



Hypothesis Testing of Edge Organizations

- Participants
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- Objective
 - Build on the work of our 2005 ICCRTS paper
 - Assess comparative performance and delineate strengths & weaknesses of Edge versus Hierarchical forms under diverse environments
 - Fortify theoretical underpinnings of Edge forms



Hypothesis Testing of Edge Organizations

- Research questions
 - How are Edge organizations hypothesized to outperform other organization forms?
 - How do Edge and Hierarchical organization forms actually perform under different mission-environment conditions?



Hypothesis Testing of Edge Organizations

- Hypotheses
 1. Edge organizations can outperform Hierarchies in demanding mission-environmental contexts.
 2. Power to the Edge is the correct response to the increased uncertainty, volatility, and complexity associated with [21st century] military operations” [p. 6].
 3. The correct C2 approach depends on [five] factors”: 1) shift from static/trench to mobile/maneuver warfare; 2) shift from cyclic to continuous communications; 3) volume and quality of information; 4) professional competence; and 5) creativity and initiative [p. 19].
 4. Given a robustly networked force, any one of the six effective command and control philosophies proven useful in the Industrial Era is possible” [p. 32].



Hypothesis Testing of Edge Organizations

5. People who work together, over time, and learn to operate in a “post and smart-pull” environment, will outperform similarly organized and capable people who do not.
6. The more uncertain and dynamic an adversary and/or the environment are, the more valuable agility becomes” [p. 124].
7. An organization’s power can be increased without significant resource expenditures” [p. 172].
8. Of all the organization forms, the Machine Bureaucracy will have experienced the greatest relative decline in performance over the past century.
9. Of all the organization forms, the Edge organization will have displayed the greatest relative increase in performance over the past century.



Hypothesis Testing of Edge Organizations

- Research method
 - Continue to develop and test computational models that simulate the performance of different organization forms under different mission-environment conditions
 - Begin to validate computational models against organization theory, expert opinion and natural empirical experiments



Hypothesis Testing of Edge Organizations

- Model setup: organization forms
 - Organization Structure
 - ◇ Centralization, Formalization, Levels of Hierarchy, # of Total FTEs, # of Units, # of FTEs per Unit, Skill Level
 - Communication Structure
 - ◇ Communication Links, Information Exchange Probability, Meetings, Matrix Strength
 - Work Structure
 - ◇ Number of Operational Tasks, Degree of Concurrency, Interdependence, Rework Links, Rework Strength, Environmental Complexity



Hypothesis Testing of Edge Organizations

- Model setup: industrial era & 21st century conditions

Manipulation	VDT Variable	Industrial Era Value	21st Century Value
Mission & Environmental Context (P1, 5)	Soln. Complexity	Med.	High
	Requirement Complexity	Med.	High
	Uncertainty	Med.	High
	FEP	Baseline in Table 3	Baseline + 0.1
	PEP	Baseline in Table 3	Baseline + 0.1
Network Architecture (P2, 3)	Noise	0.3	0.01
	Info. Exchange Prob.	Baseline in Table 3	Baseline + 0.3 ^a
Professional Competency (P2, 4)	App. Experience	Baseline in Table 3	Baseline in Table 3
	Skill Level	Baseline in Table 3	Baseline + one level
	Team Experience	Med	High



Hypothesis Testing of Edge Organizations

- Results

		Mission & Environmental Context						
		Time (days)	Cost (\$M)	Direct Work (k-days)	Rework (k-days)	Coordination (k-days)	Decision Wait (k-days)	PRI
Edge	Industrial Era	223	894	819	113	186	0	0.77
	21st Century	234	970	819	166	227	0	0.77
	% Change	5%	9%	0%	47%	22%	0%	0%
Machine Bureaucracy	Industrial Era	229	1165	830	135	15	62	0.37
	21st Century	313	1621	830	429	39	189	0.36
	% Change	37%	39%	0%	218%	160%	205%	-3%



Hypothesis Testing of Edge Organizations

- Results

		Network Architecture						
		Time (days)	Cost (\$M)	Direct Work (k-days)	Rework (k-days)	Coordination (k-days)	Decision Wait (k-days)	PRI
Edge	Industrial Era	223	894	819	113	186	0	0.77
	21st Century	223	893	819	113	184	0	0.77
	% Change	0%	0%	0%	0%	-1%	0%	0%
Machine Bureau- cracy	Industrial Era	229	1165	830	135	15	62	0.37
	21st Century	229	1159	830	135	11	60	0.36
	% Change	0%	-1%	0%	0%	-27%	-3%	-3%



Hypothesis Testing of Edge Organizations

- Results

		Professional Competency						
		Time (days)	Cost (\$M)	Direct Work (k-days)	Rework (k-days)	Coordination (k-days)	Decision Wait (k-days)	PRI
Edge	Industrial Era	223	894	819	113	186	0	0.77
	21st Century	149	611	819	81	163	0	0.77
	% Change	-33%	-32%	0%	-28%	-12%	0%	0%
Machine Bureaucracy	Industrial Era	229	1165	830	135	15	62	0.37
	21st Century	172	871	830	100	11	44	0.37
	% Change	-25%	-25%	0%	-26%	-27%	-29%	0%

Hypothesis Testing of Edge Organizations

- Results

		All Combined						
		Time (days)	Cost (\$M)	Direct Work (k-days)	Rework (k-days)	Coordination (k-days)	Decision Wait (k-days)	PRI
Edge	Industrial Era	223	894	819	113	186	0	0.77
	21st Century	159	685	819	145	214	0	0.77
	% Change	-29%	-23%	0%	28%	15%	0%	0%
Machine Bureaucracy	Industrial Era	229	1165	830	135	15	62	0.37
	21st Century	224	1152	830	315	26	143	0.36
	% Change	-2%	-1%	0%	133%	73%	131%	-3%



Hypothesis Testing of Edge Organizations

- **Conclusions**

1. Support - Edge outperforms Hierarchy.
2. Support - Edge exhibits greater agility than Hierarchy under 21st Century conditions.
3. Support – Improving network architecture and professional competency improves organization performance.
4. Partial Support – Improving network architecture improves agility.
5. Support – Improving professional competency improves organization performance.



Hypothesis Testing of Edge Organizations

- **Conclusions**

6. Support - The Edge outperforms the Hierarchy as adversary and environment become more dynamic.
7. Not tested – Difficult to test via our computational model.
8. Partial Support – The Hierarchy shows the greatest relative decline in performance over the 100 year period. Still need to test other forms.
9. Partial Support – Still need to test the other forms.



Hypothesis Testing of Edge Organizations

- Contributions

- Assess the suitability of different org forms across various C2-environments
- Introduce multi-dimensional performance variables that highlight performance tradeoffs between cost, rework, decision wait time, and risk
- Strengthen theoretical grounding of the Edge form & show conditions under which it is most favorable
- Establish empirical basis for adopting Edge orgs in practical NCO environments



Hypothesis Testing of Edge Organizations

- Next Steps

- Simulate the performance of other organization forms specified by Mintzberg:

- ◇ Simple Structure,
 - ◇ Prof. Bureaucracy,
 - ◇ Divisionalized Form, and
 - ◇ Adhocracy

- Challenges

- Specifying archetypical models of orgs & C2 environments, due to the great variation both in theory and in practice
 - Integrating and synthesizing results, due to an overwhelming number of computational experiments