Societal and Environmental Applications of Activity-Based Costing and Balanced Scorecard

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Prague University of Economics and Business

Robert S. Kaplan, Senior Fellow and Marvin Bower Professor of Leadership Development
“When you can measure what you are speaking about and express it in numbers, you know something about it. When you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind.”

Lord Kelvin

“If you can’t measure it, you can’t manage it. If you can’t manage it, you can’t improve it.”

Peter Drucker
I have, in the past decade, applied two of my accounting/measurement innovations ─ Activity-Based Costing (ABC) and Balanced Scorecard (BSC) ─ to health care, climate change, and poverty.

1. Applying time-driven activity-based costing to healthcare

2. Extending activity-based costing to measure a company’s greenhouse gas emissions.

3. Updating the Balanced Scorecard to Reflect Corporate Environmental and Societal Performance
The central goal in health care must be **value for patients**, measured as:

\[
\text{Value} = \frac{\text{Health outcomes that matter to patients}}{\text{Costs of delivering those outcomes}}
\]

The unit of analysis for creating and measuring value is the treatment of a patient’s **medical condition** over a complete **cycle of care**.

### What is Value-Based Health Care?

1. **MD encounter**
2. **Assess appropriateness**
3. **Assess risk**
4. **Schedule OR**
5. **Procedure**
6. **Recovery**
7. **Measure Outcomes and Cost**

- **Patient problem**
- **Possible need for procedure**
- **Shared decision making**
- **Pre-procedure testing**
Problem: Distorted measurement of costs at the patient level; confusion between charges and costs

Solution: Use Time-Driven Activity-Based Costing (TDABC) to measure and improve costs across a medical condition’s complete cycle of care
Time-Driven Activity-Based Costing (TDABC)

1. Determine the Care Process
   - What activities are performed over the care cycle for a medical condition?
   - Who performs each activity?
   - How long does each activity take?

2. Calculate Cost Rates
   - What is the cost per unit of time for each type of personnel and equipment?

3. Account for Consumables
   - What is the cost of devices, supplies, and drugs consumed during the care cycle?
TDABC Step 1: Clinical and administrative teams work collaboratively to create process maps:

- **Process-Steps:** All the administrative and clinical process-steps used over a patient’s complete cycle of care for a medical condition

- **Resources:** personnel, equipment, consumable medicines and supplies – used at each process step

- **Time Estimates:** The personnel and equipment time used at each process step for that patient
**TDABC Step 2: Calculate the Capacity Cost Rates for each resource (personnel and equipment)**

<table>
<thead>
<tr>
<th></th>
<th>Surgeon</th>
<th>Physician Assistant</th>
<th>RN</th>
<th>X-Ray Tech</th>
<th>Scribe</th>
<th>Office Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Clinical Costs</strong></td>
<td>$546,400</td>
<td>$120,000</td>
<td>$100,000</td>
<td>$64,000</td>
<td>$51,000</td>
<td>$61,000</td>
</tr>
<tr>
<td><strong>Personnel Capacity (minutes)</strong></td>
<td>91,086</td>
<td>89,086</td>
<td>89,086</td>
<td>89,086</td>
<td>89,086</td>
<td>89,086</td>
</tr>
<tr>
<td><strong>Personnel Capacity Cost Rate</strong></td>
<td>$6.00</td>
<td>$1.35</td>
<td>$1.12</td>
<td>$0.72</td>
<td>$0.57</td>
<td>$0.68</td>
</tr>
</tbody>
</table>
We compute total patient-level care costs by multiplying capacity cost rates of personnel and equipment by process times. Then sum across each patient’s cycle of care.

### Initial consultation

<table>
<thead>
<tr>
<th>Personnel Type</th>
<th>Minutes</th>
<th>Cost/minute</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD X₁ Y₁</td>
<td></td>
<td></td>
<td>136.13</td>
</tr>
<tr>
<td>RN X₂ Y₂</td>
<td></td>
<td></td>
<td>68.04</td>
</tr>
<tr>
<td>CA X₃ Y₃</td>
<td></td>
<td></td>
<td>6.17</td>
</tr>
<tr>
<td>ASR X₄ Y₄</td>
<td></td>
<td></td>
<td>15.74</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$266.08</strong></td>
</tr>
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</table>

### Surgical procedure

<table>
<thead>
<tr>
<th>Personnel Type</th>
<th>Minutes</th>
<th>Cost/minute</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD X₁ Y₁</td>
<td></td>
<td></td>
<td>584.99</td>
</tr>
<tr>
<td>Anesth. X₂ Y₂</td>
<td></td>
<td></td>
<td>603.89</td>
</tr>
<tr>
<td>RN X₃ Y₃</td>
<td></td>
<td></td>
<td>136.29</td>
</tr>
<tr>
<td>Tech X₄ Y₄</td>
<td></td>
<td></td>
<td>97.82</td>
</tr>
<tr>
<td>OR X₅ Y₅</td>
<td></td>
<td></td>
<td>329.16</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$1752.15</strong></td>
</tr>
</tbody>
</table>

### Follow-up or post-operative visit

<table>
<thead>
<tr>
<th>Personnel Type</th>
<th>Minutes</th>
<th>Cost/minute</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MD X₁ Y₁</td>
<td></td>
<td></td>
<td>55.19</td>
</tr>
<tr>
<td>RN X₂ Y₂</td>
<td></td>
<td></td>
<td>13.61</td>
</tr>
<tr>
<td>CA X₃ Y₃</td>
<td></td>
<td></td>
<td>3.09</td>
</tr>
<tr>
<td>ASR X₄ Y₄</td>
<td></td>
<td></td>
<td>1.77</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>$73.66</strong></td>
</tr>
</tbody>
</table>
How does TDABC help providers manage their costs

**Process Improvement and Redesign**

- **Eliminate** process steps and variations that do not contribute to improved patient outcomes.
- **Benchmark** costs across similar sites treating the same medical condition; Learn from best practices.
- **Redesign** processes to reduce inefficiencies, waste and idle time.
- **Optimize** processes and interventions over a complete cycle of care.
- **All clinicians** work at the “top-of-their-license”.
2. and 3. Market-based Global Capitalism, during the past two centuries, has created enormous wealth and lifted billions out of Poverty.

Absolute number of people living in absolute poverty (1820-2011) globally – By Max Roser
The absolute poverty is defined as living with less than $1.25/day. This is measured by adjusting for price changes over time and for price differences between countries (purchasing power parity (PPP) adjustment). Estimates post 1981 are based on World Bank data. Earlier data are based on Bourguignon and Morrison (2002).

The interactive data visualization is available at OurWorldinData.org. There you find the raw data and more visualizations on this topic. Licensed under CC-BY-SA by the author Max Roser.
But some of the enormous increase in humans’ growth and wealth has required burning carbon fuels that have degraded the environment.
And, despite enormous increases in income and wealth, many have been left behind.

Inequality undermines people’s faith that market-based global growth benefits all

- Pervasive poverty at the “Bottom of Pyramid”: Africa, Asia, Latin America
- Adverse trends in income and health in US among non-college educated individuals
- High unemployment, especially among youth
- Excessive CEO compensation

**Scope 1:** Direct GHG emissions from sources owned or controlled by a company; e.g., production equipment and fleet of company vehicles.

**Scope 2:** GHG emissions that occur at non-company owned facilities that generate electricity purchased and consumed by the company.

**Scope 3:** Indirect GHG emissions from upstream operations in a company’s supply chain and downstream by the company’s customers and end-use consumers; e.g., emissions from extraction and processing of purchased materials; transportation of purchased and sold goods; and customers’ use of the company’s products and services.
We determined that Scope 3 measurement is fatally flawed. Consider the multi-tier supply and distribution chain of a car door manufacturer.
Our 2021 Discovery: Tracing GHG emissions through corporate supply and distribution chains can be based on simple, basic accounting practices

Activity Based Costing for Multi-Product Company
  - Accurately assigns production and overhead costs to each individual products

Full and Accurate Costing of each Manufactured Product
  - Finished Goods Cost = Raw Materials Cost + Direct Labor Cost
    + ABC-assigned Production and Manufacturing “Overhead” Costs

Buyer’s Raw Materials Cost = Supplier’s Finished Goods Cost (plus profit markup), which is how all material and labor costs ripple up a value chain of suppliers and customers
A new E-liability System replaces infeasible Scope 2 and Scope 3 measurements with arm’s-length and auditable Scope 1 transactions

• Each company in a supply chain measures it Scope 1 GHG emissions in each reporting period as “E-liabilities” in its E-accounting books, in units of emitted CO$_2$, CH$_4$, N$_2$O, etc.

• The company allocates its E-liabilities to individual products using cost-accounting (ABC) techniques. When it sells a product to a customer, the price includes the manufacturer’s cost for the product (plus mark-up) **AND** the product’s allocated E-liability.

• The process continues until the end-consumer receives both the product itself and an accounting of the total E-liabilities generated in its production and distribution (cf., nutrition labels) – the consumer’s purchasing decision can be influenced by this additional information.

• The audited records can be incorporated into a blockchain.
<table>
<thead>
<tr>
<th>E-liability flows</th>
<th>Tons of CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening E-liabilities</td>
<td>3,600</td>
</tr>
<tr>
<td>Add E-liabilities directly produced through operations</td>
<td>2,600</td>
</tr>
<tr>
<td>Add E-liabilities acquired from suppliers</td>
<td>39,800</td>
</tr>
<tr>
<td>- Electricity</td>
<td>5,600</td>
</tr>
<tr>
<td>- Sheet steel</td>
<td>10,600</td>
</tr>
<tr>
<td>- Glass</td>
<td>5,400</td>
</tr>
<tr>
<td>- Fabric and Plastic</td>
<td>1,200</td>
</tr>
<tr>
<td>- Other supplies/components</td>
<td>4,800</td>
</tr>
<tr>
<td>- Capital equipment</td>
<td>12,200</td>
</tr>
<tr>
<td>Subtract E-liabilities transferred to customers</td>
<td>(32,600)</td>
</tr>
<tr>
<td>Closing E-liabilities</td>
<td>13,400</td>
</tr>
</tbody>
</table>

Change in E-liabilities during period: 9,800
E-liability Accounting and Transfers

Tier-4 Company  E-Liability CO₂ Account

0. E-Liability (Start-of-Period)
1. E-liability purchased and produced during period
2. E-liability transferred to customers
3. E-Liability (End-of-Period)

Tier-5 Company  E-Liability CO₂ Account

0. E-Liability (Start-of-Period)
1. E-liability purchased and produced during period
2. E-liability of products transferred to customers
3. E-Liability (End-of-Period)

Tier-2 Company  E-Liability CO₂ Account

0. E-Liability (Start-of-Period)
1. E-liability purchased and produced during period
2. E-liability transferred to customers
3. E-Liability (End-of-Period)

Tier-3 Company  E-Liability CO₂ Account

0. E-Liability (Start-of-Period)
1. E-liability purchased and produced during period
2. E-liability transferred to customers
3. E-Liability (End-of-Period)

End-use Consumer  E-Liability CO₂ Account

0. E-liability purchased during period
Post the E-liability on the car’s purchase sticker, along with its price build-up
2. E-liability transferred to customers
3. E-Liability (End-of-Period)

Tier-1 Company  E-Liability

0. E-Liability (Start-of-Period)
1. E-liability purchased and produced during period
2. E-liability transferred to customers
3. E-Liability (End-of-Period)
3. Corporate engagement to reduce poverty and environmental degradation. Who are the 900 million still living in dire poverty?

The estimated 500 million smallholder farmers in developing countries are among the world’s poorest and most vulnerable people. 80 percent of the extreme poor (living on less than $1.90 per day) and 75 percent of the moderately poor (living on $1.90 to $3.20 per day) live in rural areas, working in agriculture. They lack the capacity, incentives, or proximity to integrate effectively into formal markets and corporate value chains.
Create win-win partnerships among multiple stakeholders to raise income and reduce environmental degradation of Smallholder Farmers

External Funders

Public Sector

Smallholder Farmer

- Bank
- Insurance
- Seeds
- Irrigation
- Fertilizer
- Crop Protection
- Mechanical equipment
- Storage
- Processor
- Trader

NGOs
The difficult problem in creating win-win inclusive growth ecosystems. Different actors have different perspectives and expectations....

"We must preserve our environment and resources"

"We want to profitably preserve our way of life"

"If only consumers could understand our great tech solutions"

"We want to be even more efficient"

"Can we create a brand?"

"We need traceability and sustainability"

"We worry about health and environmental impacts (but not enough to pay more)"

Natural Resources, Landscape & NGOs

Farmer

Feed production / Inputs

Feedlots & Dairies

Processors

Retailers

Consumers
We create alignment by updating the traditional Balanced Scorecard to reflect the multiple outcomes and stakeholders for an inclusive growth strategy.

<table>
<thead>
<tr>
<th>Triple Bottom Line Outcomes</th>
<th>Value for Ecosystem Stakeholders</th>
<th>Sustainable &amp; Innovative Processes</th>
<th>Key Enablers and Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial Outcomes</strong></td>
<td>Increase market share with supply chain and financial partners</td>
<td>Increase penetration of our products and services to those at bottom-of-pyramid</td>
<td><strong>Financial Resources</strong> Attract external funding for ecosystem development</td>
</tr>
<tr>
<td>Revenue Growth</td>
<td>Serve more clients, partners &amp; beneficiaries</td>
<td>Increase demand for products and services supplied by low-income populations</td>
<td><strong>Organisational Model</strong> Develop collaboration and relationship-building capabilities</td>
</tr>
<tr>
<td>Return on Investment</td>
<td>Enter new segments of the market and/or new markets and businesses</td>
<td><strong>Demand Generation</strong> Increase demand for products and services supplied by low-income populations</td>
<td><strong>Partnerships</strong> Enhance relationships with NGOs and local intermediaries</td>
</tr>
<tr>
<td><strong>Social Outcomes</strong></td>
<td>Create / support systemic change in priority ecosystems benefiting all actors</td>
<td><strong>Environmental Management</strong> Eliminate waste; improve productivity of our resource inputs; reduce net GHG emissions</td>
<td><strong>Governance</strong> Establish ecosystem measurement and governance systems</td>
</tr>
<tr>
<td>Improve Family Life and Employment</td>
<td><strong>Environmental Outcomes</strong> Reduce our Environmental Footprint</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relieve Poverty in the Poorest Communities</td>
<td>Restore Degraded Land and Water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Create unique and differentiated value propositions to transform inefficient ecosystems.
Linked strategy maps connect each participant’s goals to overall ecosystem success.

**Lead Company**

**Smallholder**

**Local Buyer**

The “Catalyst”
Grow and Govern the Inclusive Growth Ecosystem

• Creating scorecards among ecosystem participants builds trust, understanding, consensus and commitment.

• Ecosystem balanced scorecards (BSC) also provide the foundation for an accountability and governance system that informs periodic meetings, among all stakeholders, to monitor and guide its growth.
Summary: What I remembered from six years of engineering study at MIT, 60 years ago

It’s Better to Measure Things Approximately Right than Precisely Wrong!