. In those circumstances, a clear image of resources consumed by activities or products can be defined by observing the process and measuring the time of coating each product batch. In case of Mittametalli some of the items to be coated repeat, but many products are customized, so their price needs to be defined from the scratch for every custom part.

Important factor to consider while creating this tool was that it should be easily adjustable to price those customized products. As discussed earlier, industrial service has many special features that make it different from more researched and analysed business types. Pricing subcontracting powder-coating service is even more challenging; the objects that are coated vary in terms of size, simplicity, color requested and come in unpredictable batch sizes and timetables. In that sense, none of the costing systems can be directly applicable to this case. However, the investigation of theory on costing systems helped the author to better understand different approaches to division of costs and brought new insights about pricing strategies. The author combines different costing methods in order to get the best results with the resources available.

6.2 Cost Structure of Mittametalli

In this case, the process was started by defining the total costs of the powder-coating unit as Mittametalli also has a manufacturing plant. We could say that paint shop of Mittametalli is hence our cost pool to which the overhead costs are initially assigned. At this point, shared overhead costs were left out from this work as there was not sufficient data on what proportion of those the paint shop consumes. These costs are for example the costs of sales department and other management of the company and managing the receipt and dispatch of the goods.

6.2.1 Average Hourly Costs

The definition of the current cost structure was chosen to be the first task to be completed to move towards the solution of the pricing problem. Excel was chosen to be the platform used to create this tool. As the author had the opportunity to make direct observations, the functions of the powder-coating unit were monitored again for couple of days in April and June 2016. Based on the observations made, and the knowledge base provided by the case company, it was possible to define estimated daily or monthly average costs of certain factors. Estimates of variable costs consist of gas, powder usage, chemicals used in the wash, powder and other variable costs. Most of the fixed costs incur whether or not any product is being coated. They consist of rent, heating costs of the wash and the costs of the investment (leasing expense). Labor costs in this case are considered semi-variable costs, as they do not have an impact on the price of an individual service order, but in case of increase or decrease in demand they must be adjusted accordingly. These costs were then allocated to operating hours of the line to create a base for the cost structure. An average hourly operating cost was defined for the chosen factors.

First an average hourly cost was defined for rent based on the monthly amount divided by the monthly operating hours of the paint shop. The cost of electricity is included in the rent with one exception; the heating cost of the wash is calculated separately. The cost of gas used to heat the two

ovens of the paint shop was then calculated based on the average consumption per hour. The average heating cost of the wash was calculated based on the monthly costs recorded and the cost of the detergents used in the wash was based on an estimate given by the chemical provider. Estimated value was also used for other direct expenses such as the hooks used to hang the products.

The average paint consumption was calculated separately for both booths that Mittametalli has because of their special features; automatic booth has a possibility to circulate and re-use the overspray powder; when using the manual booth, overspray goes to waste.

Labor costs were identified without indirect personnel costs for the Manager and the Powder Coating Technician. The indirect personnel costs such as social security costs were added to the monthly value of labor costs.

The capacity of the line was calculated for line square meter, not measured in monetary value. This was done based on the assumption that the speed of the line is 1m/min, and hence, for one hour it equals to 60m/h. However, the line does not reach full capacity as there must be spacing between the products hanged to the line. Moreover, they cannot always be hanged the optimal way which is; with as few empty space as possible per each square meter, naturally depending on the features and dimensions of the items. Based on the observations, 40m^2/h is a feasible average. We must remember that Mittametalli has a huge range of different types of products to be coated. In case of own production of certain units this measure could be improved for example by simplified design or using customized racks to hang the items. Mittametalli has a certain selection of racks, but their features are limited and investing on rack design or buying special racks for small batches is not worthwhile. This option should be considered if a big deal is made and the benefits of improving capacity utilization exceed the costs of that acquisition.

6.2.2 Cost structure

From the basis of the basic information it was possible to calculate the costs for a day, a month and a year with the current capacity utilization and activity level. These are also adjustable in the cost structure model created. As it is not possible to do cost accounting for each product line of the company, as Mittametalli is a contract manufacturer, another way to allocate costs was necessary. The commissioning company had suggested a pricing model based on the target price set for each meter of the line that the batch of products is using. This method is called *line-meter-based pricing* in this work. In practice this means that the overheads were first allocated to each hour that the paint shop is functioning in a month. Then in the pricing calculator, they were allocated to cost objects, which in this case were batches of products. However, these items in a batch must have the same design and they are to be coated with a same shade of powder. The amount of line meters that the cost object consumes was used as a cost driver to allocate these costs.

Finally all the costs except powder-coating (color) and color changing costs were treated as indirect costs. Thus they were allocated using the method described above. This decision was made as these costs vary the most between different batches of products. There are significant differences in the powder shade prices and hence it is very important to assign these costs to a specific batch, which is chosen to be the cost object. Also the color change cost affects a batch of items only once. On the other hand it still occurs regardless the amount of items in a batch. This in mind, cost is the same for a batch of one item and a batch of 100 pieces. Other costs were decided to be treated as indirect costs. These overheads were allocated to each line meter that the batch of products uses. The following figure illustrates the cost assignment process:

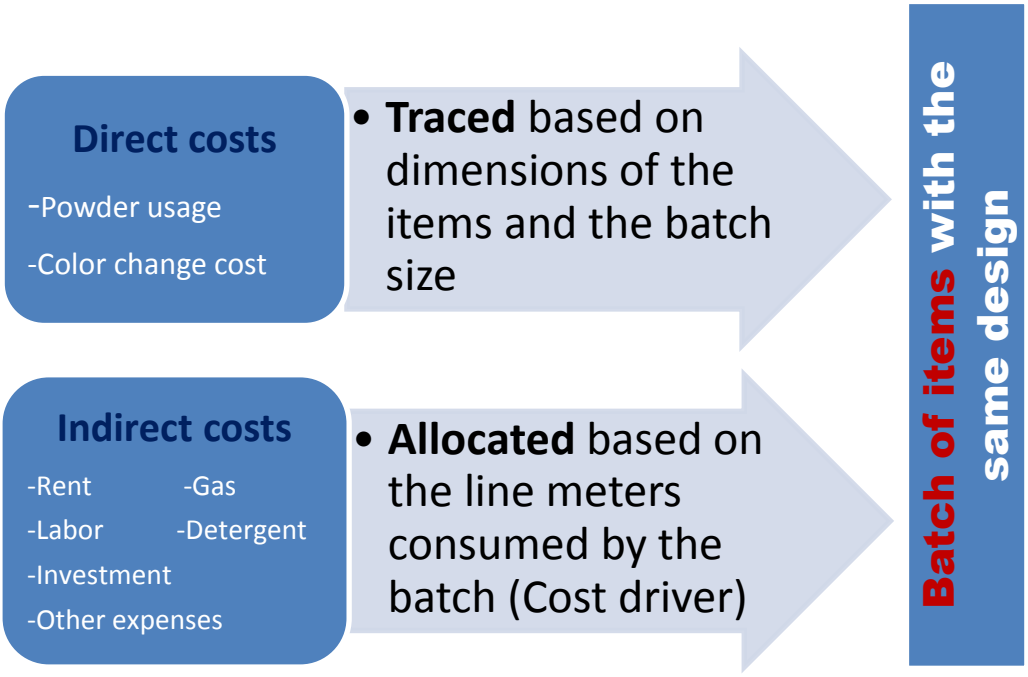

FIGURE 7. Cost assignment to a cost object in practice

6.3 Pricing Tool

Based on this cost estimate the author started the development process of the actual pricing tool. As it is impossible to know actual costs of completing a service order in Mittametalli, all values were budgeted values. In this case it also seemed more beneficial to determine the price for the batch of products powder coated than the price of a single unit. As stated earlier, the batch of items with the same design that are to be coated with the same shade was chosen to be the cost object. If requested, the average unit price could be calculated from the price of the batch. This decision was made because the costs of a small batch are relatively higher than the costs of a big batch. This is because the automatic booth of Mittametalli has the ability to collect and circulate the powder so that the overspray can be re-used. When using the manual booth, all the overspray is waste. Less powder is hence consumed while using the automatic booth for powder application compared to the manual one. Color change, on the other hand, takes more time in the automatic

booth as it needs to be cleaned thoroughly to avoid getting spots to the next batch coated in different color. One previously unmentioned feature of powder-coating is that it does not mix; if there are powder-coating particles of two different colors attached to the same part, they do melt in the oven and it is possible see spots of the different colors on the surface.

Costs that vary with each product need to be considered separately each time to get the correct price for the specific batch of products. These kinds of costs are; (1) surface that needs to be coated based on dimensions of the product; (2) price of the specific color (powder-coating shade); (3) required layer thickness; (4) amount of products fitting in 1m of the line (number of layers etc.), (5) colour change, (6) overspray circulated or not (7) pre-treatment required, (7) amount of hooks; and (8) batch size. The commissioner made it very clear that this tool should be as simple as it can be still giving correct pricing information. As mentioned in limitations of this research it is not possible to price this service correctly without the need of inserting some variables for each specific case. The amount of those variables that need to be inserted was successfully reduced to five without sacrificing accuracy significantly. They consist of the following factors:

- Powder-coating shade used and its price per kilogram
- Line-meter-price
- Requested layer thickness
- Batch size

There are big differences in the prices of different powder shades and that naturally influences the costs significantly and hence needs to be inserted each time accordingly. The tool also calculates the amount of coating needed in kilograms. This information can be used to order coating accordingly.

The tool calculates the price of labor and other indirect costs based on the line-meter-price defined based on the cost structure. Also the target profit can be included in this measure. This value could be increased based on

own evaluation. It is especially advisable to increase this value when calculating a price for a small batch of products, or parts with a challenging design or lengthy hanging process. These kinds of parts are for example tiny parts that take time to hang on.

Most of the parts coated can use average layer thickness value. This factor is still important to be adjustable as sometimes thicker layer is requested, for instance, for parts that require enhanced corrosion protection. Changing this factor naturally has a significant impact on the powder consumption, and hence price.

Information needed from each type of product batch consists of the batch size, surface to be coated and calculated value of how many parts can be hanged to a one meter of the line. The batch size influences the price that way, that if the amount of products in a batch are covering less than 12 line meters based on the given hanging estimate and their size, the tool calculates the price based on usage of the manual booth. Thus the powder consumption is also calculated based on the manual booth, where all the overspray goes to the waste. Set up costs for preparing the booth are smaller, however. In case of more than 12 meter coverage the consumption rate and set up costs are calculated based on the automatic booth. Surfaces to be coated naturally have an influence on powder consumption and hanging design (the amount of the units that can be hanged to one line meter) is used for calculating the line meters used.

7 CONCLUSIONS

This process was started from the theory of cost accounting moving towards this specific case. Material was easy to find about the cost accounting, profitability management and pricing in general, but in terms of pricing industrial service it became more challenging. The author did not expect the process of pricing subcontracting powder-coating service to be as complex as it turned out to be. One major factor for that was the limited amount of resources available. As the paint shop is very recent acquisition, Mittametalli does not yet collect data separately for their powder-coating unit, and hence it would have been too laborious to start distinguishing this data from their accounting as a whole. However, the author and the case company evaluated the amount of data available, to be sufficiently accurate to create reliable cost structure and pricing tool. The pricing tool can also be adjusted accordingly in case of more accurate or changing cost information.

7.1 Answers to Research Questions

This chapter provides answers to the research questions defined in the first chapter. The purpose of this research was to help Mittametalli to achieve profitability through understanding the costs occurring in this field of business and finding a suitable pricing method for them. The final goal of this research was to develop a budget and a pricing tool for offer calculation and pricing for the case company. The main research question was defined as follows: **How should Mittametalli price their powder-coating services in order to achieve profitability?** Several sub-questions were formed to help to answer the main question. Sub-questions are answered first and then lastly the answer to the main research question is provided.

What should be taken into account while pricing powder-coating service?

There are various factors that affect the costs of the powder-coating process and these should be taken into account while pricing powder-coating service. There are direct variable costs that vary significantly between different types of products to be coated due to the special features of the products. Because of that, the powder-coating cannot be priced the same way every time. There are many factors and aspects discussed in different parts of this research that are important to consider when pricing powder-coating service. The most important factors were chosen to be separately adjusted to each batch of products in the pricing calculator. These are: the batch size as that determines the choice of powder-coating booth used; the surface of the product and requested layer thickness as those affect the powder consumption; price of the powder-coating color; and hanging possibilities referring to the amount of products fitting into a one metre of the line.

What is the target sales level to break-even?

The target sales level with current capacity utilization rate and current average costs was defined as a monetary value during the creation of the cost structure tool. Break-even point in units was not beneficial to be determined, as due to the type of business they are in, Mittametalli is coating unpredictable designs in unpredictable quantities that are priced differently.

What are the current problems of pricing powder-coating service in Mittametalli?

The greatest challenges in Mittametalli´s pricing are coming from the lack of experience in the field and the nature of the business they are in. As a contract manufacturer and subcontractor, Mittametalli cannot define costs of each product type accurately through a follow-up as all the parts are customized based on the needs of the customer. It is probably one of the biggest challenges, that as being a subcontractor, Mittametalli receives all kinds of parts and batch sizes that are very different from each other. That makes it very difficult to price products, as many variables must be

considered separately every time that pricing calculations are made. Mittametalli described their pricing process to be quite time-consuming and even some errors were made, because of not having a proper understanding on the cost structure of the powder-coating unit (e.g. the possibilities of hanging the products). Especially small batches were difficult to price as it might be difficult to understand that they are, in fact, relatively more expensive to coat than big batches.

How could Mittametalli improve their pricing strategy?

Mittametalli has not had set standards for their pricing. Hence, this user-friendly pricing tool was created to unify their pricing. It is also suggested that the price that the tool calculates for small batches of products should be adjusted accordingly, increasing the price of a line meter as the set up costs, such as hanging design, are higher in relation to big batches.

How should Mittametalli price their powder-coating services in order to achieve profitability?

Mittametalli´s current situation was evaluated and a cost structure was created based on that. As the commissioner had requested, the pricing was based on calculating a target price for **a line metre**. Calculations resulted in suitable line-meter-price that is used as an adjustable target profit in the pricing tool among other variables. Evaluation showed that with using this line-meter-price at current operating rate, current costs and current average sales level, Mittametalli has customers and is also able to cover the costs. If the company gets more projects, and hence increases its capacity utilization, with this pricing level company´s operations will be profitable. However, it is suggested that this line-metre-price should be adjusted in case of small products or small batches and complex products as they require special arrangements specified in Chapter 6.

7.2 Validity and Reliability

Reliability means the extent to which the research completed will yield coherent results. In other words, it measures if the research is repeatable with same outcomes or not. It should be considered whether the results would be the same in other occasions and with other observers. Validity is divided into external and internal. Internal validity is concerned that the results actually measure what they are supposed to measure. External validity deals with the generalizability of the results. That is to say, if the findings are equally applicable in other situations as well as in this case. (Saunders et al. 2012, 156-158.) It is mentioned in the limitations that this research and its results will not directly apply to a different powder-coating unit without consideration. However, the pricing principles used in this case do apply in other cases as well.

The research provided answers to all the research questions set for the project. The tool was tested using different types of products that have actually been powder coated in Mittametalli. The values provided by the pricing tool were compared to the actual prices that had been charged from the customers. These prices had been calculated using the old pricing methods. The price level was considered to be relatively accurate. With this in mind it is possible to conclude that the research yielded valid results.

7.3 Suggestions for Further Research

This cost structure and pricing tool were done based on estimated average values. They provide sufficiently accurate values to be reliable, but it is suggested that Mittametalli runs an ex-post monitoring the get more accurate data on costs, capacity utilization and cost-benefit ratio.

Also separation of powder-coating units accounting from the manufacturing units accounting is suggested. This way Mittametalli will be able to control the costs and sales of the powder-coating unit more

accurately. It would also help to obtain proper statistical data for both units separately.

This work defined the optimal products to be coated in this kind of a powder-coating unit that are; big batches of sheet metal products and other simple designs with a good line coverage and easy handling. Mittametalli should direct their marketing towards customers that outsource powder-coating of such products. However, a proper marketing research should be completed to get a better idea on the company´s position in the market.

8 SUMMARY

The goal of this research was to investigate the concepts of cost accounting, profitability and pricing through a case company operating in the field of industrial powder-coating. The process started from the setting a goal for the research and defining the research questions. The purpose of this research was defined to be helping Mittametalli to achieve profitability through understanding the costs occurring in this specific field of business and finding a suitable pricing method for them. The final goal of this research was to create a cost structure and pricing tool for them.

The author investigated cost accounting, profitability and pricing first through secondary sources such as literature, articles and internet-based sources. Also the powder-coating process in Mittametalli was explained to help the reader understand this complex world of industrial subcontracting and contract manufacturing sector better, and thus to be able to follow the pricing process. Empirical research was completed using the author´s observations and interviews as the data collection method. Based on the findings a functioning cost structure and a pricing tool were created for Mittametalli.

The key findings of the study were that industrial powder-coating industry has its own special features that make it very much different from other types of service industries, manufacturing and merchandising organizations. Pricing a powder-coating service is a complex process where it is important to develop a well-functioning average pricing model that must be customized for the specific powder-coating unit under observation.

REFERENCES

Published references

Andersson, J., Ekström, C. & Garbrielsson, A. 2001. Kannattavuussuunnittelu ja laskenta: budjetointi ja kannattavuus laskentaesimerkein (Ekonomistyrning 1, Lönsamhetsplaning och kalkylering, translated by Tillman, M.), 3rd Edition. Helsinki: Tietosanoma.

Armstrong, G. & Kotler, P. 2012. Principles of Marketing. 14th Edition. New Jersey: Prentice Hall

Burrow, J. 2012. Marketing, 3rd Edition. Hampshire: Cengage Leaning.

Drury, C. 2002. Costing: An Introduction, 4th Edition. London: Thomson.

Drury, C. 2012. Management and Cost Accounting, 8th Edition. Hampshire: Cengage Learning.

Horngren, C., Datar, S. & Rajan, M. 2012. Cost Accounting: A Managerial Emphasis. 14th Edition. Harlow: Pearson Education.

Jokinen, R, Kuusela, A., & Nikkari, T. 2012. Pinnalla 2, Metallituotteiden maalaus, 2nd Edition. Helsinki: Opetushallitus.

Jyrkkiö, E. & Riistama, V. 2008. Laskentatoimi päätöksenteon apuna. Helsinki: WSOY.

Keegan, S. 2009. Qualitative Research: Good Decision Making Through Understanding People, Cultures and Markets. 1st Edition. London: Kogan Page Ltd.

Kimmel, P., Weygandt, J. & Kieso, D. 2011. Accounting: Tools for Business Decision Making 4th Edition. New Jersey: Wiley.

Kothari, C. 2004. Research Methodology: Methods and Techniques, 2nd Edition. New Delhi: New Age International.

Myers, M. 2013. Qualitative Research in Business & Management. 2nd Edition. London: Sage Publications.

Quinlan, C. 2011. Business Research Methods. 1st Edition. Hampshire: Cengage Learning.

Saunders, M., Lewis, P. & Thornhill, A. 2009. Research Methods for Business Students. 5th Edition. Harlow: Pearson Education.

Electronic references

Competitive Edge Coatings. 2014. Coating And Material Blasting Faq's. [referenced 2 April 2016]. Available: http://www.competitiveedgecoatings.com/pages/coating_faqs.php#whatpowder

Pennisi, M. 1997. Surface Finishing – Casting. Penlia & Co. [referenced 9 April 2016]. Available: http://www.coatfab.com/sur_fin_cast_1a.pdf

Powder Coating Institute (PCI). 2014. Buy Powder Coated Products for a Stronger, Greener, Better Finish. [referenced 11 April 2016] Available: https://articles.powdercoating.org/2014/12/15/buy-powder-coated-products-for-a-stronger-greener-better-finish/

Liberto, N. 2013. Calculating and Controlling your Powder Coating Operational Costs. [pdf] Powder Coating [referenced 22 April 2016]. Available: http://powdercc.com/pdf/Calculating%20and%20controlling%20your%20powder%20coating%20operational%20costs.pdf

Mittametalli Oy. 2016. Company website. [referenced: 16 April 2016]. Available: http://mittametalli.fi/

Oral references

Kolehmainen, J. 2016. CEO. Mittametalli Oy. Interview 19 April 2016.

Mustonen, K. 2016. Process Engineer. Metapinta Oy. Interview 28 April 2016

Other references

Coating Tech Oy. 2014. HangOn: Smart Solutions for Industrial Coating. Vantaa. Brochure.

APPENDICES

Appendix. 1. Semi-structured interview of Jari Kolehmainen

1. Kerro lyhyesti maalaamohankinnan taustoista?
   Miten ja miksi?

2. Mikä on maalaamon nykytilanne? Onko se osa Mittametallia vai kokonaan erillinen?

3. Milla tasolla Mittametallin tämän hetkinen maalaustarve on?
   (Alihankintamaalaus+oma maalaustarve)

4. Mitkä ovat maalaamon tiedossa olevat kustannukset?
   -Sähkö-/kaasu
   -Leasing kulu
   -Tilavuokra
   -Henkilöstökulut

5. Mikä on hinnoittelun nykytilanne?

6. Mitä odotuksia Mittametallilla on laskurin suhteen?

Appendix. 2. Semi-structured interview of Kyösti Mustonen

1. Kerro lyhyesti omasta kokemuksestasi jauhemaalaamotoiminnan parissa?

2. Miten Mittametallin maalaamo eroaa Metapinnan maalaamosta ja miten tämä vaikuttaa kustannusrakenteeseen?

3. Mitkä ovat suurimmat haasteet jauhemaalaamon hinnoittelussa?

4. Mitä tässä tilanteessa pitäisi erityisesti ottaa huomioon?

5. Miten maalaamopalvelut tulisi hinnoitella?