Modeling Duration-Based Costing in Activity-Based Costing Software

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Can Duration-Based Costing (DBC) and Modified Duration-Based Costing (MDBC) be modeled into an Activity-Based Costing (ABC) software instead of using Excel? Prior research has used Microsoft Excel to model DBC and MDBC. This study builds on prior research regarding the use of DBC and MDBC (Lelkes, 2009, 2014, 2015, 2017; Lelkes & Deis, 2013; Lelkes & Krueger, 2020, 2021) by demonstrating the integration of DBC and MDBC into an ABC software for illustrative purposes, called MyABCM, which is an ABC software that can be standalone or integrated into SAP, Oracle, and other Enterprise Resource Planning (ERP) systems. The case information in this study is adapted from MyABCM training materials and is used to demonstrate how modeling DBC and MDBC appear in MyABCM. MyABCM is used in this study as an example of one of many ways DBC and MDBC can be incorporated into a software that can be integrated into an ERP system. DBC and MDBC can effectively be modeled into any ERP system or standalone ABC software.

Keywords: Duration-Based, modified, costing, MyABCM, enterprise systems, ERP

INTRODUCTION

In times of uncertainty and vulnerability, decision-making requires prompt information, which can come from different sources and models to improve the organization's profitability. It is crucial to constantly review information needs and hypotheses to build or adjust management accounting models with other techniques and rules to issue reliable (relevant) information.

Enterprise Resource Planning (ERP) systems have integrated overhead allocation processes, such as Activity-Based Costing (ABC), to allow for cost management of production and performance of services. One example of ABC software is MyABCM software which a firm can use as standalone or integrate into SAP, Oracle, Microsoft ERP, and other ERP systems (MyABCM, 2023). This software helps companies implement and maintain an ABC system effectively.

There have been several simplification attempts to make ABC easier to use. This study focuses on two simplification attempts found in the literature: Duration-Based Costing (DBC) and Modified Duration-Based Costing (MDBC). To date, only Microsoft Excel has been used to model DBC and MDBC. This paper is the first attempt at modeling DBC and MDBC into an ABC software that can be used either standalone or integrated into an ERP system. The next section provides the literature review.

LITERATURE REVIEW

To be able to fully utilize ABC, a firm must use two stages. Stage 1 assigns resource costs to activities using resource drivers. Stage 2 assigns primary activity costs to cost objects using activity drivers. In between all that are secondary support activity costs being allocated to primary producing activity costs. Since a firm can have hundreds of activities, this can be a costly and complex process (Kaplan & Anderson, 2007a, 2007b; Krumwiede, 1998a, 1998b).

Researchers have tried to simplify ABC. Kaplan & Anderson (2007a, 2007b) created one of the simplified models called Time-Driven ABC (TDABC). One theory behind TDABC is that drivers based on time can be more accurate than transaction-based drivers (Cooper & Kaplan, 1998; Kaplan & Anderson, 2007a, 2007b). However, TDABC is also complex since all activities must be identified to develop the time equations. As a result, Lelkes (2009) developed DBC to simplify ABC due to the high cost and complexity of ABC. DBC is simpler than ABC but with similar results in cost assignments (Lelkes 2009, 2017; Lelkes & Deis, 2013). Research has shown that a more straightforward system such as DBC can be more accurate than ABC when a multiproduct firm has a nonconstant returns scale (Christensen & Demski, 1997; Christensen & Hemmer, 2006; Lelkes, 2014).

DBC uses the production cycle time to assign resource costs to products. This means that DBC is done in one stage. The information needed for DBC is the production cycle time, a number of production runs, and the total overhead cost (same as total resource cost). Each individual activity does not need to be known. Each product has its own cycle time, which is an observed value from when the materials are called to produce the product to when the product is finally completed. To compare DBC with ABC, Lelkes created an ABC benchmark where all drivers are based on time (Lelkes, 2009, 2017; Lelkes & Deis, 2013). Lelkes found that DBC provides overhead cost assignments close to those of that ABC benchmark system.

DBC relies on the theory that "time is money." There is not only a causality factor between time and cost but also a correlation factor. The more time that is spent producing a product or performing a service, the higher the cost of that product or service. The time spent drives or causes costs to incur. For instance, companies lose money if they take too much time in manufacturing a product. They lose money because of the higher cost of manufacturing due to the time spent plus customers will go elsewhere to get the product quicker and perhaps cheaper. If companies focus on the production cycle time and look for ways to make manufacturing more efficient by reducing the cycle time, they will not only cut costs but also increase their revenues by attracting customers because of timely access to the products.

Just as ABC treats overhead costs as though they were variable, DBC does the same. This is why Lelkes (2015) created Modified Duration-Based Costing (MDBC), which separates fixed and variable overhead into two components, which may allow for more accurate product cost assignments depending on how significant the fixed costs are. The variable overhead costs are assigned using the production cycle time as in DBC, whereas the fixed costs are assigned based on the number of production runs. The purpose of MDBC is to give management another option if it prefers separating fixed and variable costs.

To extend DBC and MDBC further beyond theory, Lelkes and Krueger applied DBC and MDBC to a Fortune 500 firm (2020) and a bank (2021). The Fortune 500 firm allocated overhead costs the traditional way, but the bank did not have any allocation method. DBC and MDBC provided extra information and explained specific outcomes more thoroughly (such as why a product or loan was losing money). All the prior published research thus far shows that DBC may be a valid alternative to determine profitability and costs not only accurately but also faster and easier than what ABC offers.

DBC and MDBC have yet to be integrated with an ERP system. Prior research did not use any ERP software extension to implement DBC and MDBC. At most, Excel could be easily used. This study extends the DBC and MDBC research and models DBC and MDBC using a particular ABC Software for illustrative purposes called MyABCM. This study is organized as follows. The next section discusses the background of MyABCM. The fourth section discusses the case scenario based on a MyABCM training example and ABC cost assignment results using MyABCM. The fifth section discusses how DBC appears in the MyABCM software. The sixth section compares the results of the cost assignments using MyABCM for

DBC and ABC. The seventh section incorporates MDBC into MyABCM. The final section concludes the paper.

MYABCM BACKGROUND

MyABCM was first known as ABC Technologies in 1993 in Brazil (MyABCM, 2023). In 2002, ABC Technologies were sold in the U.S., which began the development of the MyABCM software. In 2006, it was renamed as MyABCM. In 2020, MyABCM started an office in the U.S. As of 2021, MyABCM has offices and sales in many countries such as the U.S., Spain, Mexico, Caribbean, Canada, Colombia, Africa, Poland, Central America, Nordic countries, France, Switzerland, Argentina, Uruguay, China, Chile, Peru, Bolivia, and the Baltic countries (MyABCM, 2023). In 2021, MyABCM became an SAP functionality extension (SAP ISV Partner), and a Microsoft Partner (MyABCM, 2023). MyABCM software can be standalone or integrated into SAP, Microsoft, Oracle, and other ERP systems.

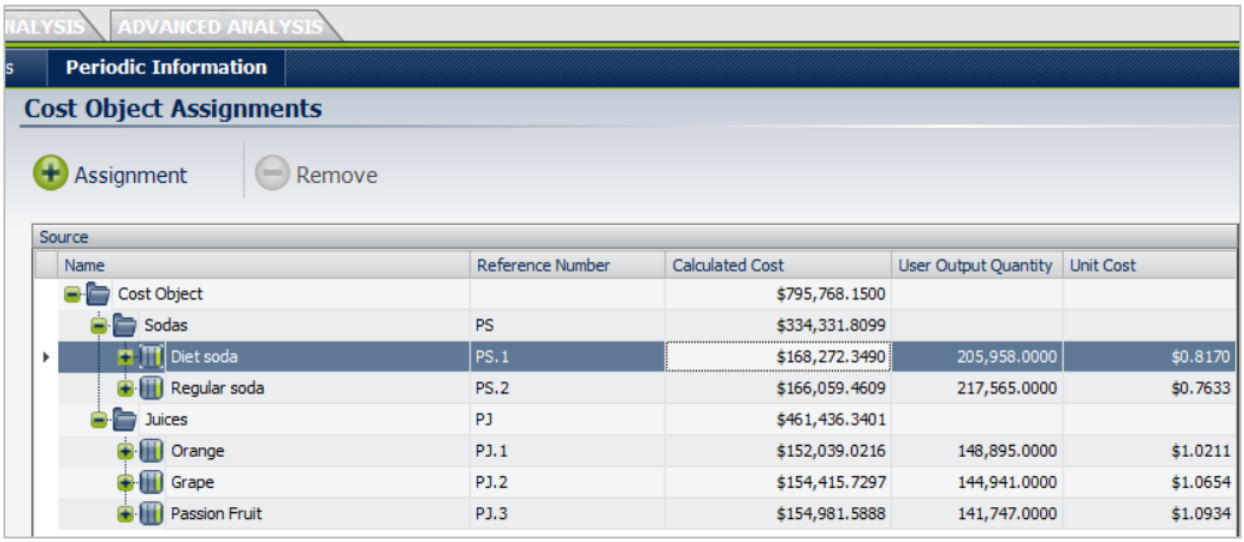
CASE SCENARIO

The case scenario is adapted from the MyABCM Training Workbook called MyABCM Corporate Desktop: Cost, Profit, and Performance Management Solutions Training Workbook (Version 9.0 - REV001). This adapted case uses the Academic Version of MyABCM, and thus, it was limited to only cost assignments. The adapted case concerns XYZ Company which produces and distributes diet and regular sodas along with orange, grape, and passion fruit juices. The ABC Model contains five major overhead resource components: Personnel, Energy, Rent, and Other. The primary activity categories are maintenance, distribution, and production. The secondary activities are systems and human resources. The direct costs are the ingredients to manufacture the sodas and juices. ABC assigns resource costs to activities, secondary support activity costs to primary activities, and then primary activity costs to the cost objects, sodas, and juices in this case scenario.

ABC Results Using MyABCM

Figure 1 shows the costs assigned to the sodas and juices using ABC. For brevity, this study does not show the resource assignments, interaction of activities assignments, and the activity assignments to the cost objects.

FIGURE 1
MYABCM RESULTS FOR ABC



Name	Reference Number	Calculated Cost	User Output Quantity	Unit Cost
Cost Object		$795,768.1500		
Sodas	PS	$334,331.8099		
Diet soda	PS.1	$168,272.3490	205,958.0000	$0.8170
Regular soda	PS.2	$166,059.4609	217,565.0000	$0.7633
Juices	PJ	$461,436.3401		
Orange	PJ.1	$152,039.0216	148,895.0000	$1.0211
Grape	PJ.2	$154,415.7297	144,941.0000	$1.0654
Passion Fruit	PJ.3	$154,981.5888	141,747.0000	$1.0934

In Figure 1, the total costs assigned to the products include both the direct costs and overhead costs. Of the Total Cost of $795,768.15, the direct costs amount to $510,004.15, with the remaining $285,764.00 being overhead. This study will use the results in Figure 1 to compare with the results of DBC.

DBC Information

As mentioned earlier, DBC is performed in one stage. First, DBC assigns resource (overhead) costs to the cost objects. Next, DBC information that is needed are the production cycle times, the number of production runs for each soda and juice, and the total overhead cost (Refer to Appendix for DBC Model based on Lelkes 2017). Activities are not identified at all, which eliminates the cost assignments for the interactions between activities and eliminates resources being assigned to activities. Table 1 shows the information DBC needs.

TABLE 1
DBC INFORMATION

Product	Product Code	Number of Units	Number of Production Runs (500 Units in each Batch)*	Production Cycle Time (Hours)	Total Time
Diet Soda	PS.1	205,958	411.92	0.1	41.1916
Regular Soda	PS.2	217,565	435.13	0.1	43.513
Orange Juice	PJ.1	148,895	297.79	0.15	44.6685
Grape Juice	PJ.2	144,941	289.88	0.15	43.4823
Passion Fruit Juice	PJ.3	141,747	283.49	0.15	42.5241
				Total Time (Hours)	**215.3795**
				Total Overhead	**$285,764**
				Cost per Hour	**$1,326.79**

*This is based on batches or production runs of 500 units each; the production cycle time is an estimate for this example (it is not based on any hours that are used in the ABC example because it would not be realistic since the ABC model in the example has other drivers that are not time-based.

Table 1 provides the number of units for each beverage and the number of production runs. For simplicity, the adapted case scenario assumes that 500 units (bottles of beverage) are in each production run. The production cycle time is 0.1 hours for each soda and 0.15 hours for each juice. The number of production runs (or batches) multiplied by the production cycle time provides the total time for each beverage. For instance, the total time for Diet Soda is the number of production runs of 411.92 multiplied by the production cycle time of 0.1 to arrive at the total time of 41.1916 hours. The total time across all beverages sums to 215.3795 hours. The total overhead cost of $285,764 is divided by the total time of 215.3795 to arrive at the cost per hour of $1,326.79. To be able to use MyABCM for DBC, a user must first multiply the number of production runs by the production cycle time to provide the total time for each beverage. Then, the user will input the total time for each beverage into MyABCM (i.e., Diet Soda 41.1916 hours, Regular Soda 43.513 hours, Orange Juice, 44.6685 hours, Grape Juice 43.4823 hours, and Passion Fruit Juice 42.5241 hours).

How to Perform DBC

To continue Table 1, Table 2 shows how DBC assigns overhead based on Lelkes's research (2009, 2017).

TABLE 2
HOW TO PERFORM DBC

Product	Number of Units	Number of Production Runs (500 Units in each Batch)*	Production Cycle Time (Hours)	Total Time	Cost per Hour	Total Overhead Cost Assigned Using DBC
Diet Soda	205,958	411.92	0.1	41.1916	$1,326.79	$54,652.72
Regular Soda	217,565	435.13	0.1	43.513	$1,326.79	$57,732.74
Orange Juice	148,895	297.79	0.15	44.6685	$1,326.79	$59,265.85
Grape Juice	144,941	289.88	0.15	43.4823	$1,326.79	$57,692.01
Passion Fruit Juice	141,747	283.49	0.15	42.5241	$1,326.79	$56,420.68
			Total Time (Hours)	**215.3795**	**Totals**	**$285,764.00**
			Total Overhead Cost per Hour	**$285,764 $1,326.79**		

Product	Total Overhead Cost Assigned Using DBC	Direct Costs	Total Cost Assigned Using DBC
Diet Soda	$54,652.72	$111,876.39	$166,529.11
Regular Soda	$57,732.74	$110,805.85	$168,538.60
Orange Juice	$59,265.85	$94,622.77	$153,888.62
Grape Juice	$57,692.01	$95,574.10	$153,266.10
Passion Fruit Juice	$56,420.68	$97,125.04	$153,545.72
	$285,764.00	**$510,004.15**	**$795,768.15**

The Cost per Hour of $1,326.79 is multiplied by the Total Time for each beverage. For example, Diet Soda Cost per Hour of $1,326.79 multiplied by the Total Time of 41.1916 provides the Overhead Cost Assigned using DBC of $54,652.72. The Total Overhead Cost Assigned using DBC added to the Direct Costs provide the Total Cost Assigned using DBC. The Direct Costs are the ingredients for the beverages that are assigned directly and, as a result, do not need an allocation method such as DBC or ABC.

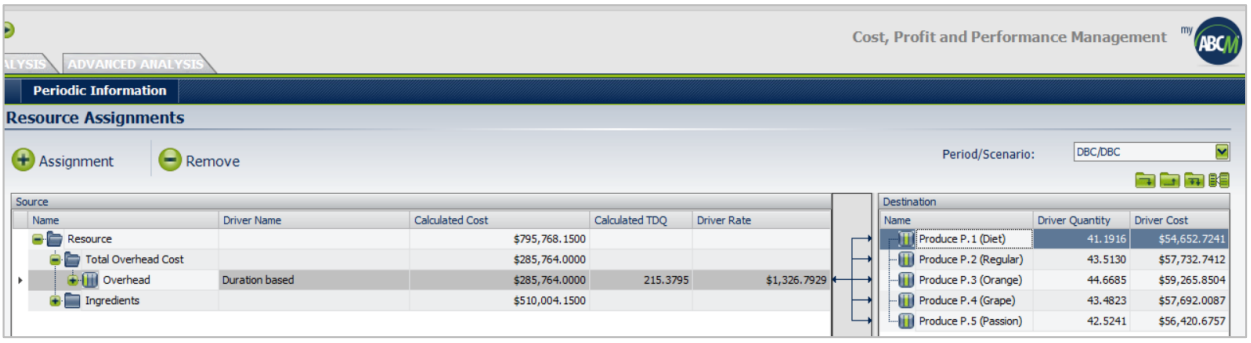
DBC ANALYSIS USING MYABCM

As this study mentions, to use MyABCM for DBC, a user must input the total time for each beverage into MyABCM. Therefore, the user must first multiply the number of production runs by the production cycle time to provide the total time for each beverage.

DBC Analysis Using Total Overhead

Figure 2 shows the information contained in the MyABCM Resource Module using DBC.

FIGURE 2
DBC RESOURCE ASSIGNMENT MODULE IN MYABCM USING TOTAL OVERHEAD

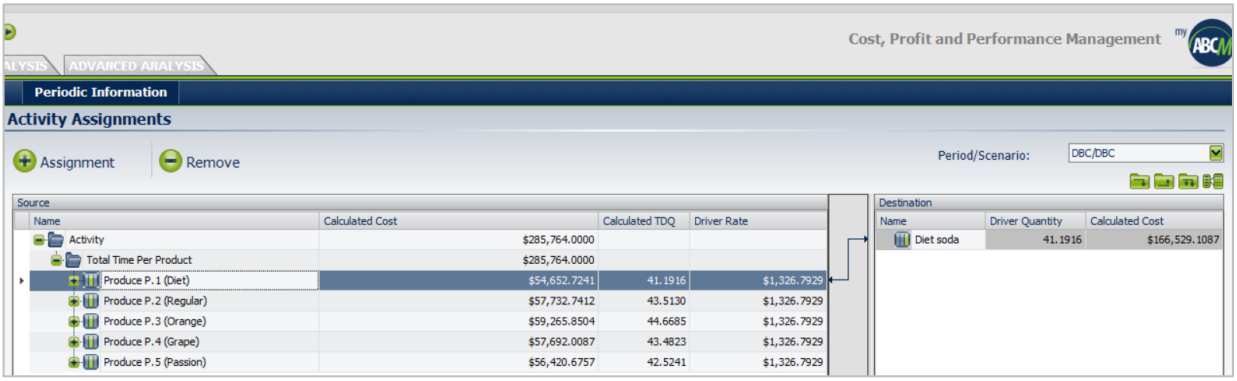


In Figure 2, overhead of $285,764 is combined in Total Overhead Cost. When a user selects the submenu Overhead, arrows point to each product. Driver Quantity is the Total Time for each beverage calculated in Table 1. MyABCM calculates the total time of 215.3795 across all beverages in the Calculated TDQ column. Note that the amount is the same as the total time calculated in Table 1. Additionally, Ingredients are direct costs. Personnel, Energy, Rent, and Other are the overhead components.

Furthermore, MyABCM also calculates the cost per hour of $1,326.7929, which is the same amount as manually calculated in Table 1. Finally, in Figure 2, notice the Driver Rate column. The amounts in the Driver Rate column are the same as the DBC overhead costs manually assigned in Table 2. Remember that DBC assigns the resource costs directly to the products in one stage if done without specialized costing software (such as using Excel).

Since ABC is done in two stages, whereas DBC is done in one stage, a user must include an intermediate step in MyABCM to perform DBC. Figure 3 shows the intermediate step for the Activity Assignments Model in MyABCM.

FIGURE 3
INTERMEDIATE STEP IN MODELING DBC IN MYABCM



The "activities" are to produce each product, i.e., Produce P.1 (Diet), Produce P.2 (Regular), Produce P.3 (Orange), Produce P.4 (Grape), Produce P.5 (Passion). Figure 3 selects the first "activity" of Produce P.1 (Diet). Notice that the arrows point to Diet Soda's product with the Driver Quantity (the Total Time for Diet Soda from Table 1) to produce Diet Soda entered as 41.1916. Additionally, although not shown in Figure 3, if Produce P.2 (Regular) were selected, the arrow would point to Regular Soda with the Driver Quantity (Total Time) of 43.5130 that the user would have entered individually. Then, the user would do the same procedure for the other beverages. Notice also that the Calculated Cost column for Diet Soda shows the total cost (both overhead allocated and direct costs) as $166,529.11, which is the same overhead

cost assignment for Diet Soda as the amount that was calculated in Table 2. This intermediate step of Activity Assignments already has the overhead cost assignments for each beverage. It will have the same overhead cost assignments in the Cost Objects Assignment Module in Figure 4.

Figure 4 shows the MyABCM Cost Object Assignments. The Calculated Cost Column shows the costs (both direct and overhead) assigned to each of the beverages. Figure 4 shows sub-rows for each beverage. Looking at the Calculated Cost Column, the direct costs are the rows for two ingredients for each beverage. The Produce sub-row under each beverage shows the overhead cost allocation. This is the same as the manual cost assignments in Table 2. For clarification, in Table 2, the Direct Cost for Diet Soda is $111,876.39, and the sum of the two ingredients in Figure 4 for Diet Soda of $28,092.67 and $83,783.71. User Output Quantity shows the number of units (or bottles) of each beverage produced.

FIGURE 4
COST ASSIGNMENTS FROM MODELING DBC IN MYABCM

Cost Object Assignments

Assignment | Remove

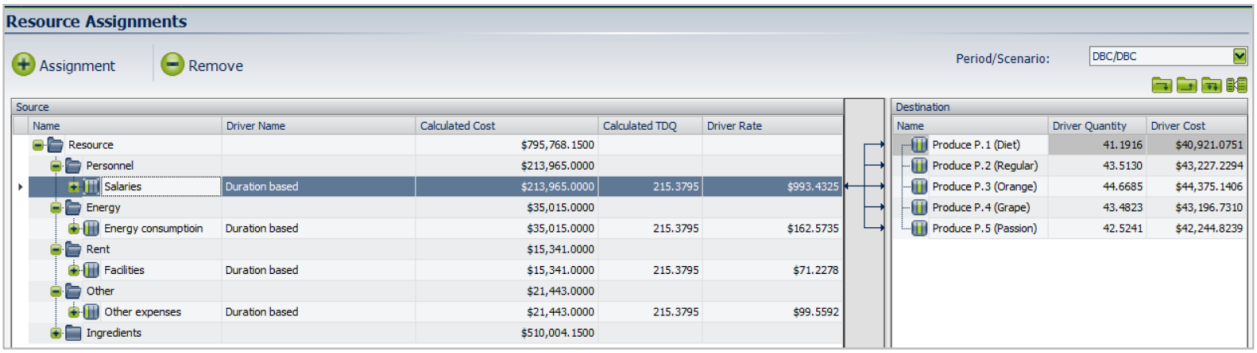
Source

Name	Calculated Cost	User Output Quantity	Unit Cost
Cost Object	$795,768.1500		
Sodas	$335,067.7035		
Diet soda	$166,529.1087	205,958.0000	$0.8086
ingredient 6.1	$28,092.6717		$0.1364
ingredient 6.2	$83,783.7129		$0.4068
Produce P.1 (Diet)	$54,652.7241		$0.2654
Regular soda	$168,538.5948	217,565.0000	$0.7747
ingredient 6.1	$29,675.8666		$0.1364
ingredient 6.2	$81,129.9871		$0.3729
Produce P.2 (Regular)	$57,732.7412		$0.2654
Juices	$460,700.4465		
Orange	$153,888.6227	148,895.0000	$1.0335
ingredient 6.1	$22,929.8304		$0.1540
ingredient 6.3	$71,692.9419		$0.4815
Produce P.3 (Orange)	$59,265.8504		$0.3980
Grape	$153,266.1039	144,941.0000	$1.0574
ingredient 6.1	$24,234.1356		$0.1672
ingredient 6.3	$71,339.9596		$0.4922
Produce P.4 (Grape)	$57,692.0087		$0.3980
Passion Fruit	$153,545.7199	141,747.0000	$1.0832
ingredient 6.1	$24,323.7857		$0.1716
ingredient 6.3	$72,801.2586		$0.5136
Produce P.5 (Passion)	$56,420.6757		$0.3980

DBC Analysis Dividing the Overhead Into Individual Resources

Instead of lumping all resources into one overhead cost amount of $285,764, the resource costs can be divided into Personnel, Energy, Rent, and Other.

FIGURE 5
DBC RESOURCE MODULE IN MYABCM WITH TOTAL OVERHEAD DIVIDED INTO RESOURCE COMPONENTS



Notice how Figure 5 differs from Figure 2. The Cost per Hour of $1,326.79 (Driver Rate) from Figure 2 is divided across the four resources. In Figure 5, for Personnel Salaries, MyABCM calculates the Driver Rate of $993.43 by taking $213,965 in Salary Cost divided by the Total Time (Calculated TDQ) of 215.3795. The same process goes for the other resources. The sum of the Driver Rates equals the Cost per Hour of $1,326.79 (Driver Rate) from Figure 2. In Figure 5, the Salary row with arrows pointing to the production is selected. Notice that the Driver Rate Column is different from that in Figure 2. This difference is due to the subdivided resource costs instead of lumped together. The question is, how does a user, for example, reconcile the Driver Cost for Diet Soda of $54,652.72 (rounded) from Figure 2 to that in Figure 5? The answer is quite simple. As shown in Figure 5, when the Salary row is selected, the Driver Rate Column for Diet Soda is $40,921.08. Although not shown in Figure 5, if the Energy Consumption row is selected, the Driver Cost for Diet Soda is $6,696.66. If the Facilities row is selected, the Driver Cost for Diet Soda is $2,933.98. If the Other Expenses row is selected, the Driver Cost for Diet Soda is $4,101. Adding those amounts together, the result is $54,652.72 (rounded). As mentioned when Figure 2 was discussed, this amount is the resource (overhead) cost assigned to soda.

When resource costs are separated, the intermediate step and the final cost assignments are identical in Figures 3 and 4, respectively.

COMPARISON OF DBC AND ABC COST ASSIGNMENTS

Table 3 compares the DBC and ABC Cost Assignments from MyABCM. Notice how the costs under DBC are close to those of ABC. The first portion of Table 3 shows the % Difference between the Overhead Cost assigned using DBC vs. ABC. The % Difference in Overhead Cost Assignment for each beverage is the Overhead Cost Assigned Using ABC minus that using DBC, then divided by the Overhead Cost Assigned Using ABC. The percentage differences in the overhead cost assignments are not too significant and could be due to some of the drivers in ABC not being based on time but rather transaction-based (refer to Introduction).

Additionally, the Total Cost for each method includes both direct and overhead costs. Notice that the total costs are even closer together under each method. Therefore, the cause of the % Difference in Total Cost being lower than the % Difference in Overhead Cost Assigned is due to the direct costs, which are the same under both methods.

TABLE 3
COMPARISON OF DBC AND ABC COST ASSIGNMENTS FROM MYABCM

Product	Overhead Cost Assigned Using DBC	Overhead Cost Assigned Using ABC	% Difference in Overhead Cost Assignment
Diet Soda	$54,652.72	$56,395.96	3.091%
Regular Soda	$57,732.74	$55,253.61	-4.487%
Orange Juice	$59,265.85	$57,416.25	-3.221%
Grape Juice	$57,692.01	$58,841.63	1.954%
Passion Fruit Juice	$56,420.68	$57,856.55	2.482%
	$285,764.00	**$285,764.00**	

Product	Total Cost Using DBC	Total Cost Using ABC	% Difference in Total Cost
Diet Soda	$166,529.11	$168,272.35	1.04%
Regular Soda	$168,538.60	$166,059.46	-1.49%
Orange Juice	$153,888.62	$152,039.02	-1.22%
Grape Juice	$153,266.10	$154,415.73	0.74%
Passion Fruit Juice	$153,545.72	$154,981.59	0.93%
	$795,768.15	**$795,768.15**	

MDBC ANALYSIS USING MYABCM

If a user wants to separate fixed and variable costs, the user can implement Lelkes (2015) Modified DBC (MDBC) (refer to Appendix for model definition). Variable Overhead Cost would be set up using the total time for each beverage from Table 1. The Fixed Overhead Cost would be set up using the number of production runs for each beverage from Table 1.

Figure 6 Panels A and B show the resource assignments using MyABCM. In Figure 6, of the $285,764 in overhead cost, $200,000 is variable and $85,764 is fixed. In both Panels, notice that the cost per hour is now $928.59 (rounded and located in the Driver Rate column), which is calculated by taking the Variable Overhead of $200,000 and dividing by the total time (in the Calculated TDQ column) across all beverages of 215.3795 (same total time amount as in Table 1 and prior discussion using DBC). However, there is now a fixed cost per production run. Figure 6 (both Panels) shows the total amount of production runs across all beverages is 1,718.21 in the Calculated TDQ column. This is the sum of all the production runs in Table 1. The cost per production run in the Driver Rate column is $49.91, which is the $85,764 in fixed overhead divided by the total production runs of 1,718.21. In Panel A of Figure 6, Variable Overhead is selected and has an arrow pointing to each of the beverages. Notice that the Driver Quantity is the total time for each beverage (as shown in Table 1). In Panel B of Figure 6, Fixed Overhead is selected and has an arrow pointing to each of the beverages as well. Notice that the Driver Quantity is the number of production runs for each beverage (as shown in Table 1).

FIGURE 6
MDBC RESOURCE ASSIGNMENT MODULE IN MYABCM

Panel A: With Variable Overhead Selected

Panel B: With Fixed Overhead Selected

Figure 7 shows the intermediate step of assigning the "activities." Again, like DBC, this intermediate step already has the overhead cost assignments for each beverage and will have the same overhead cost assignments in the Cost Objects Assignment Module shown in Figure 8.

Figure 7 shows the variable and fixed overhead cost assignments for each beverage.

FIGURE 7
INTERMEDIATE STEP IN MODELING MDBC IN MYABCM

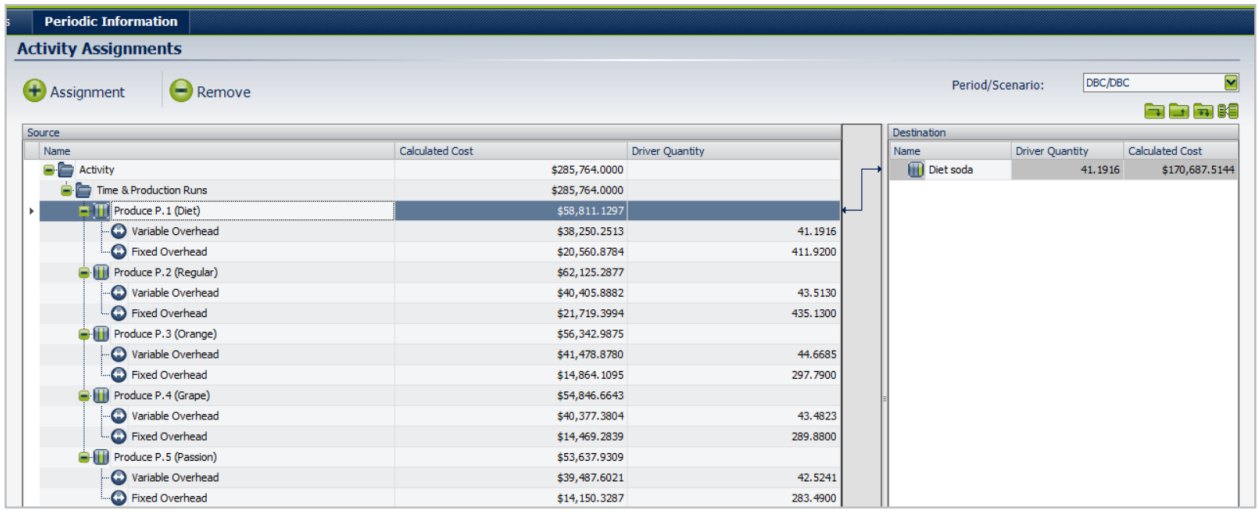
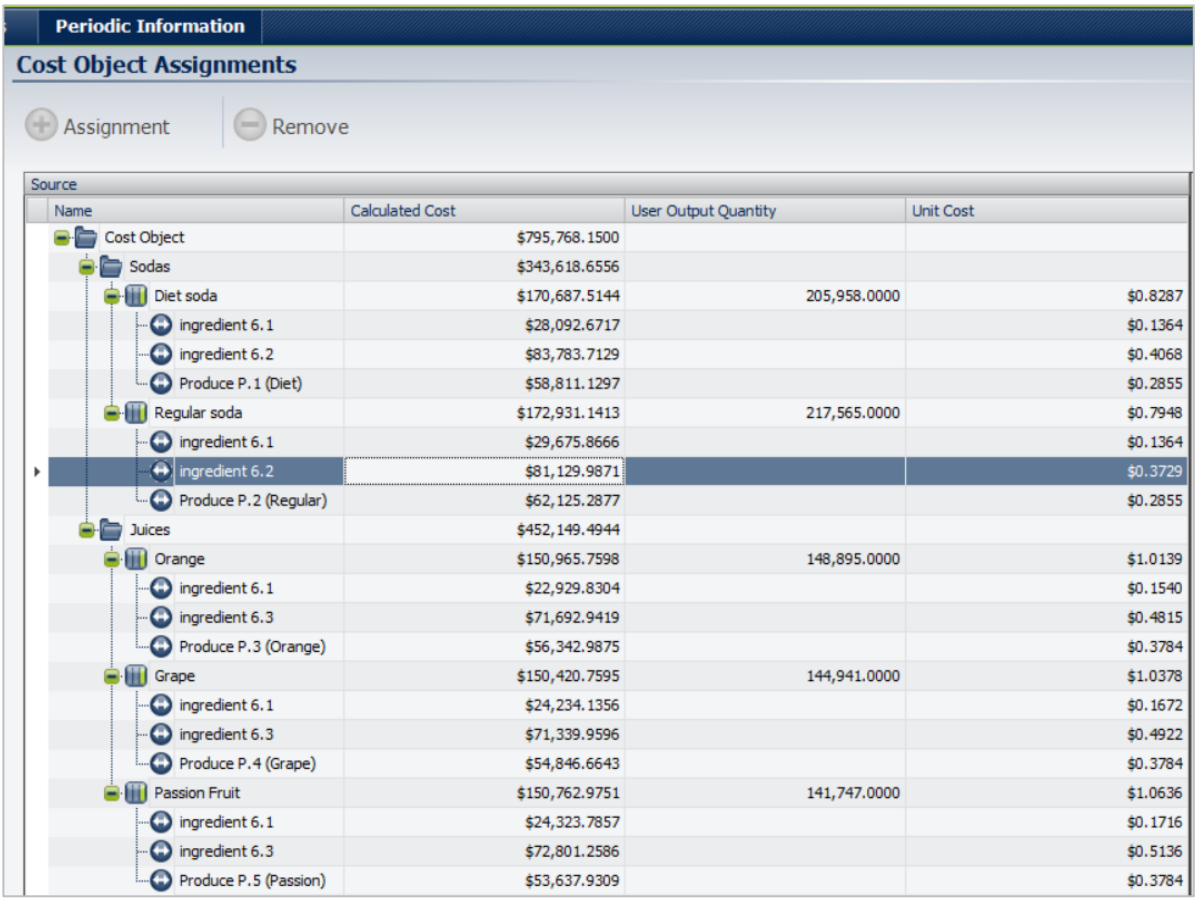


Figure 8 shows the overhead and direct costs assigned to each beverage. The variable and fixed overhead costs from Figure 7 are added together and displayed in the Produce row for each beverage.

FIGURE 8
COST ASSIGNMENTS FROM MODELING MDBC IN MYABCM



Name	Calculated Cost	User Output Quantity	Unit Cost
Cost Object	$795,768.1500		
Sodas	$343,618.6556		
Diet soda	$170,687.5144	205,958.0000	$0.8287
ingredient 6.1	$28,092.6717		$0.1364
ingredient 6.2	$83,783.7129		$0.4068
Produce P.1 (Diet)	$58,811.1297		$0.2855
Regular soda	$172,931.1413	217,565.0000	$0.7948
ingredient 6.1	$29,675.8666		$0.1364
ingredient 6.2	$81,129.9871		$0.3729
Produce P.2 (Regular)	$62,125.2877		$0.2855
Juices	$452,149.4944		
Orange	$150,965.7598	148,895.0000	$1.0139
ingredient 6.1	$22,929.8304		$0.1540
ingredient 6.3	$71,692.9419		$0.4815
Produce P.3 (Orange)	$56,342.9875		$0.3784
Grape	$150,420.7595	144,941.0000	$1.0378
ingredient 6.1	$24,234.1356		$0.1672
ingredient 6.3	$71,339.9596		$0.4922
Produce P.4 (Grape)	$54,846.6643		$0.3784
Passion Fruit	$150,762.9751	141,747.0000	$1.0636
ingredient 6.1	$24,323.7857		$0.1716
ingredient 6.3	$72,801.2586		$0.5136
Produce P.5 (Passion)	$53,637.9309		$0.3784

The costs assigned under MDBC differ from ABC because the fixed and variable costs are separated. As a result, some managers may believe that MDBC might be a more accurate representation of costs with the separated fixed and variable costs. This goes back to prior research where separating fixed and variable costs may be more accurate.

CONCLUSION

DBC compared to ABC, has proven to be more practical and flexible in defining cost assignments because it relies on the concept that "time is money": The more efficient the production process (lower cycle times), the less the cost incurred. Additionally, revenues will increase because customers will be happy to receive a timely product.

This paper has shown that DBC and MDBC can be modeled into ABC costing software, such as MyABCM for example, which can be standalone or integrated into ERP systems such as SAP, Microsoft, and Oracle. Furthermore, DBC has the potential to be more accurate in multiproduct firms with nonconstant returns to scale by matching the technical efficiency of the product lines, as Lelkes (2014) discussed. This is due to DBC being less information-intensive, whereas ABC has too much information and complexity. DBC and MDBC have been applied to a Fortune 500 firm and a bank, providing both companies with

helpful information (Lelkes & Krueger, 2020, 2021). DBC may have a future in companies that want a simpler model with cost assignments close to those of ABC, with the option of using MDBC if companies want to separate fixed and variable costs.

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APPENDIX

The DBC model from Lelkes (2009, 2017) and Lelkes & Deis (2013) used to assign overhead cost to a product or service, denoted as $i = 1,\ldots, k$ is

$$D_i = c\beta_i\theta_i, i = 1, \ldots, k, \quad \text{(A1)}$$

where

D_i = indirect overhead assigned to *i* using DBC;
c = indirect overhead cost per unit of time (in hours or minutes), or $OH/\sum_{i=1}^{k}(\beta_i\theta_i)$;
β_i = product or service cycle time for *i*; and
θ_i = number of times product *i* is created or service *i* is performed.

The MDBC model from Lelkes (2015) is

$$D_i^M = c^V\beta_i\theta_i + c^F\theta_i, \text{for } i = 1, \ldots, k, \quad \text{(A2)}$$

where

D_i^M = overhead assigned to *i* using MDBC;
c^V = variable overhead cost per unit of time (in hours), or $Variable\ OH/\sum_{i=1}^{k}(\beta_i\theta_i)$;
β_i = product or service cycle time for product or service *i*; and
θ_i = number of times product *i* is created or service *i* is performed; and
c^F = fixed overhead cost per product *i* created or service *i* performed, or $Fixed\ OH/\sum_{i=1}^{k}(\theta_i)$.