Program Architecture and Adaptation

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Introduction

- Situation: Large, complex programs
- Result: Information overload for managers
  - Filtering problems
- Need: To handle complexity, more quickly, through
  - Self-coordination and adaptation in the workforce
  - Better decision support models
  - Better information filters
  - Programs designed so that maximum value emerges
Five Program Systems or Domains

- Five systems, each with an architecture, together form a meta-architecture or program architecture.
- Most literature addresses only one of these five systems individually. Not surprising, since each is quite complex in its own right.
- But what may be optimal for each system individually may not be optimal for the project as a whole (or for the multi-project enterprise).

Source: Browning et al. (2006)
Just as the properties of a molecule differ from those of its individual elements, so do the properties of a project differ from those of its individual systems.

Using the same process, org, or tools on multiple projects does not guarantee that each will have the same outcome.

Some of this variance comes from exogenous effects, while some comes from different interactions among the systems.
The Design Structure Matrix

- A square matrix showing relationships between elements
- Shaded, diagonal squares represent the elements
- Off-diagonal marks represent a relationship
  - Read across a row to see where the element provides something
  - Read down a column to see where the element receives something
Program Architecture Framework

A “Periodic Table” of DSMs and DMMs

Adapted from (Danilovic & Browning, 2007)
Emergence Cycle

- Desired Outcomes (Goals)
- Actual Outcomes (Value)
- Value Gap
- Gap Tolerance
- Desire to Change
- Speed of Recognition
- Rate of Change
- Ability to Change
- Change Actions
- Goal System
- Tool System
- Product System
- Organization System
- Process System
- New Outcome

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Value as a Function of Structure?

No Process or Structure

Insurgency

Value Curve 1

Value Curve 2

Value Curve 3

Army Unit

Highly Procedural
# Two Pairs of Case Studies

<table>
<thead>
<tr>
<th>Less Structured</th>
<th>More Structured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurgency</td>
<td>US Army</td>
</tr>
<tr>
<td>Google</td>
<td>Microsoft</td>
</tr>
</tbody>
</table>

Adapt by increasing structure

Adapt by decreasing structure
# Army Adaptation Chart

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>Adaptation</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goals</strong></td>
<td>Maintain stability in assigned sector, including Route Irish</td>
<td>Increased patrol presence, 24 hour operations on Route Irish</td>
<td>Maintain security and presence on Route Irish in particular</td>
</tr>
<tr>
<td><strong>Product or Service</strong></td>
<td>Relative stability within sector, but increasing attacks on Route Irish</td>
<td>Refined lines of operations, increase in patrols and presence</td>
<td>Attacks decreased immediately</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>Maintain presence; set up random traffic control points; counter-mortar patrols; Route Irish presence part of natural patrol route</td>
<td>Increased combat power on route</td>
<td>Removing stopped vehicles; almost 90% of combat power on Route Irish; continuous patrol presence on route</td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>Hierarchal, Vertical</td>
<td>Increased information sharing and flow</td>
<td>Increased network connectivity to troop command posts; improved information flow</td>
</tr>
<tr>
<td><strong>Tools</strong></td>
<td>Bradley Fighting Vehicles, M1 Abrams, Up-Armored HUMVEES</td>
<td>Improved systems to defeat IEDs</td>
<td>Increased capabilities, Warlock systems</td>
</tr>
</tbody>
</table>