ABSORPTION COSTING AND VARIABLE COSTING –
HOW COSTING METHODS COULD INFLUENCE SUSTAINABILITY STRATEGIES FOR INVENTORY PRODUCTION

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CASE PREMISE – PRODUCTION OF BATTERIES FOR ELECTRIC VEHICLES
- Daveco, Inc. manufactures cylindrical automotive cell batteries used in electrical vehicles (EV), under the brand name Lumix0. After several years of manufacturing and selling Lumix0, the company expanded operations and now has three plants named Havana, Banabe and Merlen, located across three states in the United States.

- In the early years of operation, Daveco relied on standard costing approaches in producing inventory, and used industry trends/benchmarks to determine how many units of Lumix0 to produce. However, industry trends have become unreliable in predicting the accuracy of sales of inventory for cylindrical automotive cell batteries as many EV manufacturers have begun using prismatic cells in some of their vehicles.

- Also, Daveco’s customers have become conscious of adhering to the United Nations Sustainable Development Goals (SDG) and indicate that as part of the EV manufacturers’ tracking of alignment with these goals, they would be considering whether to continue ordering Daveco’s Lumix0, pending yearly assessments on Daveo’s demonstration of commitments to Goal 12 (ensure Sustainable Consumption and Production Patterns) and 13 (take urgent action to combat climate change and its impacts).
- In the production of Lumix0 battery cells, 41.48 kWh of energy per kilowatt hour of cell capacity are consumed per unit, while Daveco has also determined that 10.33 kg of CO2-eq is emitted per kWh of battery cell capacity produced. Daveco has decided to consider setting de-carbonization targets, although the company is yet to begin the process.

- In 2015, the Banebe plant switched to Just in Time (JIT) production processes, a manufacturing system that produces each component of inventory only as and when needed in the production line. In 2018, Banebe produced and sold 10,000 units of Lumix0, and the plant manager was rewarded with stock incentives.
Towards the end of 2018, Daveco’s CEO proposed the increase of the Havana and Merlen plant managers’ stock bonus incentives tied to increasing operating income in the coming year, 2019. Daveco’s plant managers have the discretion to choose their internal accounting methods, provided that the external accounting methods are those required by the Internal Revenue Service (IRS).

In 2019, managers of the Havana and Merlen plant choose the absorption costing method for their internal reporting approach citing the added fees that would be incurred in paying the variable costing reporting of their internal operations, since Daveco would also need to provide the IRS an income statement using the absorption costing approach.

The income statement used by the plant managers is also the data available to the CEO and shareholders. The following data comprises the data related to the production of Lumix0 for both the Havana and Merlen plants at the end of 2019, and the Banebe Plant for 2018.
Case Requirements

- Using an absorption costing approach and a variable costing approach, prepare income statements for the Havana and Merlen plants at the end of 2019 and the Banebe plant in 2018.
- Consider the units produced and sold for each plant (Havana and Merlen in 2019 and Banabe in 2018) and perform a data analysis of the absorption vs. variable costing approach in terms of the behavior of total costs as a percentage of revenue and operating income as a percentage of revenue.
- For each plant in the relevant period given, compute the carbon emissions attributable to units produced and units not sold.
- Perform analysis of data by visualizing with charts/graphs.
Production Data

<table>
<thead>
<tr>
<th>Production Data for Daveco Inc. Product Lumix0</th>
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</thead>
<tbody>
<tr>
<td>Havana Plant</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Beginning inventory</td>
</tr>
<tr>
<td>Production</td>
</tr>
<tr>
<td>Sales</td>
</tr>
<tr>
<td>Ending Inventory</td>
</tr>
<tr>
<td>Selling price</td>
</tr>
<tr>
<td>Variable manufacturing cost per unit</td>
</tr>
<tr>
<td>Direct materials cost per unit</td>
</tr>
<tr>
<td>Direct manufacturing labor cost per unit</td>
</tr>
<tr>
<td>Manufacturing overhead cost per unit</td>
</tr>
<tr>
<td>Total variable manufacturing cost per unit</td>
</tr>
<tr>
<td>Variable marketing cost per unit sold</td>
</tr>
<tr>
<td>Fixed manufacturing costs (all indirect)</td>
</tr>
<tr>
<td>Fixed marketing costs (all indirect)</td>
</tr>
</tbody>
</table>

Each unit produced emits 10.33 kg of CO2-eq
Each battery cell uses 41.48 kWh of energy per kilowatt hour
COST/PROFIT VISUALIZATION

**Havana Plant**
Cost/Profit as % of Revenue

- Absorption Costing System: 46%
- Variable Costing System: 47%

**Merlen Plant Cost/Profit**
as % of Revenue

- Absorption Costing System: 0%
- Variable Costing System: 61%

**Banebe Plant**
Cost/Profit as % of Revenue

- Absorption Costing System: 39%
- Variable Costing System: 39%
ENERGY USAGE VISUALIZATION

Energy usage attributed to units sold or Unsold (lost to waste)

- Sold Units
- Waste (Units Unsold)

<table>
<thead>
<tr>
<th></th>
<th>Havana</th>
<th>Merlen</th>
<th>Banebe</th>
<th>Havana</th>
<th>Merlen</th>
<th>Banebe</th>
<th>Havana</th>
<th>Merlen</th>
<th>Banebe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units Produced</td>
<td>10,000</td>
<td>10,000</td>
<td>10,000</td>
<td>105,000</td>
<td>105,000</td>
<td>105,000</td>
<td>414,800</td>
<td>414,800</td>
<td>414,800</td>
</tr>
<tr>
<td>Units Sold</td>
<td>5,000</td>
<td>2,000</td>
<td>10,000</td>
<td>52,500</td>
<td>21,000</td>
<td>105,000</td>
<td>207,400</td>
<td>82,960</td>
<td>414,800</td>
</tr>
<tr>
<td>Units Unsold</td>
<td>5,000</td>
<td>8,000</td>
<td>0</td>
<td>52,500</td>
<td>84,000</td>
<td>0</td>
<td>207,400</td>
<td>331,840</td>
<td>0</td>
</tr>
</tbody>
</table>

Energy (kWh) in thousands:
- Havana: 207
- Banebe: 415
- Merlen: 332

Thousands
CARBON COUNT VISUALIZATION

Carbon Emissions attributed to units sold or unsold

- Units Sold
- Waste (Units Unsold)

Thousands

co2 emissions in thousands

Havana
Banebe
Merlen

0
105
84
21

58
0
Sustainability Implication (Goal 12 & 13):
Havana Plant – Focused Analysis

- Expensing fixed costs within the period as evidenced in variable costing makes carbon emissions of all units produced apparent within the period.
- Companies can make more realistic budgets of how many units can actually be sold within the period.
- Inefficient inventory practices can lead to wastage, increased emissions from storage and transportation, and a heightened consumption of resources.
- Incentives to attain higher operating incomes when there is discretion on the possibility of using absorption costing internally as well as externally may lead to non-ethical opportunistic production of excess inventory.

**Absorption Costing:** Only 5,000 units of inventory sold x $125 ($625,000) is fully expensed, leaving 5,000 ending inventory x $125 ($625,000) deferred as an asset.

Implies: 5,000 end inv x 10.33 kg of CO2-eq (51,650 kg) may not be considered in the short term.

**Variable Costing:** Fixed manufacturing cost of $125 x 10,000 units ($1,250,000) is fully expensed.
The added integration of sustainability was welcomed as it would give me a real-world perspective on how companies currently make decisions for their business models.

It provided me with a great experience and provided background information on climate change.

I’ve always wanted to be a business owner and this project has allowed me to better understand what to do to make sure my mission statement aligns with what is best for my customers as well as the planet we all live in.

This is a topic that I personally had not been taught, or even had a chance to consider throughout my MBA program until now. I feel that it is something that is invaluable to learn.

i5 Efficacy – Makes learning meaningful.
I5 Efficacy Application - Fosters Joy and Well-being

- I valued this project very much. I see it as having helped me develop my interpersonal and soft skills.
- I liked working on this project because it gave almost a real-life scenario and gave me a closer look on how accountants in companies suggest decisions to grow the company.
- The project was very helpful since it helped me develop my interpersonal and soft skills while collaborating with my group.
I enjoyed the fact that sustainability was introduced into this course. I think we need it in other courses too, since it's becoming more and more relevant to our future.

I believe it is a good topic to cover since it provides us with real work field knowledge. It definitely challenged us as students allowing us to learn and kept us engaged.

I think the implementation of sustainability themed learning was very informative and interesting. It was fun learning how the SDGs are linked to the decisions on units to produce, carbon emissions, etc..

It was interesting to see something like this being applied to the class.

i5 Efficacy – Facilitates Active Engagement.
Being able to participate in this project allows me to develop team-work with a brand-new group right off the start. This shows how the teams are able to cooperate and work together which I was glad to have.

It allowed me to be accountable and responsible since we worked as a team.

I place a great value on being able to participate in this project because it let me work with a group on a real-life situation that will help me in my future career working in management.
This project helped me become more comfortable with using Excel and performing data analysis. It also helped with practicing areas I am not so comfortable in.

I think it is a great learning experience for me. It was very rigorous for me to grasp at first, but I believe I did well with additional studying and feedback over time.

I think this case reinforced pre-existing knowledge of inventory and carbon emissions calculations.

It was rigorous, but I appreciate now knowing about it and learning how to accomplish the areas that were harder at first.