A Landscape for Navigating Leadership in Complex Human Systems

“Of all the hazy and confounding areas in social psychology, leadership theory undoubtedly contends for nomination. And, ironically, probably more has been written and less is known about leadership than about any other topic in the behavioral sciences” - Bennis 1959

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Leadership 2008

Definitions of Leadership

“Leadership is like the abominable snowman whose footprints are everywhere but who is nowhere to be seen.”

“Leadership is like pornography (or complexity), you know it when you see it, but you can’t define it.”
Good Leadership Traits

- **Performance**: Accurately and reliably solves problems.

- **Approach**: Able to communicate and persuade others without resort to negative or coercive tactics.

- **Resources**: Able to understand a wide range of areas, rather than having a narrow (and narrow-minded) area of expertise.

- **Integrity**: Owning up to mistakes, rather than putting energy into covering up.

- **Robust**: Calm, confident and predictable, particularly when under stress.
Definitions of Leadership

- “A convenient definition of leadership would be those aspects of agent interactions that change the ‘local rules’ governing the future interactions among agents” which “can be enacted through any interaction in an organization”

- “Effective leadership occurs when the changes observed in one or more agents (i.e., leadership) leads to increased fitness for that system in its environment.”

Complex Systems Leadership Theory (Hazy, et al. 2007)
Theories of Leadership

Power-based: leaders sustained by power
Innate traits theories - Leaders are born not made
  ◦ Trait theory (Stogdill 1974)
  ◦ Great Man theory (Carlyle 1843)

Structure-based: leaders fill structural roles
Role theory
  ◦ Social theory and structure (Merton 1957)
  ◦ Supervisory behavior (Pfeffer & Salancik, 1975) (Adair 1965)

Performance-based - leaders as performers
Situational theory (Tennenbaum 1958, Maier 1963, Yuki 1989)
  ■ Required leader style is situation dependent
Contingency theory (Fiedler 1954) - Context based
  ■ Leader’s effectiveness is based on ‘situational contingency’

Performance-based - Collective/plurality/shared-based: leaders as enablers
Shared, relational, collective, situational theories
Distributed leadership (Gronn 2002) - Plurality based
  ■ Leadership happens everyday in formal and informal interactions and is spread over leaders, followers, and context
Adaptive leadership (Linsky 2002) - CAS-based
  ■ “Leadership is an interactive event in which knowledge, action preferences, and behaviors change, thereby provoking the organization to become more adaptable.”

Leadership meets Complexity:
Complex Systems Leadership Theory (Hazy, et al. 2007)
Leadership in numbers
Distributed, Performance-based Leadership + Emergence
Alignment of organization and leadership types: Putting the Macropolitics back into the study of Microleadership

<table>
<thead>
<tr>
<th></th>
<th>Weak group</th>
<th>Strong group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>Fatalistic: Despotic leaders</td>
<td>Hierarchical: Autocratic, positional leaders</td>
</tr>
<tr>
<td><strong>prescriptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Low</strong></td>
<td>Market: Meteoric leaders</td>
<td>Egalitarian: Charismatic leaders</td>
</tr>
<tr>
<td><strong>prescriptions</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Wildavsky, 1989)
Prior Landscape Models for Leadership

Importance of Emergent Leadership, but unappreciated

<table>
<thead>
<tr>
<th>Type of Structure</th>
<th>Source of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical</td>
<td>Imposed (Change from above)</td>
</tr>
<tr>
<td>(Command from above)</td>
<td>Command &amp; control</td>
</tr>
<tr>
<td>Participative</td>
<td>Self-Organized (Change from below)</td>
</tr>
<tr>
<td>(Command from troops)</td>
<td>Informal leadership</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Imposed teams</td>
</tr>
<tr>
<td></td>
<td>Emergent leadership</td>
</tr>
</tbody>
</table>

(Goldstein, 1998)
Wielkiewicz (2002) proposed a landscape model to capture personal stages of development of leaders based on an ecology of leadership model (Allen, Stelzner et al. 1998):

- **Hierarchical thinking** - authority extends downward
- **Systemic thinking** - interdependence of organizations and enabling leadership skills

Komives, Longerbeam, et al. (2006) validated this developmental leadership model and showed that individuals consistently move through the landscape in the development of their leadership awareness and skills.
## Landscape Model for Leadership

### How Leadership arises

<table>
<thead>
<tr>
<th>Emergent: Unpredictable, opportunistic, from interactions</th>
<th>Structurally determined: predictable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some Individuals</td>
<td>Classic Leaders - from power or traits (structure)</td>
</tr>
<tr>
<td>Most of the Collective</td>
<td></td>
</tr>
</tbody>
</table>

**Leadership Arises**

**Where Leadership Arises**
Foraging with a moving food source

Individual solutions become very important - particularly “innovative individuals”
**Leadership Model for Leadership**

<table>
<thead>
<tr>
<th>Emergence?</th>
<th>Distribution?</th>
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<tbody>
<tr>
<td></td>
<td>Some Individuals</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td>Leadership emerges without precedence - opportunistic</td>
</tr>
<tr>
<td><strong>None</strong></td>
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</table>

**Maturation: creating structure by “capturing” the emergent property**
- Emergent leadership can go “classic” with rules and regulations
- Example: early development of eBay: eBay structure followed emergent social processes
Quantitative Metrics for Leadership Landscape

**Degree of Distribution:** Where performance/benefit is located

Let:  
- \(a = \# \) of individuals needed for performance (1 to \(N\) individuals)  
- \(b = \# \) of individuals that benefit from performance (1 to \(N\))  
- \(c = \max \# \) that could benefit, i.e., size of collective (\(N\), fixed, never changes)

**Metric:** \((a+b)/2c\)  
Ranges from near zero to 1 for large \(N\)

**Examples:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Selfish leader</th>
<th>Selfless leader</th>
<th>Milked collective</th>
<th>Collective</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a - #) perform</td>
<td>1</td>
<td>1</td>
<td>(N)</td>
<td>(N)</td>
</tr>
<tr>
<td>(b - #) benefit</td>
<td>1</td>
<td>(N)</td>
<td>1</td>
<td>(N)</td>
</tr>
<tr>
<td>(c - \max#)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
<td>(N)</td>
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<tr>
<td>((a+b)/2c)</td>
<td>((1+1)/2N \sim 0)</td>
<td>((N+1)/2N \sim 0.5)</td>
<td>((1+N)/2N \sim 0.5)</td>
<td>1.0</td>
</tr>
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</table>
“Quantitative” Metrics for Leadership Landscape

**Degree of Emergence:** How performance arises
From deterministic structure to synergistic, unpredictable interactions

Let:  
d = # of synergistic, unpredictable interactions needed for performance  
e = # of rule-based or structural interactions needed for performance

**Metric:** \((d - e)/(d + e)\)

**Examples:**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classical single leader</th>
<th>Hero</th>
<th>Markets</th>
<th>Emergent collective</th>
</tr>
</thead>
<tbody>
<tr>
<td>d - synergy</td>
<td>Low</td>
<td>Some</td>
<td>Low</td>
<td>Large</td>
</tr>
<tr>
<td>e - structure</td>
<td>High</td>
<td>Low - moderate</td>
<td>High</td>
<td>Low - moderate</td>
</tr>
<tr>
<td>((d-e)/(d+e))</td>
<td>~ -1</td>
<td>Near 0 to 1</td>
<td>~ -1</td>
<td>Near 1</td>
</tr>
</tbody>
</table>
Examples within Leadership Landscape

1. Authoritarian
   1a. Autocracy (dictator), monarch
   1b. Oligarchy
   1c. Totalitarian

2. CEO / president / aristocracy
   2a. decision maker
   2b. facilitator of collective

3. Transient (hero, savior)
### Landscape Model for Leadership

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**Involves some Individuals**
## A Survey of Web-based Collective Decision Making Systems

by Jen Watkins

<table>
<thead>
<tr>
<th>Collective Decision-Making Systems</th>
<th>Aggregation Mechanism</th>
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<tbody>
<tr>
<td>document ranking</td>
<td>PageRank</td>
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<tr>
<td>folksonomy</td>
<td>collaborative tagging</td>
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<td>collaborative filtering</td>
</tr>
<tr>
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<tr>
<td>open source software</td>
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<tr>
<td>prediction market</td>
<td>market scoring rule</td>
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[http://cdms.lanl.gov](http://cdms.lanl.gov)
Examples within Leadership Landscape

Degree of Emergence:
How performance arises

From synergistic, unpredictable interactions

Degree of Distribution
Where performance is located

From deterministic interactions

Individual – Localized

Entire collective – Distributed

1. Polling
2. Representative democracy
3. Markets
   3a. Internal markets (Hp)
   3b. Currency exchange market & Commodity markets
4. Recommender systems
5. Document ranking
6. Folksonomy
Diversity in Finance, HealthCare, Military

Discover Retreat for the Physicians Alliance

August 7, 2007

Deep Blue, the Wisdom of Crowds, and the Demise of Experts

Michael Mauboussin
Chief Investment Strategist
Legg Mason Capital Management
Expert Performance in Finance

Why can’t financial experts outperform consistently the S&P 500 “collective” (including good + bad performers)?

- Professional money managers fail to beat the S&P 500 at an average rate of 70% per year.
- 90% trail the S&P over a 10-year period.
- Beat every year for 10 years are only a few – Soros, Miller, ….

“These are the people who have more knowledge and more training than the vast majority of investors. And yet, neither the superior knowledge nor the superior experience helps them in the long run.”

Bill Mann, TMFOtter
Experts are Getting Squeezed

Computers → Expert ← Wisdom of Crowds (WOC)
When the WOC Works

- Conditions for the WOC to work
  - Diversity
  - Aggregation mechanism
  - Incentives

Needle in the Haystack

◆ Which person is not a member of the Monkees?

A. Peter Tork  
B. Davy Jones  
C. Roger Noll  
D. Michael Nesmith

Needle in the Haystack

- Assume 100 people have knowledge, distributed as follows

  - 7 know all 3 of the Monkees
  - 10 know 2 of the Monkees
  - 15 know 1 of the Monkees
  - 68 have no clue

Needle in the Haystack

- Noll will get 34 votes

- Two variables are key
  - Percentage who know the answer
  - Degree of randomness

Diversity Prediction Theorem

Collective Error =
Average Individual error minus
Prediction Diversity

Academy Awards

12 categories
Not a poll, a prediction

2007
Consensus: 11 out of 12 correct
Best student: 9 out of 12 correct
Average student: 5 out of 12 correct
Expert Performance in Finance

Why can’t financial experts outperform consistently the S&P 500 “collective” (including good + bad performers)?

Where Experts Have Value

Value of Experts

Value of Collectives

Simple

Complex

Domain

Michael Mauboussin - Legg Mason Capital Management
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Ants Solving “HARD” problems

The ant colony (and individuals) finds the shortest path

Does a “classic leader” find the path?

How is this possible?
Averaged Performance

Normalized number of steps

Using novice information, with two different collections

Using established information

Average Individual

Shortest path

Individuals in Collective Decision
How collectives find the Shortest path

Paths of three ants
Collective path

Unlike in natural selection, no one individual is the fittest!
Conclusions on Emergent Collective Leadership

Solves a problem “perfectly” that experts cannot reliably solve
Is more robust to misinformation.
Is not initially embodied in any individual

Correlates with diversity

Diversity is defined as uniqueness of information/skills contributed
Diversity of performance is also required
Competition, optimization or stress all reduce diversity, performance and/or robustness.

“Solves” a problem that individuals are unaware of => emergent problem definition and solution

Has a sweet spot

Collective performance is bounded by individual performance and complexity of the problem.
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Leadership Landscape Considerations

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Secondary considerations

Embodied and disembodied emergent solutions (upper row)

Maturation: creating structure by “capturing” the emergent property

Problem solving capability and robustness increases as you move up & right
  • Higher diversity (and complexity) is required from lower left to upper right

The efficiency-quality tradeoff problem - particularly for fast change
  • Lower left can be the most efficient (less communication and coordination required) and has a speed advantage in dealing with fast change
  • But Upper right has the best and most robust solutions

Mixed “classic” leadership models are becoming essential
  • “Localized” Leader as facilitator to develop emergent collective intelligence
Revisit Traits of Good Leadership

Do some of these also apply to Distributed Leadership?

- **Performance**: Accurately and reliably solves problems
  => Diverse collectives outperform leaders

- **Approach**: Able to communicate and persuade others without resort to negative or coercive tactics
  => ?

- **Resources**: Able to understand a wide range of areas
  => Diverse collectives have greater resources

- **Integrity**: Owning up to mistakes, rather than putting energy into covering up
  => Diverse collectives are more transparent

- **Robust**: Calm, confident and predictable, particularly when under stress
  => Diverse Collectives are more robust. But Narrow collectives have detrimental herd (heard) effects
Conclusions and Next steps

- **Leadership theories develop over time**
  - From power-based, structure-based theories to performance-based, distributed and emergent theories
  - Parallels the development of social systems - recognition of new collective leadership models, particularly “wisdom of the crowds”
  - New leadership resources reflect greater needs by society

- **If Leadership is based on performance…**
  - Then must include new mechanisms of performance: emergent collective problem discovery and problem solving

- **Leadership landscape as degree of distribution & emergence**
  - Recent trends begin to make sense
  - Opens a new area of study, particularly for utilizing modern tools of self-organization for collectives

- **What’s next?**
  - Academic study needed of Emergent Collective Leadership
  - What’s the proper macropolitics-microleadership model?
  - What’s the proper developmental model?
  - Full description of leadership domain within one simulation model
See the World Differently...

- **Next time** you use Google, Amazon, FaceBook...
- **Heroism** and Lucifer Effect: What about collective heroism?
- **Politics**: How did the Berlin wall fall?
- **Consumer**: Online music purchases
- **Computer Science**: What is the “fastest” computer?
- **Finance**: How has China become a world leader?
- **Biology**: The brain is a collective of “dumb” diverse neurons
- **Leadership**: Next time you are an emergent leader...
References


Symbiotic Intelligence Project http://www.collectivescience.com/symintel.html


