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A Case Study on Inventory Costing Methods



Honors Thesis

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November 2017

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Abstract

Firms use costing methods to determine the price of a product and to analyze the efficiency of resource consumption. These methods often comply with the external financial reporting rules set forth by the U.S. Generally Accepted Accounting Principles (GAAP), which require all manufacturing costs, including overhead, to be assigned to goods in inventory for costing purposes. However, firms can internally use alternative costing methods that do not comply with GAAP. The purpose of this case study is to understand and evaluate the costing method currently employed by a company in the Dayton, OH area¹, and identify the most beneficial costing method for its circumstances. Background research on common costing methods including traditional, process, job, activity-based, and variable is used to analyze the Company's costing method. This background research includes each costing method's advantages and disadvantages along with circumstances that help dictate the use of each method. This research is combined with research on the Company to develop expectations regarding the Company's current costing method and to develop an interview guide for employee interviews. Interviews with the Company's employees and a factory tour are used to understand the Company's current costing method, including why management selected a particular costing method, and the advantages and disadvantages of the method. This information is then synthesized and analyzed to determine if the current costing method best serves the Company's interest or if an alternative costing method would better serve the Company. This is completed by assessing the validity of the other costing methods and possible advantages and disadvantages of use for the Company.

¹ Throughout this project, the company this case study evaluated will be referred to as the Company.



Table of Contents

| | |
|----------------------------------|------------|
| Abstract | Title Page |
| I. Introduction | 2 |
| II. Background | 5 |
| General Costing Background | 5 |
| <i>Traditional Based Costing</i> | 5 |
| <i>Process Costing</i> | 6 |
| <i>Job-Order Costing</i> | 7 |
| <i>Activity Based Costing</i> | 8 |
| <i>Variable Costing</i> | 9 |
| <i>Summary</i> | 10 |
| Background on the Company | 10 |
| Hypothesis Development | 12 |
| III. Methods | 14 |
| IV. Results and Analysis | 16 |
| Results | 16 |
| Analysis | 17 |
| <i>Traditional Based Costing</i> | 17 |
| <i>Process Costing</i> | 17 |
| <i>Job-Order Costing</i> | 17 |
| <i>Activity Based Costing</i> | 18 |
| <i>Variable Costing</i> | 19 |
| V. Conclusion | 21 |
| Appendix 1 | 22 |
| Appendix 2 | 23 |
| Operations Questions | 23 |
| Accountant Questions | 23 |
| References | 26 |

I. Introduction

The cost of producing a good or service is comprised of three components: direct labor, direct materials, and overhead. Direct labor is physical work performed by employees that can be directly traced to the generation of a good or service. Direct materials consists of physical items that can be traced to a specific good or service. Overhead is defined as indirect costs related to the production of items and services. Indirect costs includes items that cannot be traced easily to a good or service, such as administration and security personnel costs. All three components are needed to accurately cost a product or service. However, because of overhead's indirect nature, it can be difficult for firms to determine this cost compared to direct labor and direct materials. Many methods have been developed to allocate overhead costs in a manner that complies with the type of product a firm generates and the desired accuracy of information. Because of the uniqueness of each costing method, each method will have different advantages and disadvantages depending on the firm. As there are many methods available, and no standardized approach for firms to determine the most appropriate method, firms often have difficulty deciding on a costing method to implement. The purpose of this study is to evaluate if the Company, a firm in the Dayton, Ohio, area, is implementing a costing method that balances costs and benefits for its business model.

The costing method a firm chooses to implement has a substantial effect on selling price and, consequently, realizable profit. For instance, if one costing method determines that the cost of an item is \$6.00 and the firm wishes to receive a profit of 30%, the price of the item would be \$7.80 with a profit of \$1.80. However, if another costing method determined the cost of the item was \$7.00, the price of the item would be \$9.10, with a profit of \$2.10. A significant impact on the profit realized by the firm is presented when these numbers are multiplied by the number of units sold each month. Pricing can also impact profits by discouraging consumers from purchasing because the cost may be too high for the perceived value of the item. Conversely, if the perceived value of the product is high, firms can charge a higher price for the item and receive a higher profit margin. Thus, it is imperative that overhead be calculated accurately since differences in overhead calculation can lead to discrepancies in the cost of an item. These discrepancies can ultimately mean thousands of dollars in lost profit for a firm.

While costing methods can affect the price and profit of a good or service, they may also help a firm determine the efficiency of various processes. A more reliable costing method is able to provide more representative information in the way overhead is actually incurred by a good or service. If there is a difference between applied and actual overhead costs, this difference can help managers determine where in a process inefficiencies are occurring or which product is proving to have inefficiencies.

Before a firm implements a costing method, it is critical that managers conduct appropriate background research. Research can include obtaining an understanding of the circumstances under which it is most appropriate to use each method and how the methods allocate overhead. Managers can then evaluate this information relative to the firm's current capacity of labor resources to carry out the costing method, data currently

being collected, and business strategy such as producing a quality commodity at a low price. It is important that a firm select a method that complies with the manner in which it generates its product and the amount of data accuracy needed. For instance, some costing methods are best used when heterogeneous products are created, while others are best used when homogenous products are created. In other cases, methods provide highly accurate data with regards to overhead cost breakdown, but more accurate data can be costly and may not be critical to the firm's survival or may not be in line with the firm's competitive strategy.

The purpose of this case study is to evaluate if the Company is implementing a costing method that balances the costs and benefits of its' business model. This is done by analyzing common costing methods and applying this knowledge to the Company. This information is then used to determine why the Company uses a specific method, the validity of other costing methods, and what data would be needed if a different method were to be implemented.

The most common costing methods used by firms are traditional based, process, job-order, activity, and variable. To understand and evaluate these costing methods, I gathered research from various academic journals, cost accounting text books, and lay articles. My background research shows that the main difference between the methods previously mentioned is how costs are traced to each good or service and under what circumstances the various methods can be used. For example, job-order costing is better suited for heterogeneous products, and process costing can best be used for relatively homogenous products. The application of cost drivers also varies considerably between the costing methods. Cost drivers can include items such as direct labor hours worked and number of machine hours used. Depending on the costing method, the number of cost drivers and the nature of the costs allocated by these drivers vary considerably. Each costing method also carries its own advantages and disadvantages such as implementation costs and accuracy of overhead allocation.

To gather information on the Company, I conducted two sets of interviews. In the first set of interviews, I met with the Controller and the Chief Financial Officer (CFO). During the interviews, the Controller and the CFO provided background on the Company including the main revenue generating items, a description of the main components of the manufacturing process and what happens at each step of the process¹. The discussion of the manufacturing process was then followed by a tour of the production facility for Product A. Using the information gathered in the interview along with background research on costing methods, I developed a hypothesis that the Company uses a dual costing method that implements both traditional based costing and job-order costing.

To determine the accuracy of my hypothesis, I conducted a second round of interviews at the Company. For this set of interviews, I met with the Controller and an Accountant who specializes in cost accounting at the company. During the interviews the Accountant discussed how the Company allocates direct labor, direct materials, and

¹ Throughout this project, the main revenue generating item for the Company will be referred to as Product A

overhead to products. This discussion included how the Company costs current and new products along with how it evaluates if the proper amount is being allocated to each product or whether adjustments need to be made. After talking to the Accountant, I interviewed the Controller about the costing method the Company implements, why the Company selected its current method, why other costing methods were not implemented, and the Company's options for future costing methods.

After gathering information from the second round of interviews, I analyzed why the Company chose the costing method it decided to implement. In addition to this, I also analyzed the validity of implementing other costing methods at the Company. If a method was viable, I determined what additional information the Company would need to collect to make the costing method work. If the method was not viable, I determined what changes would need to be made to the current production process or goods in order to make the costing method viable. In addition to analyzing and evaluating the Company's current costing method and options for other viable methods, I analyzed the potential of the Company changing costing methods in the future with the expansion of the Company and what costing methods in the future may be most beneficial to the Company.

II. Background on Costing Methods

General Costing Background

A common issue most firms face is determining how much a single good or service will cost the firm to provide. The cost of a good or service is comprised of three components, direct labor, direct materials, and overhead. One reason determining the cost of a good or service is challenging is due to the allocation of a cost known as overhead, to each individual product. Unlike the costs of direct labor and materials, overhead is an indirect cost and includes items such as electricity, property taxes, and rent on buildings. It is important that firms allocate overhead costs because this cost is required in the costing of a good or service according to GAAP. GAAP is the accounting rules and regulations that firms must follow when it comes to external recording purposes. Allocation of overhead can also help managers determine appropriate sales prices and where inefficiencies are occurring in the manufacturing facility. However, since there is no way to directly trace overhead costs to a good or service, costing methods are used to allocate this cost. Because of the importance of costing, firms need to focus on the allocation of overhead in a way that is cost effective, and yields the most accurate results as to the true nature of the cost of a product. The method a firm chooses to allocate costs is known as the firm's costing method. All costing methods use cost drivers to determine the overhead allocation for each item. Cost drivers are the reason as to why the cost exists- it "drives" the change in a cost. The two most common cost drivers include direct labor hours worked and number of machine hours used, but a firm can create a cost driver in any instance where there is a change in the cost of an activity. While all costing methods use cost drivers, it is how the cost drivers are implemented that differentiates the various costing methods.

Cost drivers may be used to help allocate variable, fixed, and product costs. Variable costs are those that depend on the usage of the cost driver; thus, it fluctuates. Fixed costs are costs that do not depend on the amount of the cost driver; they are a flat rate and do not alter. Product costs are those that can be better traced to the product or service being sold. This would include all costs that are included in Costs of Goods Sold. It is important to note that depending on what cost drivers the firm uses and what sort of costs it is allocating, the firm may or not comply with GAAP. If the costing method a firm uses for internal decision making purposes does not comply with GAAP, then the firm must also have a separate costing method that complies for external reporting purposes.

Traditional Based Costing

There are two broad types of costing methods, the first being traditional based costing. This method implements only one cost driver and consists of product costs that are fixed and variable (Verico, 2008). This method presumes that variable costs and overhead resources are proportional in regards to fixed costs. Some proposed benefits of this method are that all costs are accounted for in this method, allowing data users to assess the quality of information received since the data can be reconciled with the ledger. In other words, the information used in the costing method can be traced to

ledgers to ensure that the information is reliable. This helps the user review information regarding customer profitability management, product profitability management, and firm operations (Vercio, 2008). Although this method is one of the cheapest costing methods and complies with GAAP, it is typically in a firm's best interest not to use this method. Because traditional based costing presumes that variable costs and overhead resources are proportional in regards to fixed costs, it can lead to lower costs being allocated to low volume products compared to those made in bulk. Thus, this method can be highly inaccurate (Hundal, 1997). This method also combines costs that do not have a similar cost driver pattern, allowing costs to be allocated to products when those products did not cause the cost in question. An example of this would be an item having to stay at a work station longer than normal because a product downstream requires additional attention. Because the item must stay at the station longer, more labor hours may be attributed to that item, even though work may not have been completed. In this case, a cost driver other than labor hours may have caught this error and attributed this cost only to the product that caused the backup in workflow. For most firms, this broad costing method may be too inaccurate and misleading for decision makers and thus might not be used. However, the costing methods that are derived from the traditional based method, such as process, job-order, and activity based are alternative forms of traditional based costing seen in firms. This is because these methods use all costs, like their parent's costing method, but use cost drivers differently in order to create more accurate data for decision makers.

Process Costing

A costing method that stems from traditional based costing is process costing. With this method, costs are traced through each department. These departments would be production cells or areas, such as Fabrication and Assembly, which the product must pass through in the production process. Departments track the costs that are incurred in their cell and apply those costs to the department's Work in Process account. This account is used for assets that have not yet been completed (Oliver, 2000). The cost per unit can then be determined by the following formula:

$$\frac{\text{total process cost}}{\text{total number of goods existing in the process}}$$

(Vitez, n.d.).

There are two types of process costing methods, the weighted average method and the first in first out (FIFO) method. The weighted average method includes overhead costs for both current and prior periods in its cost per unit calculation. In contrast, the FIFO method only uses the costs incurred in the current period to determine cost per unit (Blotcher, 2015). While these two types of process costing methods calculate costs in a different manner, the circumstances in which the methods are used and many of the methods' benefits are similar.

Process costing, as a whole, is typically employed in companies that generate homogenous products, and users of this method receive similar benefits according to some researchers, no matter which type of process costing method they use. Some of

these perceived benefits include providing managers with detailed information on the various production statistics of individual departments or workgroups. This is accomplished by having each department create its own cost driver that is unique to what each department does and allocate overhead incurred from their specific production cell to the final good (Vitez, n.d.) To then determine the final amount of overhead allocated to each product, the individual overhead allocations from each department are summed. By having unique cost drivers rather than a general cost driver, the firm can more reliably determine how much overhead should be applied to the final product. Overhead allocation by department can also help in understanding department performance by converting the cost allocated to the product and the cost driver to terms of cost-controls, efficiency, and productivity. Measuring these terms over time can help a firm track effectiveness of changes in policy (Ingram, n.d.) Process costing also complies with GAAP, so secondary costing methods do not need to be in place.

When determining the practicality of process costing for a firm, the disadvantages of the method must be considered. Firms have the option to either include non-production costs in their overhead allocation or not (Ingram, n.d.) The omission or inclusion of such costs can lead to discrepancies regarding the efficiency of departments. If the decision makers are not aware that non-production costs are allocated to products, they may incorrectly determine that a department is operating at a lower efficiency than what it actually is (Ingram, n.d.) This method can also lead to distorted finished good totals if equivalent units, the amount of work in process inventory that could be combined to make finished units at the end of the accounting period, are not calculated at the end of an accounting period accurately (Blotcher, 170). Process costing can be difficult for some firms to use since an accurate inventory management method must be in place to be able to determine where products are at the end of the period in order to calculate equivalent units. Inaccurate numbers of where items are in the product process may result in an inaccurate finished good total, thus, making it difficult for the company to determine how many products the firm has available to sell on the open market (Vitez, n.d.) Additionally, this costing method is not recommended for firms that do not generate homogenous products. Firms that desire to employ a method similar to process costing often turn to another derivative of traditional based costing, job-order costing.

Job-Order Costing

Job-order costing is typically found in firms that generate heterogeneous products. This method is similar to process costing, but instead of having costs applied by each department, costs are traced and applied by using the job cost sheet (Ingram, n.d.) This means that the cost for each product is determined by analyzing the direct materials, direct labor, and overhead costs that can be specifically traced to the job. A job is defined as a unit or multiple units of a distinct product or service. Jobs normally include custom items or services such as creating custom cabinetry or tailoring of an article of clothing.

Job-order costing has several inherent benefits. One benefit is this method complies with GAAP, since it is a form of traditional based costing, and both product and period costs are combined to determine overhead. Other benefits include allowing managers to more reliably calculate the costs on each job, leading to a better

understanding of profit compared to job costing's parent method, traditional based costing. Researchers believe this allows managers to establish which jobs are more desirable and should be pursued (Ingram, n.d.) Some researchers also argue that other benefits include managers being provided with the tools to track both an individual's and a team's performance with respect to cost-control, efficiency, and cost productivity (Ingram, n.d.) This is done by analyzing job cost sheets to see how overhead costs fluctuate. Since this fluctuation would be caused by the applied cost driver, managers can analyze the applied overhead costs of similar jobs to better understand the individual's or team's performance, depending on which is used. With job costing, the Work In Process account also serves as a control account in the general ledger. This means that there is a subsidiary ledger. This subsidiary ledger contains multiple accounts for each job that support the total amount in the overall Work In Process account. This is useful because it provides a check for a firm to help ensure that their Work In Process account is accurate (Ingram, n.d.)

However, job-costing has several shortcomings. The method requires extraneous employee labor since employees must track all material and labor for each job. This can be time consuming, and thus costly, for the firm. Also, record keeping varies for each job since jobs vary, and jobs may be inaccurately charged for inefficiencies, such as downtime (Lal, 2009). While process costing and job-order costing are best used in industries that generate specific product types, homogenous or heterogeneous, activity-based costing can be applied to any product type.

Activity Based Costing

Activity-based costing, better known as ABC, is the last method that has roots in traditional based costing. This method allocates overhead to the activities that cause the various costs. Activities can be combined based on various criteria such as physical, logical, or cost. Physical means that costs can be combined into homogenous groups of tasks based on physical characteristics. Logical means combining same or similar tasks independently from the process or functional area that a task is performed at. Lastly, cost means combining activities based on similar factors that affect the amount of costs applied, such as place and time (Kapic, 2014). Unlike the traditional based method that allocates all overhead with one cost driver, ABC allocates costs with multiple cost drivers that are needed to produce the commodity (Johnson, n.d.)

ABC has several significant shortcomings. ABC, unlike traditional based costing, rarely complies with GAAP. ABC does not comply with GAAP because it does not assign all manufacturing costs, specifically fixed overhead, to products. ABC does not allocate these costs because these costs do not change with regards to the amount of goods being produced. This costing method, though, will also attribute costs that are not manufacturing to products because the cost may still be relevant to the product, such as salaries of the workers who designed the product (Kapic, 2014). Because ABC rarely complies with GAAP, firms are required to have an external cost accounting method for financial reporting. Another disadvantage pointed out by several researchers is that this method is costly. Detailed records of all the cost drivers and activities are required which can lead to a large amount of data that must be gathered on a regular basis (Kapic, 2014).

The amount of data needed in some cases can also lead to employees actively resisting the method due to time constraints.

There are several benefits to ABC. Some business professionals believe ABC more accurately calculates item costs and increases a firm's efficiency by providing information about effectiveness and efficiency of various activities. This method can also help managers assess the activities that do not add value to the customers, and determine if these activities should or can be eliminated. Various advocates also state that ABC provides managers with an understanding and interpretation of the various costs, not just the valuation of the end commodity (Kapic, 2014). This enables companies to predict what costs should be present versus just what costs are present, thus allowing firms to ensure that they have accounted for all costs of the product.

A variation of activity based costing is time driven activity based costing (TDABC). TDABC relies on the time it takes to perform an activity to determine the cost of an activity. This derivative of ABC has some separate disadvantages compared to regular ABC. One disadvantage is the difficulty of collecting accurate information. The percentage of a worker's time spent on each activity that is recorded will often be higher than actual because workers will not want to admit idle time. Also, interviewing employees to obtain this information can be time consuming and costly. However, if a firm uses TDABC by engaging in time studies, managers can more accurately assess the amount of time it takes to complete an activity and it is less time consuming than using percentage of time (Blotcher, 149).

While ABC and its derivation, TDABC, are the last methods that stem from traditional based costing, firms have one final option for costing methods.

Variable Costing

The final costing method firms can employ is variable costing. This method, like traditional based, is considered a broad cost accounting method. However, unlike traditional based, this method has no existing deviations because it is used so infrequently. This costing method includes all variable costs but does not consider fixed costs in its calculation of overhead (don Edwards, 1958).

According to some academic scholars, perceived benefits of this method are that cost-volume-profit relationships are distinct and help managers generate basic policy decisions (Blotcher, 2015). This method, also, allows managers to quickly evaluate various actions regarding cost controls since the only way to change operating income is to sell more units. This is different than traditional based costing which can make operating income change by fluctuating the number of units produced (Blotcher, 2015). Others contend that this method helps managers reach conclusions about profitability of operating segments, product prices, profit planning, and cost control since it is easier to see how changes impact costs compared to traditional based costing and methods that stem from traditional based costing (De Vos, 1968).

Despite the benefits, critics tend to agree that there are many disadvantages to this method. One disadvantage is that variable costing is not GAAP compliant. Therefore, for external financial reporting, a secondary costing system must be employed. Other disadvantages include this method's incapability of handling costs that are both fixed and variable in nature. In an attempt to separate these costs, the firm must analyze and possibly change how it separates the fixed and variable costs multiple times in an attempt to make this separation of costs as representative as possible (don Edwards, 1968). The most common example seen to highlight this issue revolves around batch costs. Other problems include that missing fixed costs can lead to an inaccurate image of how much a product costs, causing companies to not meet their desired profit levels. Critics also note that if managers are familiar with traditional based costing methods and decide to switch to variable costing, this can lead to poor management decisions if they do not understand the differences in gross margin analysis between the two. This complication stems from the fact that gross margin will appear higher in variable costing since fixed costs are not analyzed, which can lead to incomplete analyses of how the firm is performing (De Vos, 1968). Because of its failure to consider fixed costs and the disadvantages that arise, most firms choose not to use this method.

Summary

While there are various costing methods that a firm can employ, it is always up to managers to determine which method is most appropriate for the firm's goals. Firms need to analyze the perceived costs and benefits of potential costing methods and determine the method that allocates overhead in a manner that is most appropriate to the firm's size, profit levels, and product. From there, managers can determine which method makes the most logical sense.

Background on the Company

The Company is a manufacturing firm that specializes in the production of equipment. The Company is known for its manufacturing of Product Family A which alone holds 50% of the Company's total sales. The Company creates several different variations of Product A depending on the customer. However, in the next year, the Company hopes to make some of the options for Product A more standardized. The Company performed a study several years ago and determined that one version of Product A can have over 17,000 configurations, though the Company will only sell approximately 125 of these configurations. In addition to Product A, the Company also manufactures other products, which comprise 25% of the Company's total sales. The remaining 25% of the Company's total sales is attributed to other products, parts, supplies, accessories, and computer boards.

For the purpose of this case study, the production process of Product A will be the main area of focus since Product A comprises the largest portion of the Company's total sales. Figure 1: Production Flow of Product A, found in the Appendix, highlights the production process of Product A and the systems used to determine how items moves through the facility. These various production systems include MRP, Kanban, and pull by customer demand. The diagram breaks down the production process starting with

purchasing of the raw materials and ends with the shipping of the final product. This diagram highlights the different types of systems that move inventory through the production process along with the process flow on the production floor.

The production process begins with Purchasing, which orders the raw materials that will be needed in the production process. These materials are then stored in the Warehouse until the production processes requires them. Both Purchasing and the Warehouse determine how much raw materials should be purchased or on hand based on Materials Resource Planning, a system that uses information on current orders and forecasts of future orders to determine how much material needs to be on hand.

Raw materials are then pulled from the Warehouse and taken to the Laser and Flexible Manufacturing System (FMS) machines to be cut into components using a Kanban system. For a Kanban system, new components are brought to a work station when containers in that station run out of necessary parts. Once the container is empty, upstream stations are notified that a replenishment of parts is needed. From the FMS machines, if the components need to be smoothed they are taken to the Deburring station, if not, they are placed on the Racks. Both the Deburring station and the Racks use a Kanban system to determine when components need to be replenished at a station. Up to this point, all component generation is standardized.

Once an order is initiated, components are pulled from the racks and taken to Fabrication and Assembly. Components are pulled based on a Bill-of-Materials. Therefore, the method is considered Pull Production, and it is used for all Fabrication. Assembly, though, still uses a Kanban system for some components. The Bill-of-Materials is required because beginning at this point in the production process each product is unique to each customer. For the Fabrication process, components first go to the Press Brakes station where they are bent into the shape needed. From there, the components are sent to the Welding station to be welded together to make the body of Product A. Product A is then sent to the Cutting station, where the excess material is cut off the body and smoothed out. The body of Product A is then sent to the Polishing station to be polished.

After the Fabrication process, Product A then moves to Assembly. Assembly consists of several main assembly stations, and the main assembly station may have several sub-assemblies depending on the type of Product A moving through the production process. In general, the Assembly portion of the production process begins in the Body station. In this station, larger components such as dials and drains are attached to the body of Product A. After this, Product A moves to Power. In Power, power cords are installed in Product A. Product A then moves to Probes where probes are installed. Following Probes, the product moves to Element where more switches and brackets are added to Product A. Next, the product moves to Cords, where more wiring is added to the product. Then, the product moves to Wiring where all of the previous cords and wires are connected together and to the main unit. Product A is then moved to Pretest. If Product A passes the Pretest, it moves on to Test for the final test. If the product fails at either the Pretest or the Test, it goes back to the assembly station that can fix the error that occurred. If the product passes the Test station, it moves on to Final Assembly where

finishing cosmetic components are added and the product is packaged. Items are removed from the production process to be sent to Shipping or to the Company's finished goods warehouse.

The Company has approximately \$24 million worth of inventory. This number includes finished units, partially made units, components awaiting use, and raw materials. Components awaiting use are stored on racks and stay on the racks for approximately four weeks before being pulled for use in Fabrication and Assembly. In general, Product A spends two days in Fabrication and two days in Assembly. To reduce the amount of setup time needed in Fabrication, the Company groups its demand into two day lots and then runs these lots together. The Company also organizes part numbers by similar tooling and runs them sequentially. This approach allows the Company to run four or five different component numbers with the same tooling, requiring only minimum changes to programs in the machine control. At the end of Assembly, items are either sent to a distributor to be sold to the end customer or held in a finished goods warehouse. On average there are eleven finished goods turns a year. It takes the Company approximately three to four weeks from the time an order is placed to when an order is shipped to create all Product As for the order.

Hypothesis Development

After learning about the Company's production flow, I believe that the Company does not use a singular costing method and likely uses a costing method that is comprised of two different methods. This hypothesis is based on information gathered during my first visit to the Company. During the first visit, the Controller provided several diagrams to help me better understand the process flow of the main revenue generating item, Product A. A comprehensive diagram of the handouts provided during the visit can be found in Appendix 1.

The figure in Appendix 1 shows that the Company uses three different approaches in the plant to pull items to be used for production. These three different approaches are Material Resource Planning (MRP) Forecast, Kanban capacity replenishment, and pull production by customer demand. These three approaches are used in various stages of the production process. MRP forecasting is used to determine how much raw material inventory should be on hand. Kanban capacity is used in the FMS and Laser station along with Deburr, Racks, and portions of Assembly. Pull production by customer demand is used for Fabrication and Assembly, along with Finished Goods.

MRP is a system that attempts to keep adequate inventory levels to assure that required materials are available when needed. This is done by predicting future demand. Data are collected on items such as how fast the Company uses up inventory and how much inventory is needed in order to complete upcoming orders. In addition to MRP, the Company uses a Kanban system. Kanban systems regulate inventory by having inventory pulled through the production process rather than pushed. This means that if you look at the production process as a stream, workers upstream only work on items when workers downstream need them. This is different from many systems where workers are asked to work on as many items as possible, regardless of whether items are

needed or not. Pull production by customer demand means that items are moved or added to the production process specifically because the customer needs said items for their desired product.

Because there are three different methods used to generate inventory in the production process, I believe that no single costing method would accurately allocate overhead to these items. I hypothesize that the Company uses two different costing methods in order to allocate overhead. I believe that based on the three methods used to move inventory through the plant that the costing methods used are traditional based and job-order. My reasoning for this is based on the Background work previously mentioned and my understanding of MRP, Kanban, and pull production.

I hypothesize that in standardized parts of the production process, the Company uses a traditional based costing method to apply overhead to items. The Company likely does not use a variable costing method, because this method is known to lead to many inaccuracies. Also, in this part of the production process, job-order would not be appropriate since each item is not unique in nature, a characteristic often found where job-order costing is used. Activity based costing would most likely be an inadequate fit because ABC requires a lot of data to be used to make the allocation accurate. Since the Company would most likely have another costing method, due to ABC costing rarely complying with GAPP, economically it would not make sense to use activity based. For these reason, I hypothesize that the Company uses traditional based costing to allocate overhead that applies to items that fall under the MRP forecasting and the Kanban systems.

As discussed earlier, the Company implements three major methods to help move inventory through the production process. While traditional based costing would make sense for items that fall under MRP and Kanban, this method would not be accurate for the unique items that fall under the pull production by customer demand. I believe that items that fall into this category would use job-order costing to accumulate costs. This is because in order to pull items based on customer demand, a bill of materials would need to be issued. While talking to the Controller at the Company, he stated that all final products that leave the Company facility are unique to each customer. A characteristic found in many firms that use job-order costing is that the firm creates unique products. Since the Company generally makes products that are unique to each customer, the Company has grounds to use this methodology.

III. Methods

To analyze the Company's costing method and to make predictions about what costing method the Company currently employs, I compiled background research on the most common costing methods: traditional based, job-order, process, activity based, and variable costing. Scholarly articles, text books, and lay articles on cost accounting are used to understand under what circumstances each method is used along with how overhead is attributed in each method. The background research also included what information is needed to implement each costing method and the advantages and disadvantages of each method.

On May 24, 2016, I, my thesis advisor, and a managerial accounting professor traveled to the Company to conduct interviews and tour the Company's plant. In our interviews, we talked to the Controller and the Chief Financial Officer. With both, we discussed several items including, the Company's sources of revenue, which items contribute most to revenue, and the breakdown of the production process of the highest generating item of revenue, in this case Product A. Several hand outs were made available that further diagramed how production flows through the Company's plant. Before walking through the plant, the Controller discussed these diagrams so I would better understand what I was seeing while on the plant floor. After explaining the diagrams, the Controller discussed the various systems used at the Company to help products move through the facility. These system included MRP, Kanban, and pull production by customer demand. The Controller explained the entire production process starting with when an order is first made, to when the items are either shipped or stored in the Company's finished goods warehouse. Following this discussion, we toured the plant floor to better understand the production process previously mentioned. Throughout the tour, the Controller answered questions regarding the production process including how much inventory is on hand at any given time and how long it takes items to go through the production process. After the tour with the Controller and CFO was completed, we discussed what I observed on the plant floor, and I asked any questions that were not answered that pertained to my Operations Interview Questions that I submitted to the Institutional Review Board (IRB). These questions can be found in Appendix 2. Following the interviews, I was able to generate my hypothesis regarding what cost accounting methods the Company implements to allocate costs to Product A.

On July 11, 2016, my thesis advisor and I traveled to the Company for a second round of interviews with the Controller and a Cost Accountant. In this interview, I asked them specific questions regarding the costing method(s) employed by the Company along with how direct labor and direct material costs are attributed to items at the Company. In addition to answering the interview questions, the Cost Accountant gave a PowerPoint presentation to further diagram how direct labor and direct materials are allocated.

Following the second round of interviews, I analyzed why the Company uses a specific methodology. To do this, I used the background information on the various costing methods and the Company along with the interview notes. I then analyzed why the Company uses one method versus other methods, the feasibility of implementing a different costing method, the advantages and disadvantages of implementing a different

method, and what additional information the Company would need to collect to implement the method.

IV. Results and Analysis

Results

During the interview that occurred on July 11, 2016, I met with a Cost Accountant and the Controller. The Cost Accountant discussed the overall costing process using a PowerPoint presentation. The first item mentioned was product cost source data, this included information about what is collected in order to begin the costing process. Necessary material includes Bill-of-Materials, material cost, and fabrication/assembly cost. From there, the Cost Accountant explained how each of the prior items are used to help generate the product cost. Next, it was discussed that in order to ensure that the Company is applying the most accurate information, the actual product cost is reviewed and updated monthly to check for any numbers that appear incongruent with expectations. The Cost Accountant then discussed how the product costing process for standard units varies from configured units and how the process for costing new products varies from the prior mentioned units.

Following the discussion with the Cost Accountant, the Controller explained the Company's specific costing process for the allocation of overhead. The Controller informed me that the Company uses a traditional based costing method for all steps in the production process. The Controller noted that the Company chose this costing method because the Company's primary focus is on customer service. The Company believes that if it chose a more rigorous costing method, it would ultimately hurt customer service since it would take longer to collect data for reporting purposes and be more costly. With the traditional based costing method, the Company establishes an annual overhead rate at the beginning of the year by analyzing the overhead rates from the past twelve months and the coming year's budget. During the year, the overhead rate is analyzed on a monthly basis. If the overhead exceeds a certain margin of error, then it is possible that a new overhead rate needs to be determined for the remainder of the year. The overhead rate includes items such as production supplies, overtime, production support, quality management, scheduling, materials management and handling, and production supervision. Overhead is applied as a percentage of direct labor. Direct labor is tracked based on product routings. The Company's direct labor wages includes employee vacations, holidays, benefits, payroll taxes, and retirement contributions.

According to the Controller, advantages of the traditional based costing method include it being a straight forward method to assign costs to products, to determine product margin, and to set a sell price. The Controller also noted that for the Company's desired level of accuracy, traditional based provides accurate enough data. In fact, in 2013 a study was conducted to see what overhead would be if ABC was used, and the differences between the two methods proved to be negligible. As for the future of the traditional based costing at the Company, the Controller notes that as of now the traditional based method should stay in place. However, the Company does plan to add more product lines in the future, which will require the reevaluation of overhead.

Analysis

Traditional Based Costing

The Company uses traditional based cost accounting. This costing requires the use of only one cost driver to determine overhead applied (Vercio, 2008). The Company uses this method because its strategic advantage is to deliver quality products in a timely manner to its customers. Traditional based costing is beneficial to the Company because it yields accurate enough information for overhead allocation, without having to spend unnecessary resources, such as time and capital, on extra information gathering. Also, because this method complies with GAAP, the Company does not have to spend additional capital on implementing a secondary costing method. While upper management at the Company realizes traditional based accounting is not the most accurate costing method, the costs of implementing other methods at this time exceeds possible benefits as proved by the Company's in-house study conducted in 2013. During this study, the Company concluded that the use of a more accurate, but costly, costing method did not provide information that was vastly different than the overhead allocated from traditional based.

Process Costing

Process costing is a partially viable method that could be implemented at the Company. Process costing is used mostly for homogenous products since costs are traced through departments by having departments apply costs to their Work in Process Account (Oliver, 2000). This method is only partially viable because the Company only makes homogenous products for the first half of the production process, FMS and Laser to Racks, and portions of Assembly. Process Costing complies with GAAP, therefore no additional costing methods need to be implemented that overlap with the Process Costing method.

If the Company were able to apply this method, a benefit received would be that it is able to more accurately determine the efficiency of the Laser and FMS, Deburring, Rack, and Assembly stations since those departments could use Process Costing. If in the future the Company is able to make more standardized Product As, upper management would be able to determine the efficiency of more departments, such as Fabrication and other portions of Assembly. Reasons the Company may not want to use this method include the Company having to either make its process more standardized or implement a secondary costing method. In addition, the Company may have to update its inventory management method since the location of inventory is important for the calculation of overhead at the end of each period (Vitez, n.d)

Job-Order Costing

Job-order costing is a partially viable method the Company could implement. Job-order costing can best be used in processes that generate heterogeneous products or when a firm wants to treat standardized products as "unique" items. Firms may choose to use this method for allocating costs because it can help them determine how profitable a

specific job, or item, may be or how efficient the production process is for that job or item. For the Company, this method would work best for the Fabrication and parts of the Assembly portions of the production processes, since during those stages, the product is unique to each customer. One complication, though, could occur with the production of some of the standardized components, FMS and Laser to Racks portion of the production process along with parts of Assembly. Because many of the standardized components are created before an order is made, more documentation may be necessary to keep track of the component's costs so it can then be applied to the job. Another option could be to remove the production of standardized parts in Laser and FMS, Deburring, Racks, and Assembly. The Company could eliminate these departments by purchasing instead of creating components for Product A. The Company would then have a process that consists entirely of heterogeneous products. However, this would most likely cause the cost of its finished product to increase.

An advantage of job costing would be that it could help the Company determine the efficiency of the Fabrication and Assembly portions of the production process by analyzing how overhead is attributed to similar jobs. This could allow managers to determine possible inefficiencies in their production process. While this method does comply with GAAP, it may not be best to use it as a stand-alone cost allocation method since it can only cover half of the production process as it currently stands. This could make it expensive for the Company to implement and impractical since these costs are then added to the cost of implementing another costing method. In addition to the implementation of a secondary costing method, process costing may require more labor and capital to be spent on data collection and record keeping. Job costing requires all materials and labor to be tracked, which may require additional records to be kept of standardized items so it can be accurately attributed to a job. These additional costs would cause the end product to have a higher cost, which is incongruent with the Company wanting to provide an efficient process that helps reduce costs.

Activity Based Costing

ABC is a viable cost accounting method that the Company could implement. The advantage of implementing this method would be increased accuracy in the allocation of overhead to each product since more than one cost driver is used. By using more than one cost driver, costs are able to be assigned to items based on a more cause-and-effect relationship, thus allowing overhead to be more accurate (Kapic, 2014). ABC rarely complies with GAAP, though, so the Company would most likely have to implement a secondary costing method. If this were done, it would increase the costs associated with record keeping required for costing methods. Because the Company focuses on providing a quality product and the lowest possible cost, this costing method may not be the best for the Company's competitive advantage.

Activity based costing could also help the Company increase the efficiency of the plant by using time-driven activity based costing (TDABC). This specific form of activity based costing is based on the time it takes to perform specific activities that can be observed (Blotcher, 2015). By using this method, the Company can see how much unused capacity is currently at the firm and manage those costs. The disadvantage of this

method is the extra cost for information the Company would need to implement this method.

If the Company were to use time-driven activity based costing, the Company would have to collect information on how much time it takes to perform each activity. This could be done in two ways. The first way would be to interview employees to see what percentage of time they spend on each activity. Information collected in this manner is time consuming because interviews with many workers must be held in order to get the most accurate percentage. This percentage will still be inaccurate, though, because workers will not want to share information about how much time they spend idle, so a majority of the percentages will be inflated (Blotcher, 2015).

The second manner to collect information for TDABC, is to perform time studies to see how much time on average is spent on each activity. This method of data collection is less time consuming but still costly (Blotcher, 2015). The Company could, also, use regular activity based costing and allocate costs based on multiple cost drivers. However, this still requires extensive data keeping and collection.

Variable Costing

Variable costing is a viable method for the Company to implement. This method includes all variable costs in the cost of the product and does not allocate a percentage of fixed cost to each product. Instead, all fixed costs are considered period costs rather than product costs (don Edwards, 1958). This method would not require additional record keeping for the Company and managers would not have to allocate a portion of fixed overhead to each item. This could ultimately lead to variable costing being less time consuming to implement compared to prior mentioned methods. Another advantage of implementing this method is that it will allow the Company to reward its employees fairly. This is possible because the only way for employees to raise operating income is to sell more units. This is different than traditional based costing because operating income can fluctuate based on of how many units are produced. This can cause different departments to have different objectives and be able to manipulate metrics that can lead to rewards that were not deserved (Blotcher, 2015). By having only one way to change operating income, it will encourage different departments, such as Power and Cords, to work together and to reward departments using the same metric without one department being able to have more influence on the metric over another.

Variable costing, however, has several disadvantages. One major disadvantage to this method is that the Company's production process includes fixed costs in addition to variable costs. If the Company used this method, the accuracy of the overhead allocation would decrease since several major costs would be excluded from the price of the final product. This could cause the Company to incorrectly price their finished product, since not all product costs are being allocated to each item. Another difficulty for the Company would be determining how to label costs from batched operations, such as laser bed cutting and press brake operations, that contain characteristics of both fixed and variable costs. Because batch costs are neither fixed nor variable, the Company would have to determine a way to incorporate these costs into the variable costing method that would

allow them to still reap the rewards of the method (Blotcher, 2015). Another disadvantage to variable costing is that this costing method is not compliant with GAAP (De Vost, 1968). Therefore, the Company would be required to implement another costing method on top of variable costing.

V. Conclusion

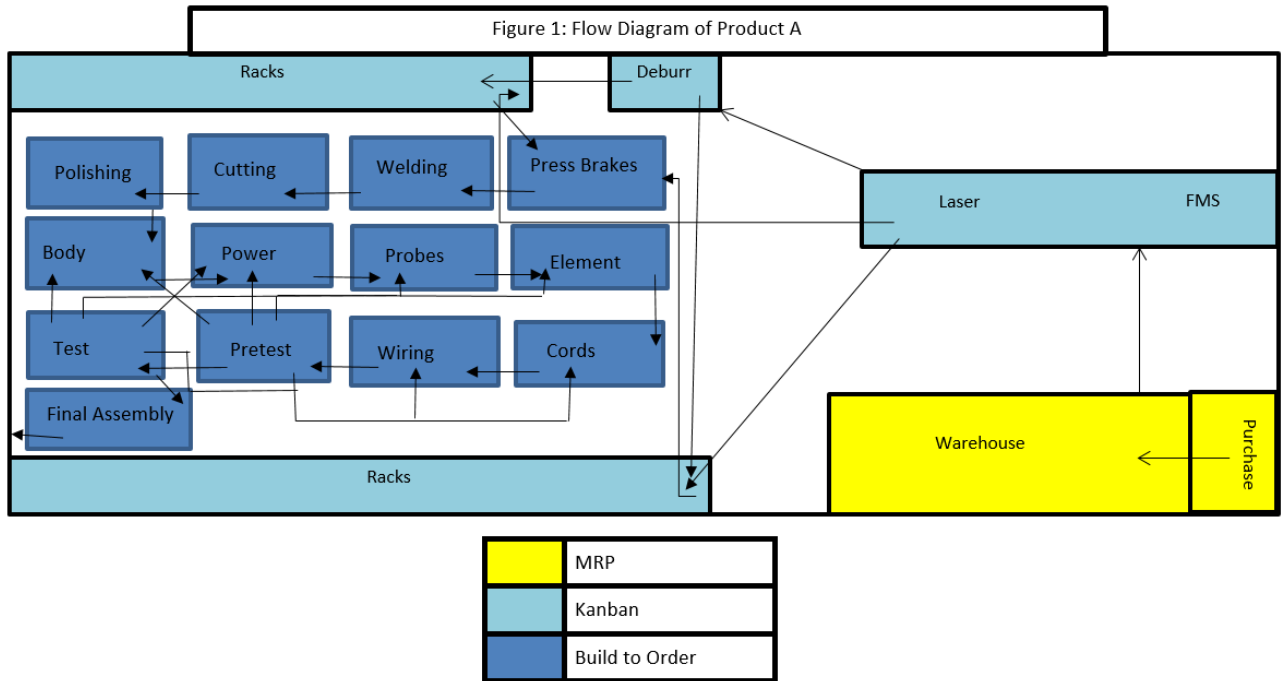
The cost of producing a good or service is comprised of three components: direct labor, direct materials, and overhead. All three components are needed to accurately cost a product or service. However, because of overhead's indirect nature, it can be difficult for firms to determine this cost compared to direct labor and direct materials. This causes overhead to be a vital item that allows a firm to accurately determine a selling price for a product. All firms must use a costing method in order to be able to allocate costs to products, however, most methods differ in how overhead is applied. The main costing methods that firms utilize are traditional based costing, job-order costing, process costing, activity based costing, and variable costing. The main differences between the costing methods are the number of cost drivers each method utilizes and the nature of the costs allocated.

The purpose of this case study was to evaluate if the Company is implementing a costing method that balances the costs and benefits of its business model. This was done by analyzing common costing methods and applying this knowledge to the Company. This information was then used to determine why the Company uses a specific method, the validity of other costing methods, and what data would be needed if a different method were implemented.

Background research on costing methods and the Company lead me to the hypothesis that the Company most likely uses a dual costing method of traditional based and job-order because its production process has two major components. The first component of the production process is the generation of standard items that are then used in the final product for the customer. The second component of the production process is the assembly of the standardized items to make a unique item for each customer. The first component is in line with major characteristics involved in traditional based costing, a method that deals with standardized items, while the second shows characteristics found in job-order, a method that deals with unique products.

After the hypothesis was made, I traveled back to the Company where the actual costing method of traditional based was revealed. Thus, my hypothesis was only partially correct. Further analysis shows that traditional based costing is most in line with the Company's business model of delivering a quality product in a timely manner. If the Company were to employ a dual method, as hypothesized, this would ultimately require more resources, and thus slow down the process. While a dual method would be more accurate, the level of accuracy provided would ultimately be too costly to justify its use. However, with the Company expanding its product lines in the future, it may become critical for the Company to eventually change its costing method to one that provides more accuracy. Until that time, though, it is likely that the Company will continue use to traditional based costing to allocate overhead to its products.

Appendix 1



Appendix 2

Interview Questions

Operations Questions

The Process

What are some of the products manufactured in this facility?

Can you walk me through the production process from when the order is placed to when it is shipped to the customer on one of your products?

What are some of the non-value add activities that take place in the production line? Non-value add meaning any activity that does contribute to the production of the product.

Are units ever sitting idle during the production process? When? For how long?

Do you track the amount of time units are idle during production?

How long does it take for a product to go through the production process?

Does it vary by product type?

Inventory

On average how many units of inventory are on hand? How much is it worth?

How long do items typically stay in inventory?

Customer features

Do you allow customers to add unique options to their product? If so what are some of the add ons customers can purchase?

Do you limit how many add ons a customer can have?

When are these add ons added to the product? Are they added to a unit that is pulled from inventory or is it added in the initial creation of the product?

Accountant Questions

Questions about the Individual

What is your name?

How long have you been in the accounting profession?

How long have you worked for company?

Questions about the Company's Costing Method in General

What sort of costing method, for example standard costing, process, job, or activity-based costing, does COMPANY use for inventory?

How long has company been using this particular method? What method was it using before, why did COMPANY decide to change methods?

Questions about the Company's Specific application of the Costing Method

Could you walk me through an example of the application of your costing method to a specific product?

How many overhead cost pools do you have?

What cost drivers does the company use when determining overhead cost allocation?

How do you gather the necessary information regarding the cost drivers?

Aside from looking at cost drivers, does COMPANY need any other information to allocate overhead?

How do you evaluate the reasonableness of the cost of an item?

In your opinion what are some of the benefits of using the method COMPANY currently uses?

In your opinion what are some of the disadvantages of using the method COMPANY currently uses?

Questions about the Future of the Company's Costing Method

Has COMPANY been looking into possibly changing the costing method currently in place? If so why and to what method?

If COMPANY is not looking into changing the method currently in place, in your opinion do you think they should? If so, why and to what method? If not, why not?

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