SUSTAINABLE IMPLEMENTATION OF NEW TECHNOLOGIES:

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WHAT IS SUSTAINABILITY?
Definition

- **Sustain**
  - to provide what is needed for (something or someone) to exist, continue, etc.

- **United States Environmental Protection Agency**
  - To create and maintain conditions in which both humans and nature can exist harmoniously

- **Corporate sustainability**
  - 3BL
    - social, environmental and financial.

www.merriam-webster.com
https://www.epa.gov/
Definition

Social

Bearable

Equitable

Viable

Environmental

Economic

Sustainable
WHY IS IT HARD TO ACHIEVE?
Sustainability is valued subjectively.
SV represented in USD future value

- Over the course of 50 years, a single tree can generate:
  - $31,250 of oxygen
  - provide $62,000 worth of air pollution control
  - recycle $37,500 worth of water

www.re-treewny.org/
SV represented in USD Present Value

- Trees can reduce energy bills by up to 40 percent.
- Residential Homes landscaped with trees are worth 4-15 percent more than homes without

www.americanforests.org
MANAGING FOR SUSTAINABILITY
Law of unintended consequences

• Unforeseen Outcome
  – Unexpected benefit
    • Giving Blood
      – The American Journal of Epidemiology found blood donors are 88% less likely to suffer from a heart attack.
  – Unexpected drawback
    • Prohibition in the 1920s
      – Increase in large-scale organized crime
  – Perverse result
    • Passenger-side airbags
      – increase in child fatalities in the mid-1990s
Law of unintended consequences

• Cause of unforeseen outcomes
  – The world is inherently complex
  – Human recklessness
  – The cobra effect
    • attempted solution makes the problem worse
      – Corruption, perverse incentive
  – The butterfly effect
Law of unintended consequences

- Unforeseen outcome = Risk
  - the possibility that something unpleasant or unwelcome will happen

- Risk management:
  - mitigate the effects of human recklessness
  - anticipate world complexities
  - avoid unexpected drawbacks
    - CFCs used as refrigerants, and propellants in aerosol applications
      - Drawback: ozone depletion
PROJECT RISK MANAGEMENT
Risk

- Can happen during a project, and after project close
- First time quality mitigates the costs of continuous control/improvement
- Project/Corporate/Supply Chain transparency is critical for optimal solutions
Six Process Groups

- Planning risk management
- Risk identification
- Performing qualitative risk analysis
- Performing quantitative risk analysis
- Planning risk responses
- Monitoring and controlling risks

www.pmi.org/
### Risk Matrix

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Impact</th>
<th>Very Low</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Legend:**
- **Very High**
- **High**
- **Medium**
- **Low**
- **Very Low**
80-20 Rule

Pareto Analysis

- Mobile device services
- Prescription refill lead time
- Wait time
- Online services
- Quality of care
- Unfriendly Staff
- Treatment options

Count

%
Risk Process Map

1. Data Input
2. Identify
3. Evaluate Likelihood
4. Evaluate Consequences
5. Risk Matrix
6. Accept?
7. Operate
8. Reduce/Mitigate
QUALITY MANAGEMENT
Quality in Healthcare Tech.

- Malcolm Baldrige National Quality Award (MBNQA)
  - Past 10 years, increasing number of applicants & recipients among non-profits, schools, and hospitals
- Third Working Draft of ISO/IEC 42030
  - Systems and Software Engineering Architecture Evaluation
  - Focus on sustainability in software engineering
Six Sigma as Quality Metric

- A measure of variation
  - Sigma represents standard deviation
- A measure of variability
- Reduction in variability/defects = reduction in waste

<table>
<thead>
<tr>
<th>Yield</th>
<th>DPM</th>
<th>COQ</th>
<th>Sigma</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.99%</td>
<td>3.4</td>
<td>&lt;10%</td>
<td>6</td>
</tr>
<tr>
<td>99.97%</td>
<td>233</td>
<td>10-15%</td>
<td>5</td>
</tr>
<tr>
<td>99.40%</td>
<td>6210</td>
<td>15-20%</td>
<td>4</td>
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<tr>
<td>93%</td>
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<tr>
<td>65%</td>
<td>308537</td>
<td>30-40%</td>
<td>2</td>
</tr>
<tr>
<td>50%</td>
<td>500000</td>
<td>&gt;40%</td>
<td>1</td>
</tr>
</tbody>
</table>
Lean Waste / New Technology

- Defects: Does the solution match the need?
- Overproduction: Would the solution be under utilized?
- Waiting: Does the solution rely on supplements?
- Non-Utilized Talent: Current tech capabilities?
- Transportation: redundancies across supply chain?
- Inventory: software/database scaling?
- Motion: Is the solution accessible without changing current processes?
- Extra Processing: redundancy in the process?
SUSTAINABLE TECH CRITERIA
Criteria for technology implementation

- HIPPA & FDA regulations
  - Federal/State policy
- Cybersecurity
  - Malware, malicious cyber attacks
- Adaptability
  - Useful life of the technology to be implemented
- Market & Economic volatility
- Cost effectiveness / EVA / SROI
Criteria for technology implementation

• Does this provide a needed service to the community, patients, caregivers, doctors, etc.?
  – ROI, does the benefit outweigh the initial cost and ongoing total cost of ownership?

• Sustainable sourcing practices?
  – GPOs (group purchasing organization) and their OEMs (original equipment manufacture) maintain sustainable operations? 1<sup>st</sup> 2<sup>nd</sup> tier suppliers.
CONCLUSIONS
Conclusions

• Sustainable projects, processes, and operations are critical to the continued success of a Supply chain network and SC players

• In order to mitigate the negative effects from unintended consequences, sustainability should be managed as a risk
  – KPIs include focus on quality and lean waste reduction

• Criteria effecting the health care industry include elements that are social, environmental, and financial (3BL)

• Further Research would be necessary to critique these claims
QUESTIONS