



Reducing Risk with Enterprise Response Ability

**Enterprise Risk World 2008
March 19-20 - Tampa Florida
Rick Dove, Stevens Institute of Technology**

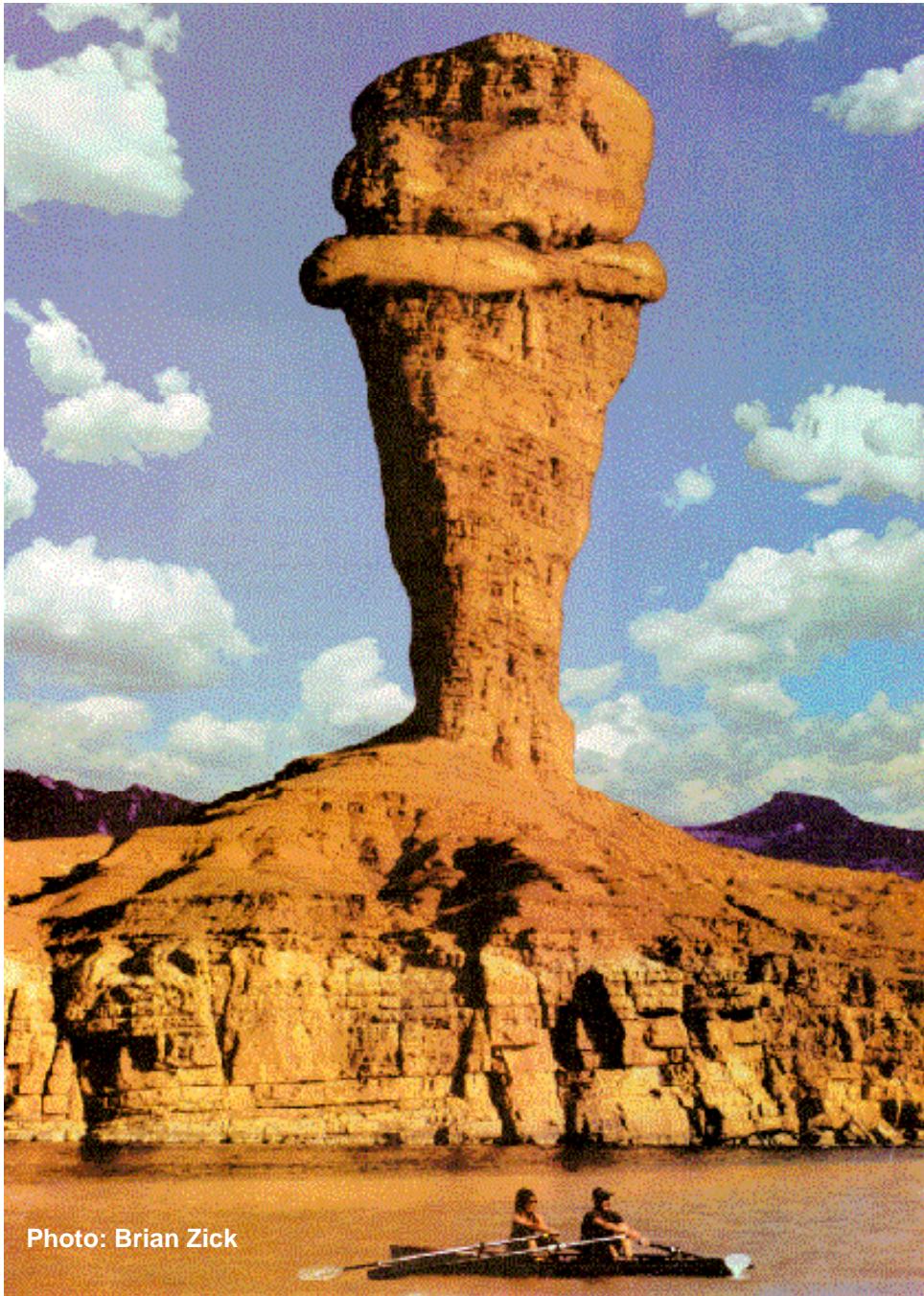


Photo: Brian Zick

Rick Dove

Industry Professor:

**School of Systems and Enterprises,
Stevens Institute of Technology**

Partner: Kennen Technologies

Chairman: Paradigm Shift International

**CoChair: Security Engineering, International
Council on System Engineering**

**35+ years: start-ups, turnarounds and
interim executive management**

Carnegie Mellon: BSEE

UC Berkeley: CompSci grad work

**Co-founder of current global interest in *Agile
Enterprise* concepts**

Research director of Agility Forum

**Author: Response Ability: The Language,
Structure, and Culture of Agile Enterprise**

**Author: Value Propositioning: Perception
and Misperception in Decision Making**

**Lives in Taos, NM, at 8200 feet,
Land of Enchantment...and thin air**

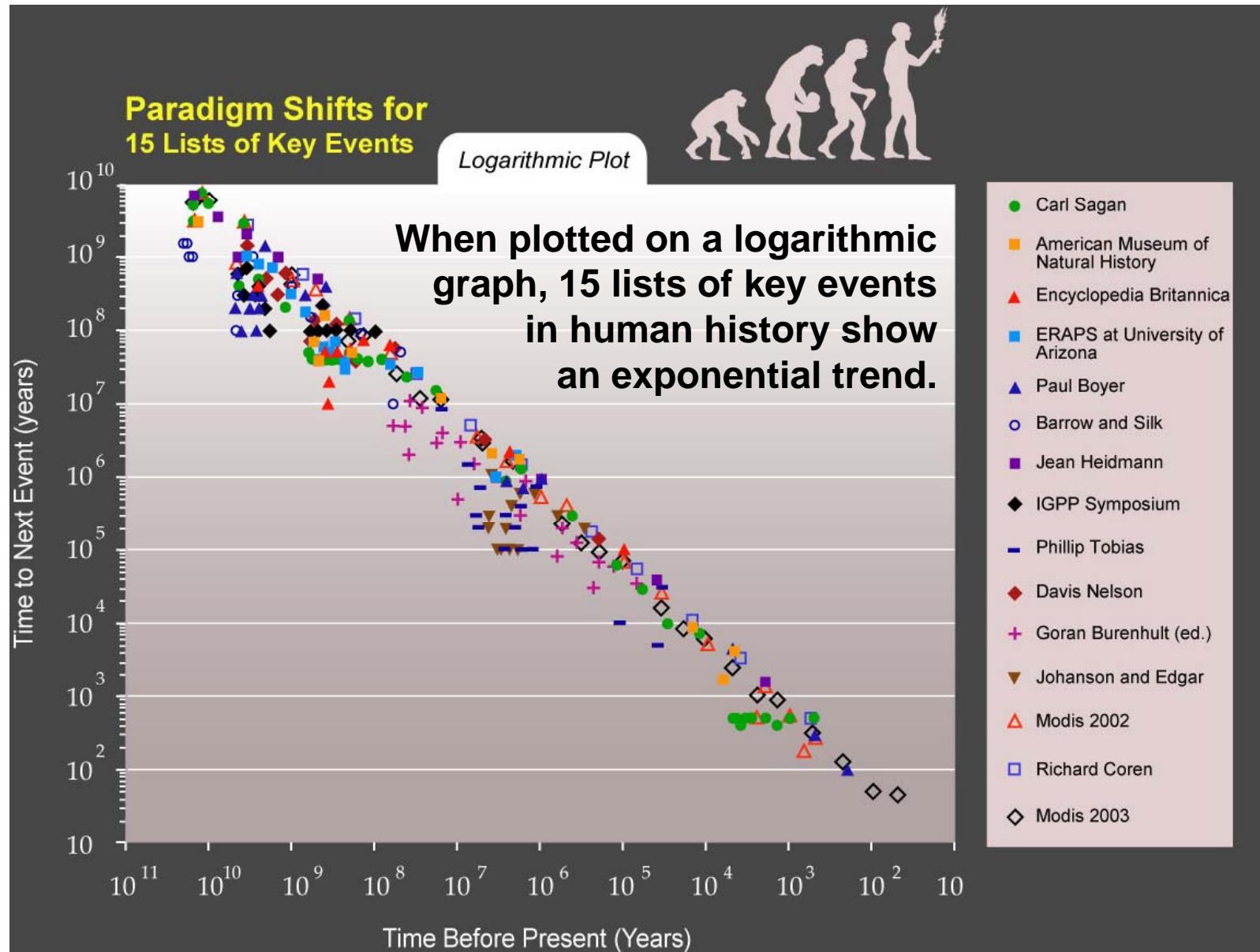
**Current interests: agile security and
self-organizing systems-of-systems**

Abstract

Business and enterprise of all kinds today rely on complex networks of resources and relationships. These networks enable necessary performance while bringing new forms of major vulnerability, immeasurable uncertainty and unpredictability.

Yesterday's history provides little visibility and few trends on what can go wrong tomorrow. Strategy based on traditional risk analysis is little more than window dressing and denial. Enterprise systems at risk need optional response capabilities; but choosing which ones and calculating how many is more whistling in the dark.

Agile response ability is based on a response architecture that is open ended, evolvable with the threat landscape, proactive as well as reactive, and network counter-sensitive. The nature of network economy vulnerability and agile counter measures will be examined.



4th Generation Warfare

Here, now....

**Iraq, al Qaeda, MS-13, terrorists,
Russian Business Network, ...**

**Guerrilla bands
attacking networks of modern society**

Chinese Intelligence cyber-force ...

Open source, open collaboration

**High leverage economic damage,
cheap to cause massive effects**

5th Generation Warfare

Just starting....

Superempowerment

One person commands an army

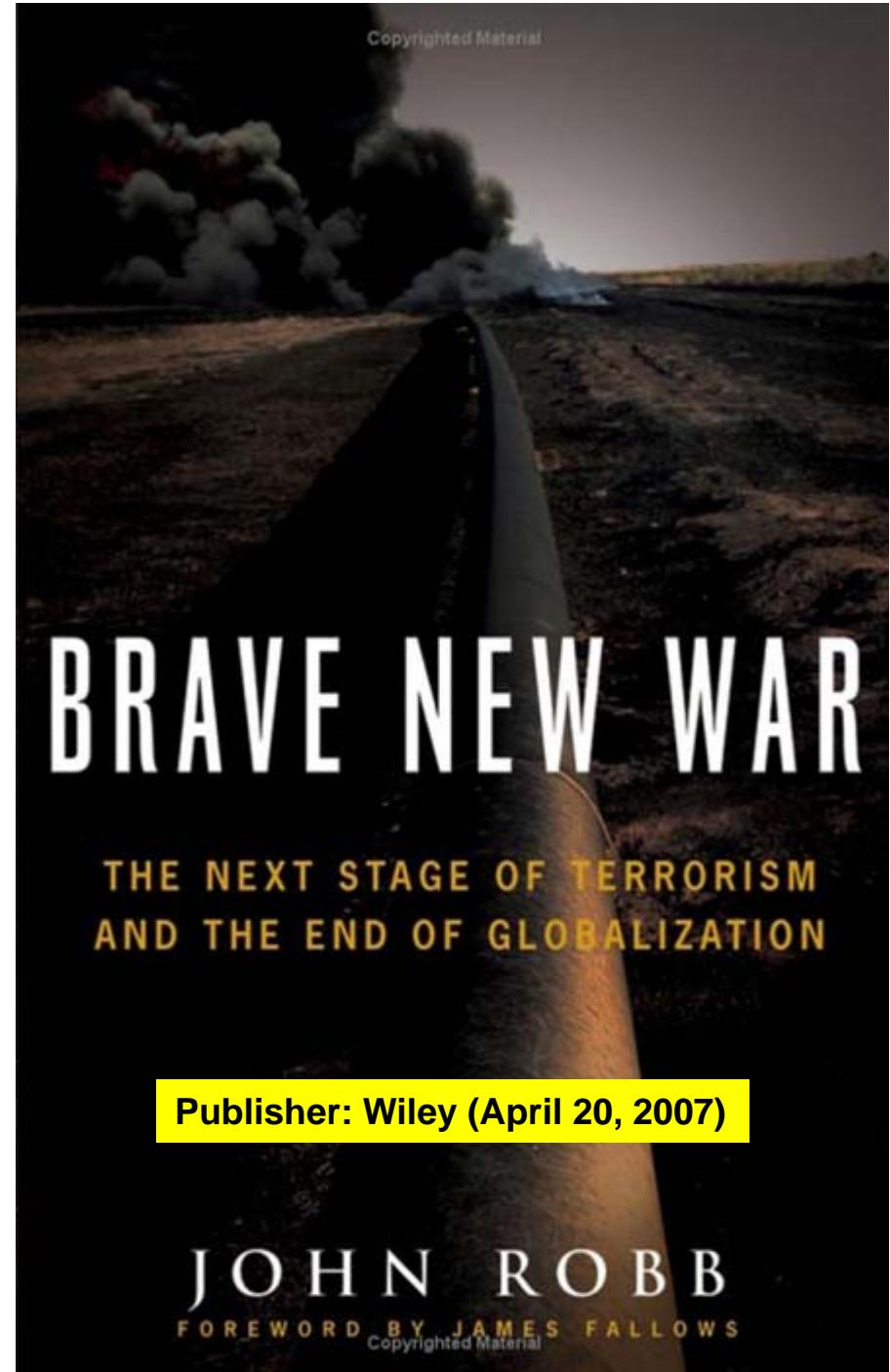
One person controls high tech weapons

Swarm-bots on the Internet

Robots in the streets

Biofab-created pestilence

Cheap submarines, helicopters, ...



Synthetic DNA on Brink of Yielding New Life Forms

Rick Weiss, Washington Post, Monday, December 17, 2007



Scientists at LS9 Inc. in San Carlos, Calif., are using artificial DNA to reprogram E. coli bacteria to produce a cheap alternative fuel.

Scientists in Maryland have already built the world's first entirely handcrafted chromosome -- a large looping strand of DNA made from scratch in a laboratory, containing all the instructions a microbe needs to live and reproduce.

In the coming year, they hope to transplant it into a cell, where it is expected to "boot itself up," like software downloaded from the Internet, and cajole the waiting cell to do its bidding. And while the first synthetic chromosome is a plagiarized version of a natural one, others that code for life forms that have never existed before are already under construction.

"Evolutionary processes are no longer seen as sacred or inviolable. People in labs are figuring them out so they can improve upon them for different purposes."

That unprecedented degree of control over creation raises more than philosophical questions, however. **What kinds of organisms will scientists, terrorists and other creative individuals make? How will these self-replicating entities be contained? And who might end up owning the patent rights to the basic tools for synthesizing life?**

Some experts are worried that a few maverick companies are already gaining monopoly control over the core "operating system" for artificial life and are poised to become the Microsofts of synthetic biology. That could stifle competition, they say, and place enormous power in a few people's hands.

High Tech Low Cost – Goldfinger Criminals



In Colombia, a boat sits at the main Pacific naval base at Malaga Bay. The cigar-shaped vessel is 60 feet long. It can travel at 10 knots and reach Central America — a 1,100-mile journey — in four days. Most importantly, its cargo hold can carry 10 tons of cocaine, worth \$200 million.

This craft comes with a fiberglass cover, on the outside and on the inside. Indeed, that's what gives the vessel a leg up over the navy. With little metal to speak of, it's hard to detect with sonar.

"It's a submarine that has good lines; it's more difficult to detect. It's harder to detect with radar. It's better technology," Angel says. Still, the Colombian and American navies have stopped plenty of the vessels — 13 in 2007 — which is more than in all the years combined since 1993, when the first subs were detected, Angel says.

Submarines dive, and these don't — though most of the craft glides under the water. They're submersibles. Still, he respects the engineering, which he says is getting better.



Feb 11, 2008: <http://www.npr.org/templates/story/story.php?storyId=18707501>



Home-made helicopters hit northern Nigeria

The chopper, which has flown briefly on six occasions, is made from scrap aluminium that Abdullahi bought with the money he makes from computer and mobile phone repairs, and a donation from his father, who teaches at Kano's Bayero university.

It is powered by a second-hand 133 horsepower Honda Civic car engine and kitted out with seats from an old Toyota saloon car. Its other parts come from the carcass of a Boeing 747 which crashed near Kano some years ago.

For a four-seater it is a big aircraft, measuring twelve metres (39 feet) long, seven metres high by five wide. It has never attained an altitude of more than seven feet.

The cockpit consists of a push-button ignition, an accelerator lever between the seats which controls vertical thrust, a joystick that provides balance and bearing.

He said he learned the rudiments of flying a helicopter from the Internet and first got the idea of building one from the films he watches on television.

"I watched action movies a lot and I was fascinated by the way choppers fly. I decided **it would be easier to build one than to build a car.**"

Abdullahi has started work on a new flying machine. Currently just a spindly metal frame in the back yard, the helicopter will be a two-seater and Abdullahi calculates it will be able to fly at an altitude of 15 feet for three hours at a stretch.

A DIY Cruise Missile

Watch me build one for under \$5,000



The DIY Cruise Missile project is actually an off-shoot of development work on my XJet engine.

Needing a "flying testbed" for the Generation-3 X-Jet prototypes, I figured I could kill two birds with one stone and create a design that not only gave me the dynamic environment required to thoroughly test this new engine, but one which could also become a low-cost cruise missile.

It should be noted however, that the DIY Cruise Missile version of this craft documented on this site will not use an X-Jet engine but instead rely on a traditional pulsejet design for which there is much design information already in the public domain. [www.interestingprojects.com/cruisemissile/]

The viability of home-made weapons has already been established. New Zealand inventor Bruce Simpson announced plans in 2003 to build his own cruise missile for \$5,000. He intended to open source the plans and publish them on the internet.

Simpson was at the flight testing stage when the New Zealand government stepped in and squashed the project on security grounds and banned him from exporting the technology to the US.

"Although they have openly admitted that it is quite legal, I believe that it was causing them a good deal of embarrassment and that they may well have been under some pressure from at least one other country to shut it down," Simpson said on his website.

"Fortunately, the vast majority of the work has already been completed and the missile is ready to test."

Simpson claimed that he was approached by Iran about a deal to license his engine but that he did not respond.

[<http://itnews.com.au/News/70991,uk-scientist-warns-of-terrorist-robots.aspx>]

Killer robots 'cheap and easy to build'

<http://www.vnunet.com/vnunet/news/2210620/boffin-warns-terrorist-robots>



27 Feb 2008 – One of the UK's leading scientists has warned that terrorists will soon be using robots to attack their targets.

Professor Noel Sharkey, from Sheffield University's Department of Computer Science, told the Royal United Services Institute that robots will be cheap and easy for terrorists to use in combat situations and could replace suicide bombers.

"With the current prices of robot construction falling dramatically, and the [greater] availability of ready-made components for the amateur market, it would not require a lot of skill to make autonomous robot weapons," he said.

"Once the new weapons are out there, they will be fairly easy to copy. How long is it going to be before terrorists get in on the act?"

Professor Sharkey claimed that it would be possible to build an autonomous flying drone with GPS for around £250 that could be used to scout out targets.

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BBQ-smoker-turned-'Robocop' chases off drug dealers

www.cnn.com/2008/CRIME/03/06/bum.bot/index.html#cnnSTCVideo



Former BBQ smoker armed with a water gun to chase off bums and drug dealers in downtown Atlanta. Cops frown on water spraying.

ATLANTA, Georgia (CNN) -- It's midnight on the streets of Atlanta, and bar owner Rufus Terrill patrols his neighborhood with a rolling crime fighter of his own creation. Meet "Bum-bot," as Terrill describes it; others in his neighborhood call it simply, "Robocop."

It's a barbecue smoker mounted on a three-wheeled scooter, and armed with an infrared camera, spotlight, loudspeaker and aluminum water cannon that shoots a stream of icy water about 20 feet.

Operated by remote control, the robot spotlights trespassers on property down the street. Using a walkie-talkie, Terrill belts out through the robot's loudspeaker, "That's private property. You guys need to get out of here."

Terrill is chasing out unsavory-looking characters from a street corner that resembles a drug dealer's dream at night.

Some of Terrill's bar patrons say they've seen a difference in the neighborhood. Susanne Coe lives nearby. "I've seen a marked change simply with this robot that doesn't have any power of arrest. It does scare people and to be honest with you I'm grateful for it," she says.

On this night, as Terrill and his robot make their way to the street corner, he shines the robot's spotlight on the parking lot of the daycare center. One by one, the shadowy figures stand up, walk away and saunter down the street.



Forget sports doping. The next frontier is brain doping

LA Times, 12/20/07, Karen Kaplan and Denise Gellene

Academics, classical musicians, corporate executives, students and even professional poker players have embraced drugs to clarify their minds, improve their concentration or control their emotions.

"There isn't any question about it -- they made me a much better player," said Paul Phillips, 35, who credited the attention deficit drug Adderall and the narcolepsy pill Provigil with helping him earn more than \$2.3 million as a poker player.

They are all just precursors to the blockbuster drug that labs are racing to develop. "**Whatever company comes out with the first memory pill is going to put Viagra to shame,**" said University of Pennsylvania bioethicist Paul Root Wolpe.

<http://www.latimes.com/news/science/la-sci-braindoping20dec20,0,6487141.story>

THE BLACK SWAN



The Impact of the
HIGHLY IMPROBABLE

Nassim Nicholas Taleb

ever seen were white swans; indeed, "all swans are white" had long been used as the standard example of a scientific truth.

September 11th is one such example, and stock market crashes are another. Or, as he puts it, "**History does not crawl, it jumps.**"

Our brains are wired for narrative, not statistical uncertainty. We tell ourselves simple stories to explain complex things. We have no idea why stock markets go up or down on any given day. Whatever reason we give is sure to be grossly simplified, if not flat out wrong.

Nassim Nicholas Taleb first made this argument in *Fooled by Randomness*, an engaging look at the history and reasons for our predilection for self-deception when it comes to statistics. Now, in *The Black Swan*, he focuses on that most dismal of sciences, predicting the future.

The problem, Nassim explains, is that **we place too much weight on the odds that past events will repeat** (diligently trying to follow the path of the "millionaire next door," when unrepeatable chance is a better explanation).

Instead, **the really important events are rare and unpredictable.** He calls them **Black Swans**, which is a reference to a 17th century philosophical thought experiment. In Europe all anyone had

[Amazon Review by Chris Anderson]

Probabilistic Risk Assessment

PRA is the discipline of trying to quantify, under uncertainty, the risk or safety of an enterprise. To briefly state my views:

Quantification, or measuring, the risk/safety of a situation is not the goal of a PRA. Nor is it necessary to “quantify” with numbers (one could use colors).

The act of trying to measure the risk involved is the source of knowledge. The acts of trying to assign values, combining them, questioning their verisimilitude, building the model are the great treasure of PRA: the key to the treasure is the treasure itself.

Uncertainty is not some noisy variation around a mean value that represents the true situation. Variation itself is nature's only irreducible essence. Variation is the hard reality, not a set of imperfect measures for a central tendency. Means and medians are the abstractions.

Too often risk is defined as

$$\text{risk} = \text{likelihood} * \text{consequence}$$

$$\text{safety} = 1 - \text{risk}.$$

I disagree with this. Risk is likelihood and consequence, not a simple multiplication with safety as the additive inverse of risk.

Risk and safety are normative notions, changing with situations and expectations, and must be assessed accordingly.

“Unexampled Events, Resilience, and PRA,” Steve Epstein,
http://www.resilience-engineering.org/REPPapers/Epstein_R.pdf

Unexamined Events

"Unexamined Events, Resilience, and PRA," Steve Epstein, www.resilience-engineering.org/REAPapers/Epstein_R.pdf

The focus of these PRAs is almost entirely on known system disturbances as initiating events, and static, sequential views of accident emergence/progression.

As a result, procedures, training, regulations, and methods of operation were put in place to guard and watch out for the known disturbances. Risk models were used not for their insights, but for the quantitative results offered, thus never exploring novel failure modes of the facilities, totally missing the ability to postulate unexamined events and strange system and extra-system influences/interactions/background.

The result is that the attention of the risk analysts is not on unexamined events. Given that symptoms of system failure occur, attention will not be on the tail of the distributions where unexamined events reside. There will be little experience in the organization for imagining scenarios that change critical assumptions, have slightly different symptoms, or include multiple failures. **Moreover, the standard operational culture is focused on the procedures and rules for dealing with known disturbances and standard ways of solving problems.** And rightly so, since without this focus on the checklists, procedures, and protocol controllable situations can easily escalate out of control, and the daily safety of the facility impacted.

A second culture is also needed. To restate a central theme in this essay, in well-tested, etc., systems, **given that there is an accident, chances are the level of consequence is high and that the causes had not been modeled in the PRA.** The second culture, to be prepared for the unexamined event, must play with the model, question assumptions, run scenarios, and understand the uncertainty. **When initial indications or symptoms that a system may be going astray, the second culture moves away from the probable and into the possible.**

Attack on South African Nuke Facility, 9 November 2007



Anton Gerber, Necsa emergency services operational officer, was shot in the chest when four gunmen stormed the facility's emergency response control room in the early hours of Thursday morning.

The shooting comes four months after Necsa's newly appointed services general manager Eric Lerata, 43, was gunned down in front of his Montana home after returning from a business trip in France.

Pelindaba is regarded as one of the country's most secure national key points. It is surrounded by electric fencing, has 24-hour CCTV surveillance, security guards and security controls and checkpoints.

It is believed that the attackers gained access to the building by using a ladder from Pelindaba's fire brigade and scaling a wall. The men are thought to have forced open a window by pulling out several louvers.

Gerber attacked two of **the gunmen as they forced their way into the control room and ran straight for the control panel.** "I did not know what they were going to do. I just kept on hitting them even when one of them attacked me with a screwdriver. Unbeknownst to Gerber one of the robbers had shot him in the chest as he fought them off.

<http://www.pretorianews.co.za/?fSectionId=&fArticleId=vn20071109061218448C528585>

<http://globalguerrillas.typepad.com/globalguerrillas/>

rick.dove@stevens.edu, attributed copies permitted, 080317

"Unexamined Events, Resilience, and PRA," Steve Epstein,
http://www.resilience-engineering.org/REAPapers/Epstein_R.pdf

In this type of matrix, colors represent risk, with the order usually being like a traffic light: red, orange, yellow, and green (from high risk to low). The two dimensions represent consequence and likelihood as marked in Figure 4.

The upper matrix is the typical risk matrix for the standard operating culture, focusing on the area above the diagonal. The lower matrix is the typical risk matrix for the second culture, focusing on the area below the diagonal. Note how the two matrices are rotated.

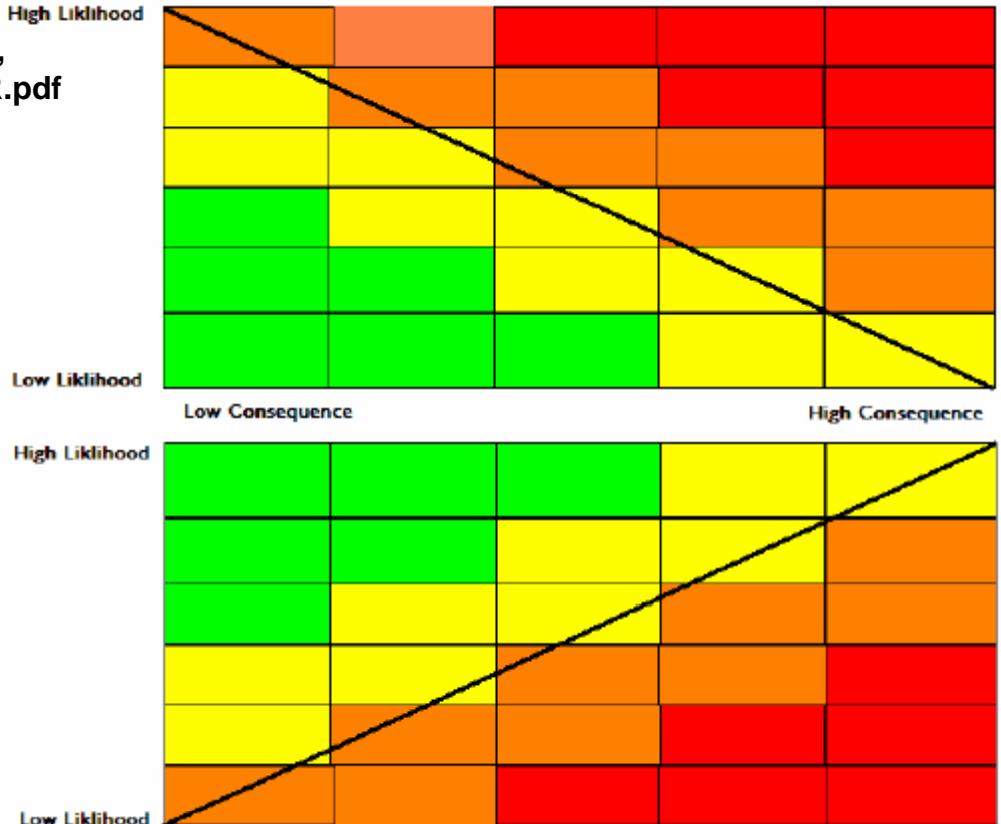


Figure 4

Can these two cultures coexist? Can one of the cultures “proactively presilient”? I do not know the answers at all. But I do know, that without them both, we can be assured of accidents with higher levels of consequence than not.

Safety is connected not only to risk, but also to expectation. It is a normative notion. In operations like a nuclear power plant or a chemical weapons disposal facility, which are of the well-tested etc. category, I expect the rare events to be guarded against, also. I **weight consequence more heavily than likelihood to calculate safety in the well-tested etc.**

No Matter Where We Go – Here We Are

Why are the lessons of safety relevant to ERM?

Many consequences of risky events are unforgiving today.

There is no save-and-reload in the game of enterprise.

Why are 4th and 5th generation warfare relevant to ERM?

Many risky events have network topologies, and cascaded complications.

Many unexpected risky events will occur just because they can.

Some will occur with open-organized leverage.

Why are unexamined events relevant?

The speed of change has accelerated beyond historical precedence.

Risk assessment needs a new math, as a minimum.

Focus needs to move to vulnerability and consequence management.

Why is systems engineering relevant?

Enterprise looks like a system, walks like a system, and quacks like a system.

Enterprises are species within an economic ecology = class 2 agile systems.

Defining Agility

**Agility is *effective response* to opportunity and problem,
within mission ... always.**

An *effective response* is one that is:

- timely (fast enough to deliver value),
- affordable (at a cost that leaves room for an ROI),
- predictable (can be counted on to meet expectations),
- comprehensive (anything/everything within mission boundary).

An ineffective response is failure - there is zero tolerance for failure today.

You can think of Agility as Requisite Variety.

You can think of Agility as proactive Risk Management.

**The trick is understanding the nature of agile-enabling concepts, and
how they can be applied to any type of system.**

Domain Independent

What analysis found (design)

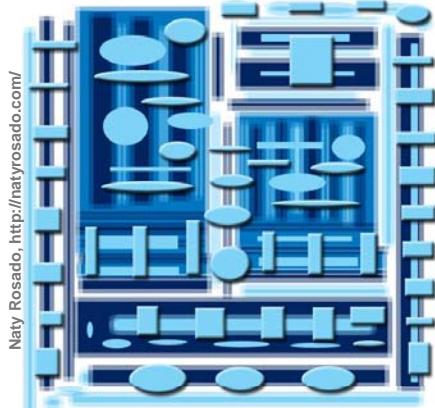
One general strategy:

- Reusable modules **Reconfigurable** in a **Scalable** framework

Ten general design principles:

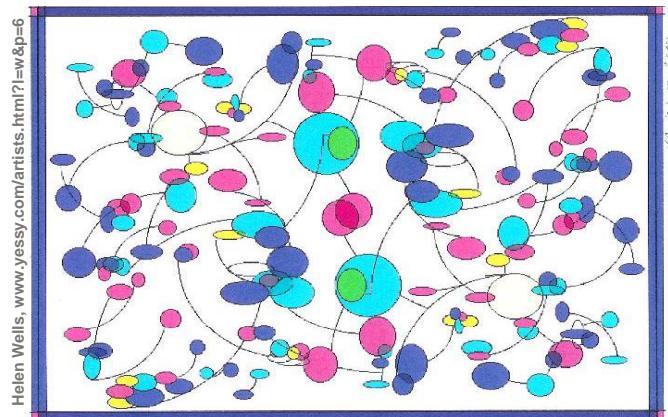
- 1. Evolving **Framework Standards**
- 2. Encapsulated **Modules**
- 3. Facilitated Plug Compatibility
- 4. Facilitated Module Reuse
- 5. Module Redundancy/Diversity
- 6. Elastic Capacity
- 7. Distributed Control/Info
- 8. Facilitated Deferred Commitment
- 9. Flat Interaction
- 10. Self Organization

Class 1 Agile Systems are Reconfigurable



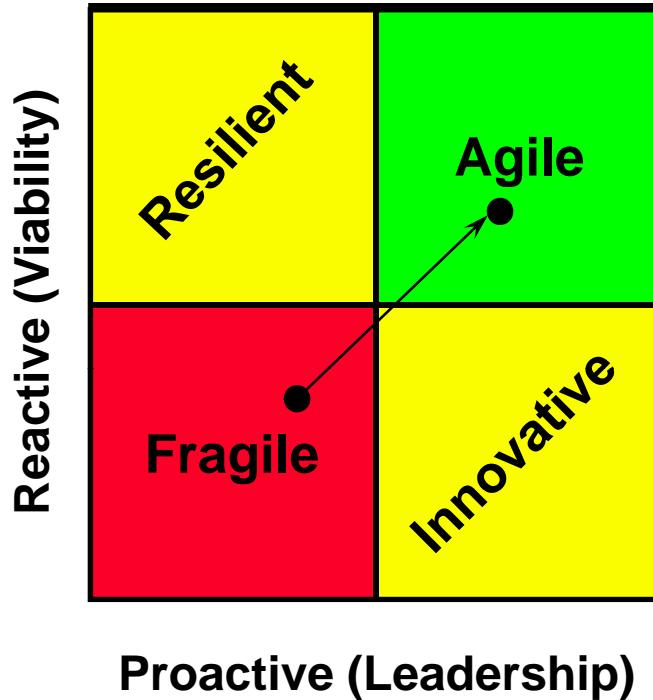
Useful Metaphors:
Plug-and-Play – Drag-and-Drop

Class 2 Agile Systems are Reconfiguring



Useful Metaphors:
Ecologies and Evolution

Agility is ...



The ability to respond effectively at *all* times, reactively *and* proactively ...within mission

... the ability to survive and thrive in an unpredictable and uncertain environment

Manifested As ...

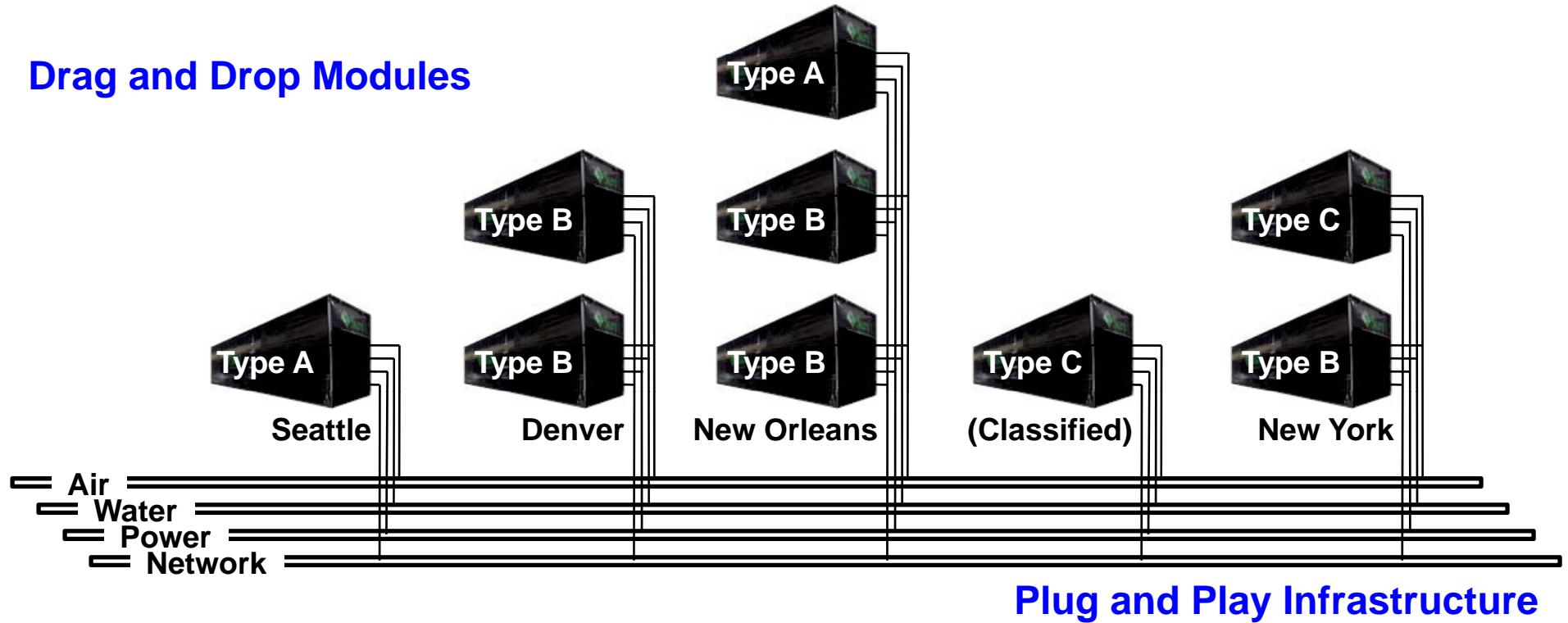
- An operating strategy
- An embedded culture
- An enterprise architecture
- A business-engineering discipline
- A broad competency across the enterprise

- **Agility decreases vulnerability and risk by increasing options and predictability**

Agile Data-Center Location, Capability, Capacity on Demand

<http://www.sun.com/emrkt/blackbox/index.jsp>

Drag and Drop Modules



Sun Microsystems New product Data Center Modules in Shipping Containers

No buildings to build, no space to renovate and lease, no waiting time from moment of additional need.

Put them in the parking lot, on the roof, in the desert.

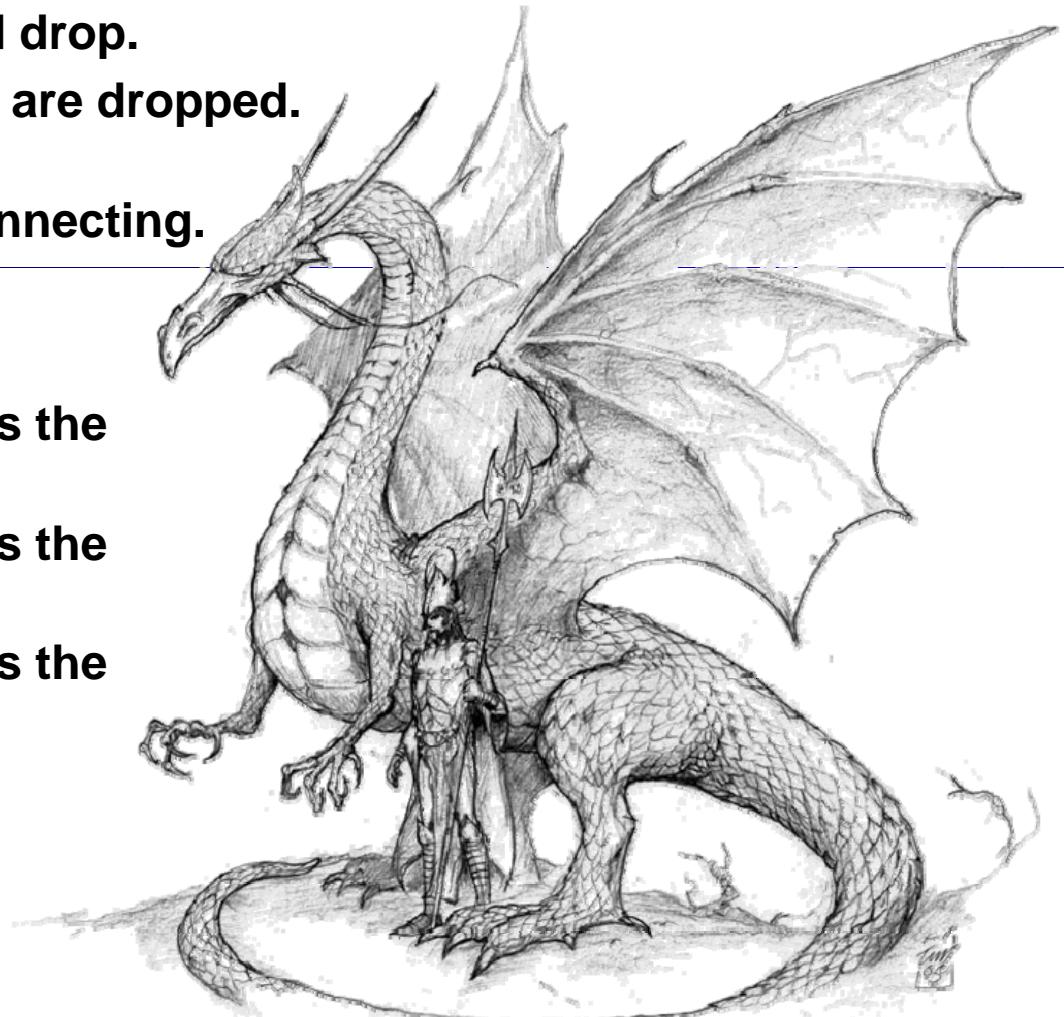
Class 1: Drag-and-Drop

In Real Time:

- Something is available to drag and drop.
 - Something accepts the things that are dropped.
 - Somebody does the dragging and dropping and connecting.
-

In Some Other Time:

- Somebody maintains and improves the draggable things.
- Somebody maintains and improves the drag-and-drop capability
- Somebody maintains and improves the accepting infrastructure.



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How Everything Is Connected to
Everything Else and What It Means for
Business, Science, and Everyday Life

Linked



"*Linked* could alter the way we think about all of the networks that affect our lives." —The New York Times

Albert-László Barabási

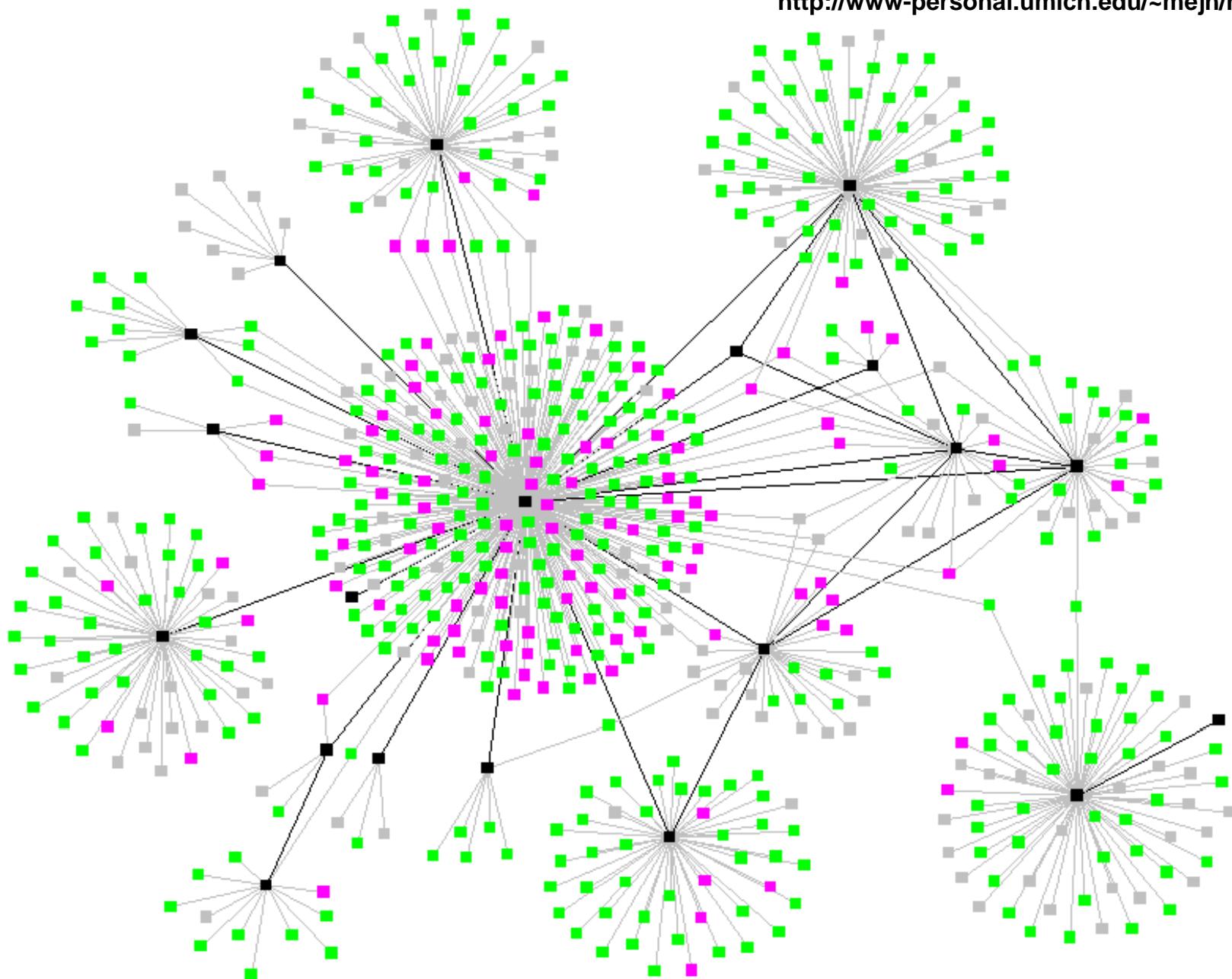
With a New Afterword

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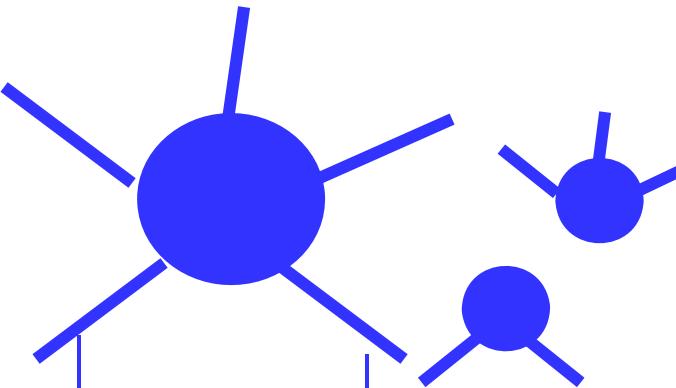
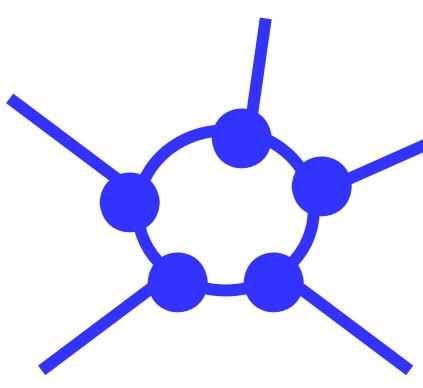
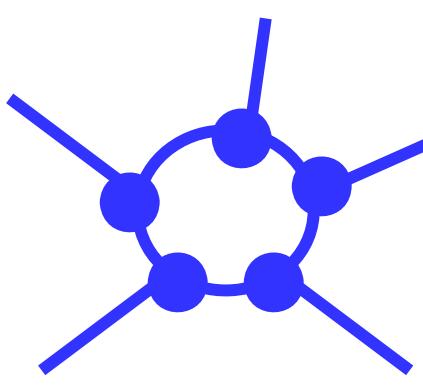
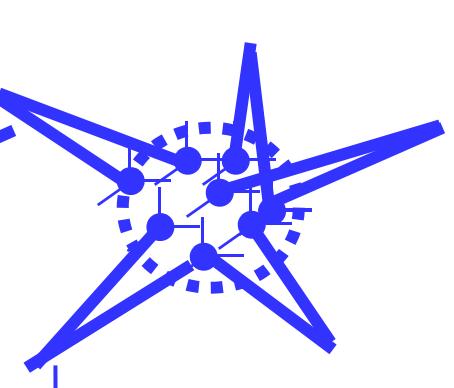
What do sexually transmitted diseases, the World Wide Web, the electric power grid, Al Queda terrorists, and a cocktail party have in common? They are all networks. They conform to surprising mathematical laws which are only now becoming clear. Albert-Laszlo Barabasi has helped discover some of those laws over just the past five years.

He explains the basic history of network theory, and then shows how his own work has turned it into a closer model of reality, a model that most of us will recognize. Networks are all around us, and they are simply not random. Some of our friends, for instance, are loners, while others seem to know everyone in town. Some websites, like Google and Amazon, we just cannot avoid clicking on or being referred to, but many others are obscure and you could only find them if someone sent you their addresses. Barabasi calls these "nodes" with such an extraordinary number of links "hubs," and has found laws of networks with hubs, showing such things as how they can continue to function if random nodes are eliminated but they fragment if the hubs are hit.

[Amazon reviewer Rob Hardy]



Network Topologies

| | | | | |
|------------------|--|---|---|---|
| |  |  |  |  |
| Design: | Node | Delegation | Ring | Clique or supernode |
| Function: | Hub in scale free network | Immunizes network | Covert Node | Virtual Node |
| Analogue: | Leaders | Node with deputy node | Dining Cryptographers passing messages | Terrorist Cell |

The Topology of Covert Conflict, Nagaraja, S. and Anderson, R., Technical Report, University of Cambridge, Computer Laboratory, 2005,
<http://weis2006.econinfosec.org/docs/38.pdf>, Reviewer: Georganne John 1/25/08

Strategies for High Vertex Order Nodes

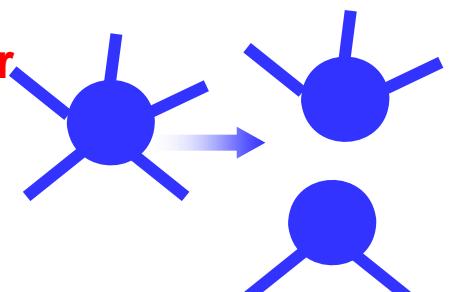
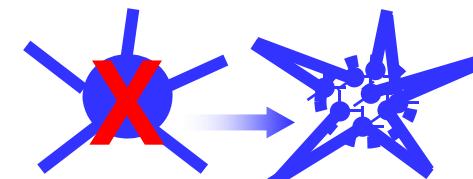
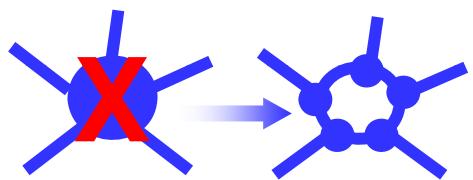
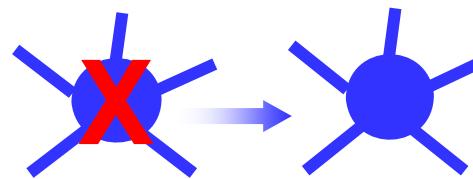
Vulnerabilities

Vertex order attack:

- Target highly-connected nodes
- Connectivity (vertex degree) can be observed

Centrality attack:

- Target nodes that lie on the largest number (or proportion) of paths
- Centrality must be calculated
- Use when vertex order of nodes appears equal (doesn't discriminate)



Defense Strategies

Random Replenishment

- Randomly replace nodes
- No adaptation to restructure links

Split into n nodes arranged as ring

- Resilient
- Covert communications

Split into n interconnected nodes

- Uniformly split external connections among nodes

Delegate prior to attacks

- Shortens path lengths

Results

Best strategies:

Centrality attack

Delegation plus clique defense

Create large cliques (simulated up to size=20)

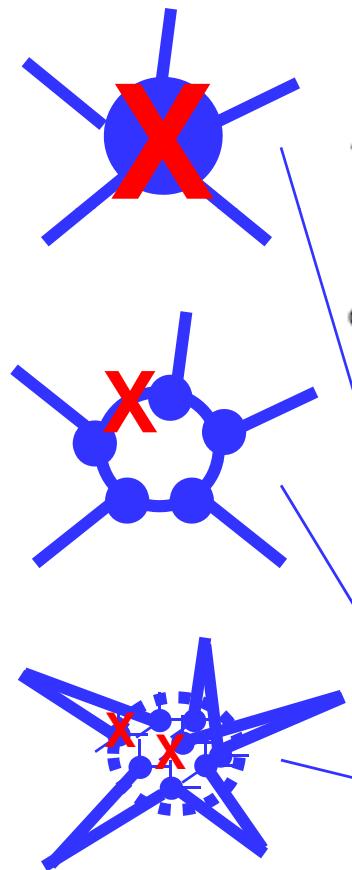
Multiple attacks ultimately:

Reach new equilibrium at 14 rounds

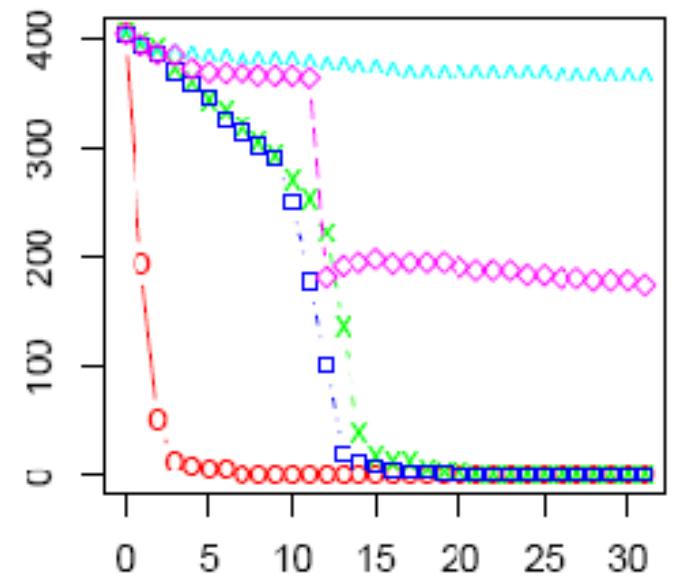
Partition clique

Reduce vertex order

Increase path length between nodes



Vertex-order and Centrality attack with Rings and Cliques



- vertex order attack, No adaptation
- +— vertex order attack, Rings
- △— vertex order attack, Cliques
- centrality attack, Rings
- *— centrality attack, Cliques



Iran Isolated from Internet



Jan 30, 2008 – ... two cables on the Mediterranean seabed were damaged, causing widespread disruption to internet services in Egypt, Gulf Arab states and South Asia. Media reports have attributed that damage to a ship's anchor.

Feb 2, 2008 – A third undersea cable has been cut off Dubai ... could further disrupt internet services after two cables were cut earlier this week. The cause of the latest cable damage was not immediately known.

Feb 4, 2008 – The fourth break is located between the Qatari island of Haloul and the UAE island of Das. The cause of damage is not yet known, but *ArabianBusiness.com* has been told unofficially the problem is power related.

The location of the breaks and short space of time in which they have happened has sparked **fears the cables were intentionally damaged by the US and Israel to deprive Iran of internet access**...spokesperson admitted it did seem like a bit of a coincidence that all four were damaged within such a short space of time.

...cause of the breaks will not be known until repair ships reach the site of the damage.

Flag Telecom played down conspiracy theories over the recent damage that has seriously disrupted internet and international telecoms services across the region.

"The Starfish and the Spider is a compelling and important book."
—PIERRE OMIDYAR, CEO, Omidyar Network; founder and chairman, eBay Inc.

THE STARFISH AND THE SPIDER



THE UNSTOPPABLE POWER OF
LEADERLESS ORGANIZATIONS

ORI BRAFMAN and ROD A. BECKSTROM

Whether or not you care about leaderless, borderless and/or decentralized organizations, labeled as starfish organizations, they probably affect your life in some way or another whether you have downloaded music or avoided it, looked up something in Wikipedia, had actions of al-Qaeda affect your life in some way like stricter restrictions at the airports, etc. In that sense, you might as well get to know something about them to make better use of them or be prepared to deal with them effectively when you have to.

The book identifies the qualities of starfish organizations and what makes them effective, how anyone and everyone could start, sustain and/or get involved in these organizations, the types of people key to such organizations and how to combat them if you're on the other side. Guidelines are offered and useful real life examples illustrate what otherwise be just concepts.

Amazon Review by [Minh Tan](#)

The Starfish and The Spider

**Observations on leaderless organizations and ownerless problems,
with an ultimate interest on business models**

Principles of Decentralization

- 1. When attacked, a decentralized organization tends to become even more open and decentralized (p21)**
- 2. It's easy to mistake starfish for spiders (p36)**
- 3. An open system doesn't have central intelligence; the intelligence is spread throughout the system (p39)**
- 4. Open systems can easily mutate (p40)**
- 5. The decentralized organization sneaks up on you (p41)**
- 6. As industries become decentralized, overall profits decrease (p45)**

The Starfish and The Spider – The Unstoppable Power of Leaderless Organizations,
Ori Brafman and Rod Beckstrom, Penguin Books, 2006

Differentiating a Starfish from a Spider

Questions to Ask

- 1. Is there a person in charge?**
- 2. Are there headquarters?**
- 3. If you thump it on the head, will it die?**
- 4. Is there a clear division of roles?**
- 5. If you take out a unit, is the organization harmed?**
- 6. Are knowledge and power concentrated or distributed?**
- 7. Is the organization flexible or rigid?**
- 8. Can you count the employees or participants?**
- 9. Are working groups funded by the organization, or are they self funded?**
- 10. Do working groups communicate directly or through intermediaries?**

The Starfish and The Spider – The Unstoppable Power of Leaderless Organizations,
Ori Brafman and Rod Beckstrom, Penguin Books, 2006

Mapping the Cone of Uncertainty (For Robot Products)

a dynamic work in perpetual process

2002

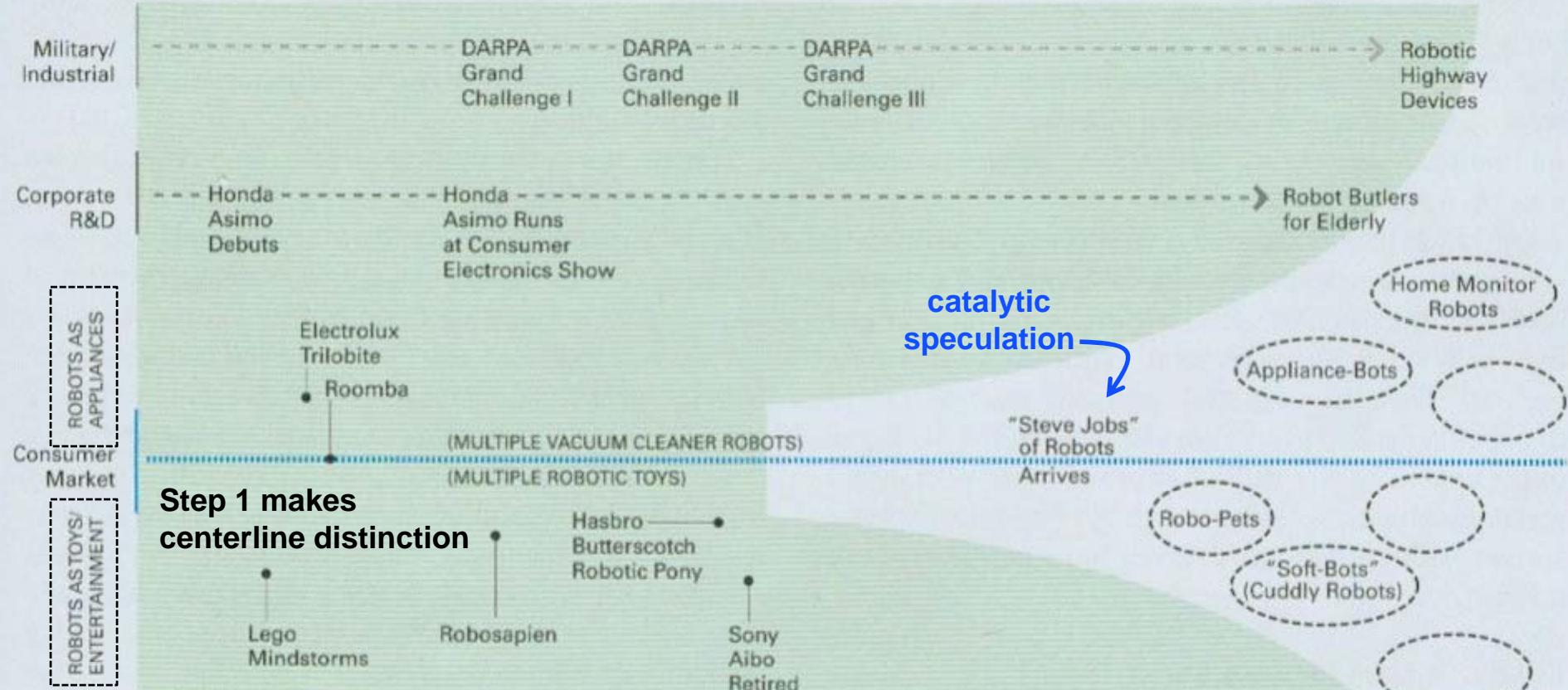
2005

2007

2010

2015

"Six Rules for Accurate Effective Forecasting," Paul Saffo, Harvard Business Review, Jul-Aug 2007, pps 122-131.



Delineates the possibilities that extend out from a particular moment or event. Drawing a cone is a dynamic process. Seen here is one iteration. Forecasts are meant to be scribbled on, disagreed with, and tossed out – and replaced with new, better one.

Six Rules for Accurate Effective Forecasting

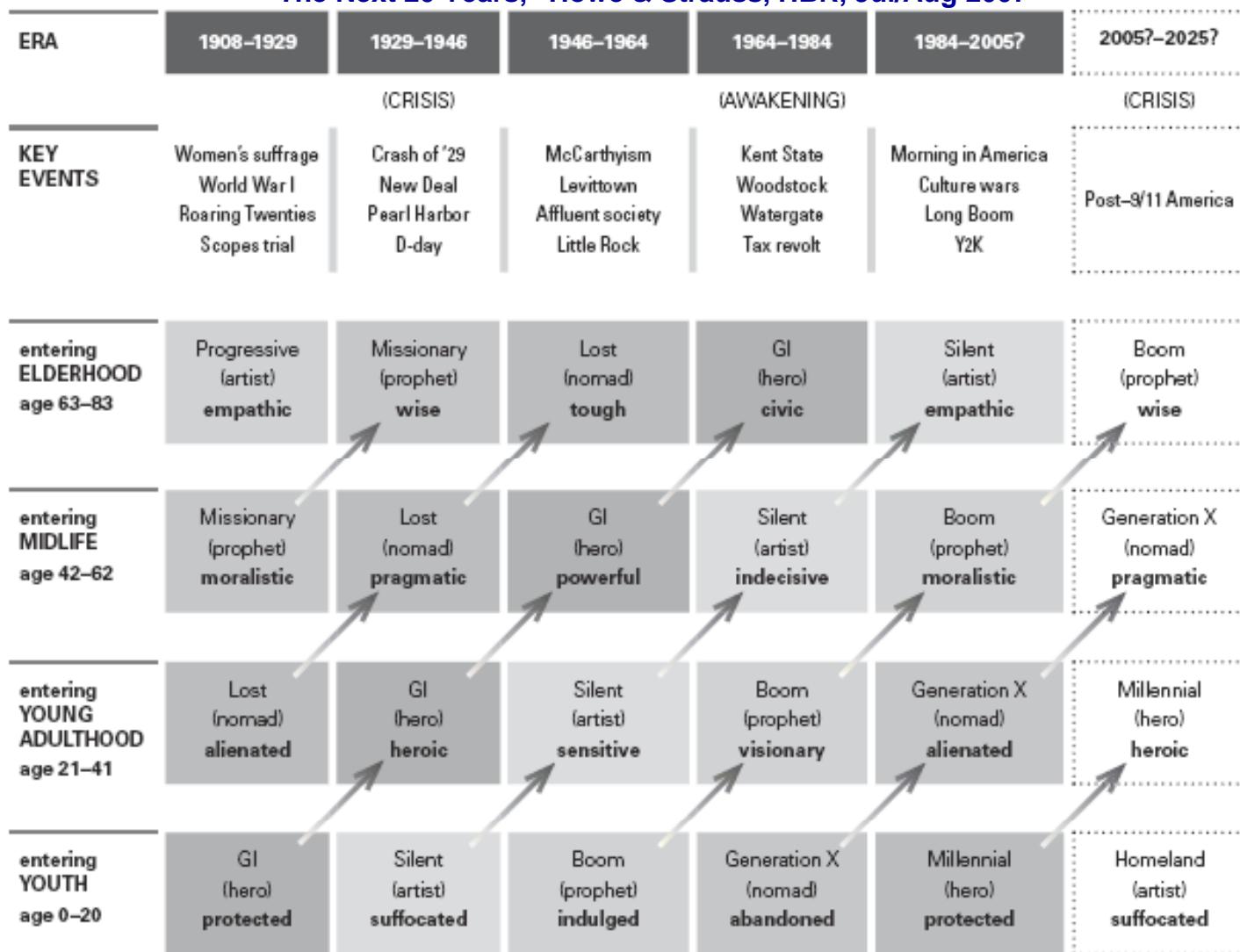
1. Define a cone of uncertainty – recognize a pattern of precursors, sense a pending quickening, chart speculative outcomes of the seeds in the nursery, with higher uncertainty farther from the center line, and don't deny the low plausibility as they are the Black Swan disruptive events.
2. Look for the S curve – change typically follows a power law S curve. Forecast the inflection point, act to its left before the explosion.
3. Embrace the things that don't fit – they are the precursors, the weak signals of pending disruptive S curves.
4. Hold strong opinions weakly – lots of interlocking weak information is vastly more trustworthy than a point or two of strong information – counter to training, habit, and comfort.
5. Look back twice as far as you look forward – history rarely repeats itself directly, but sometimes it rhymes. Look for the rhymes, and look far enough back to see the patterns instead of the details.
6. Know when not to make a forecast – even in periods of dramatic, rapid transformation, there are vastly more elements that do not change (like the laws of economics) than new things that emerge.

“The future’s already arrived. It’s just not evenly distributed yet.” - William Gibson

“Six Rules for Accurate Effective Forecasting,” Paul Saffo, Harvard Business Review, Jul-Aug 2007, pps 122-131.

The Generational Diagonal

"The Next 20 Years," Howe & Strauss, HBR, Jul/Aug 2007



Generations are formed by the way historical events and moods shape their members' lives—and by the fact that these events and moods affect people depending on the phase of life they occupy at the time.

The generational diagonal can help provide new answers to historical questions, such as why the American Revolution happened when it did.

It can also explain why SAT scores fell through the 1970s, and why attitudes toward having and raising children became much more positive in the early 1980s.

Perhaps most important, it provides a powerful tool for predicting what to expect from each phase of life—and from society as a whole—in the decades to come.

The Cycle Continues

“The Next 20 Years,” Howe & Strauss, HBR, Jul/Aug 2007

Over the next 20 years each of today’s generations will enter its next phase of life. In doing so, each will transform that phase in ways that echo through our history. This is how history repeats and society progresses.

Each new young generation fills a role being vacated by an older generation, a role that now feels fresh, functional, desirable, and even necessary for society’s well-being.

Boomers will transform old age as champions of values. They will urge the nation to act decisively on those values—even if doing so requires civic risk and sacrifice. Generation X will transform midlife as practical problem solvers.

Gen X traits criticized for decades—survivalism, pragmatism, realism—will be recognized as vital national resources.

Millennials will transform young adulthood as America’s new junior citizens, deeply engaged in civic life. They will revitalize community and public purpose, filling the role being vacated by senior citizen GIs.

History suggests that with the generations so aligned, the risk of a major crisis (whether geopolitical, military, economic, or environmental) will be great—but so, too, will be the opportunity to fix national or even global problems that today seem beyond solution.

The Pentagon's Force-Transformation Director Comments On What Worked And What Didn't In Iraq

Aviation Week, May 2, 2003, By David Fulghum



There also are at least three lessons in the context of grand strategy, Cebrowski said. Great power politics are anachronistic. Instead, the world is divided among those who want to join in globalization and those who remain disconnected. "Disconnectedness is emerging as one of the great signals of danger. The department is going to have to pay attention and posture forces near such areas."

The U.S. military will adopt a policy of continuous change and the broadening of capabilities and options. "Other people study us and they adapt," Cebrowski said. "The two Russian generals who apparently advised the Iraqis were posturing for something that would have looked like the first gulf war. That's exactly what we wanted them to do. I don't mind generals planning for the last war so long as they are all on the other side."

The growing implementation of "network-centric" warfare--what is destined to be a very long process--is shifting the sources of power. "We're going to see a new air-land dynamic. It's as if we discovered a new sweet spot . . . through the tighter integration of those. The process will be driven by better sensors, good networked intelligence, high-speed decision-making and the ability to exploit the noncontiguous battlefield, the battlefield without a front. You can't do the noncontiguous battlefield if you are not networked," he said. Most affected, he predicted, will be artillery support, close-air support and aerial battlefield interdiction. "The comfort level for [the use of] all indirect fires is going up," he said. "You see a new interdependency emerging."

http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/04283iraq.xml

rick.dove@stevens.edu, attributed copies permitted, 080317

The Shape of Things to Come

"The broad strategic thrust of the nation is to move from being reactive to being preventative," Cebrowski said. "You have to be engaged around the world.

The general rule is that small forces with a depth of local knowledge have more power than very large formations that come from [elsewhere].

That's been a strength of Special Operations Forces [SOF]. SOF also has ease of insertion and specialized skills.

The question becomes, do you buy more SOF, or can you pull some of those characteristics into the rest of the force? I think we'll find the [latter] is the preferred alternative.

The summary answer to what the U.S. needs is

**more SOF-like forces,
a higher ISR [intelligence, surveillance and reconnaissance] fraction and
more focus on the weapons of mass destruction problem."**

"The Pentagon's Force-Transformation Director Comments On What Worked And What Didn't In Iraq,"
Aviation Week, 5/2/03, David Fulghum, www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/04283iraq.xml

Overview of Transformation

Transformation is the roadmap that will lead the U.S. to “...a future force that is defined less by size and more by mobility and swiftness, one that is easier to deploy and sustain, one that relies more heavily on stealth, precision weaponry and information technologies.”

Transformation is necessary because:

- U.S. military superiority cannot be assumed in the future. As Information Age technologies proliferate, U.S. dominance will increasingly be challenged in novel ways.
- Growing asymmetric threats require new ways of thinking about conflict that require creative approaches
- Force-on-force challenges are likely to increase as adversaries seek to take advantage of changes in global power relations resulting from the transition to the Information Age.
- Technological changes make transformation of the military imperative; there is a window of opportunity to leverage U.S. competitive advantage into the future.
- The stakes are very high; if the U.S. fails to transform, current superiority will be increasingly challenged, regional competitors will emerge, conflict will become more likely.

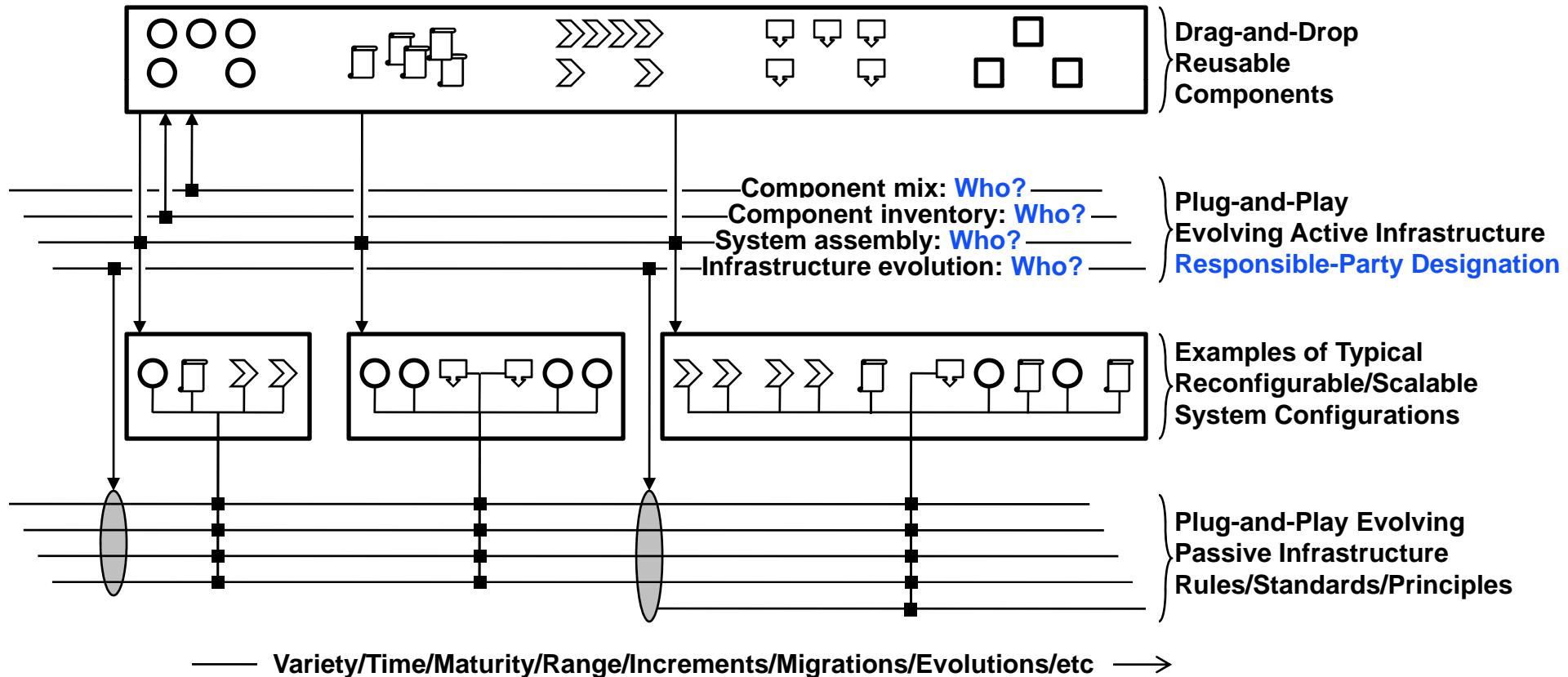
Transformation of this magnitude does not occur in isolation. The transformation of the military is, in fact, part of the larger transition from the industrial to the Information Age that is occurring simultaneously in societies and economies around the world. This transition is enabled by rapid changes in technologies that precipitate rapid coevolutionary changes in strategies, concepts, processes and organizations.

The Office of Force Transformation (OFT) is chartered to take the lead in moving the U.S. military from an Industrial Age organization to an Information Age organization.

Network Centric Operations Conceptual Framework, Prepared for John Garstka Office of Force Transformation by Evidence Based Research, Inc., Vienna VA, November 2003, [www.oft.osd.mil/library/library_files/document_353_NCO%20CF%20Version%201.0%20\(FINAL\).doc](http://www.oft.osd.mil/library/library_files/document_353_NCO%20CF%20Version%201.0%20(FINAL).doc)

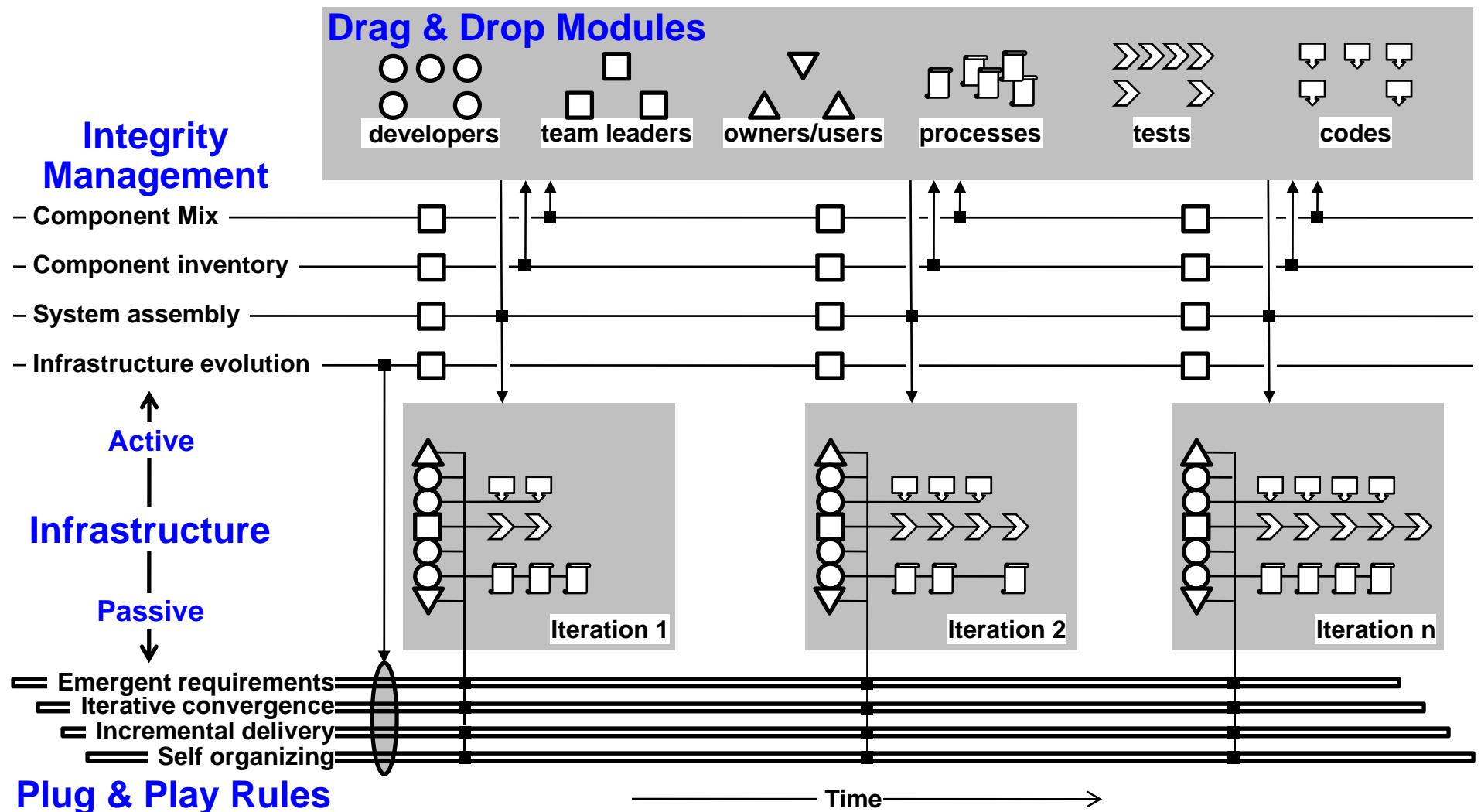
Agile System Plug-n-Play/Drag-n-Drop Pattern For Class 1 (reconfigurable) Agile Systems

This is a general/conceptual system architecture graphic “pattern”



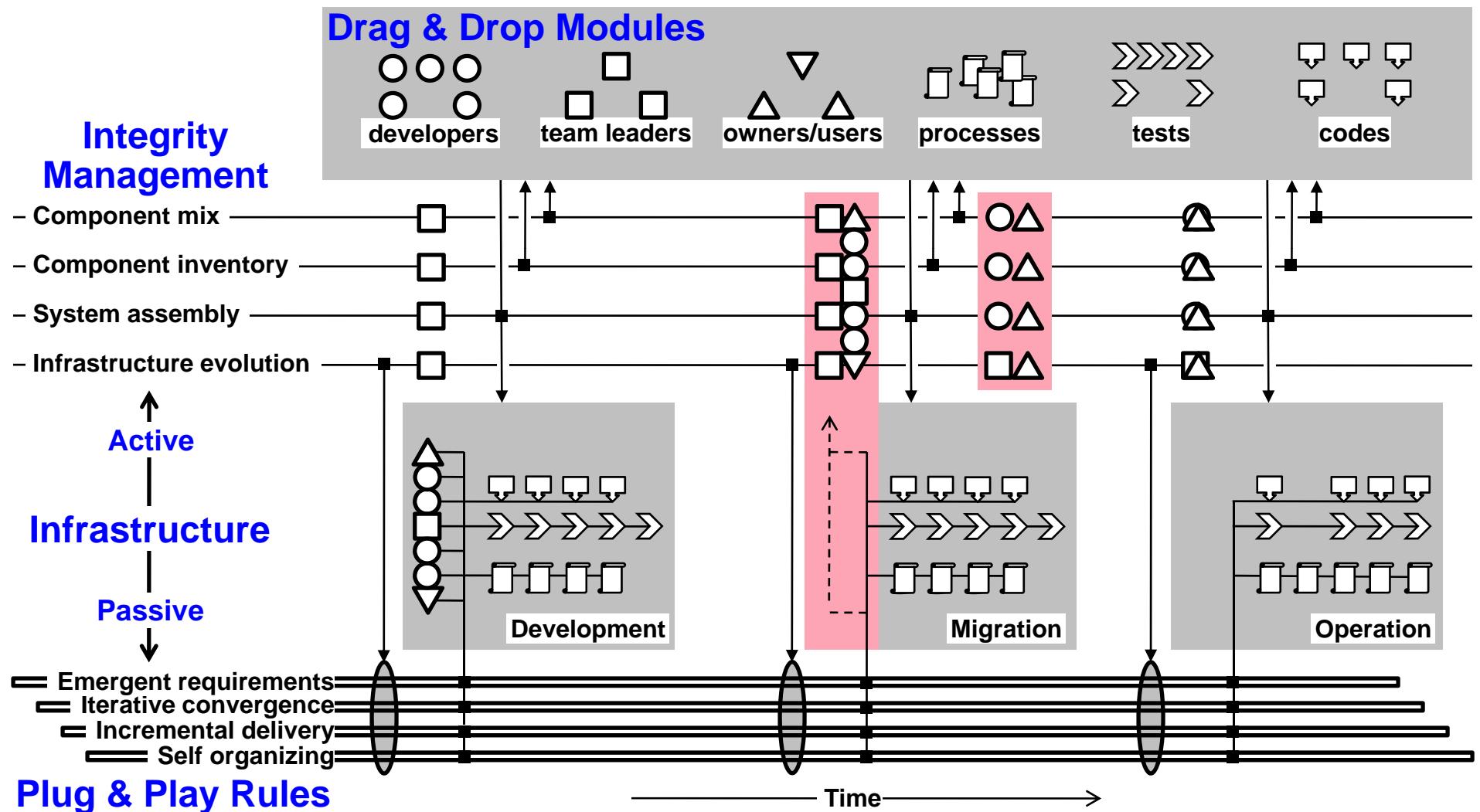
Agile Development Process

www.parshift.com/Files/PsiDocs/Pap080404Cser2008DevOpsMigration.pdf



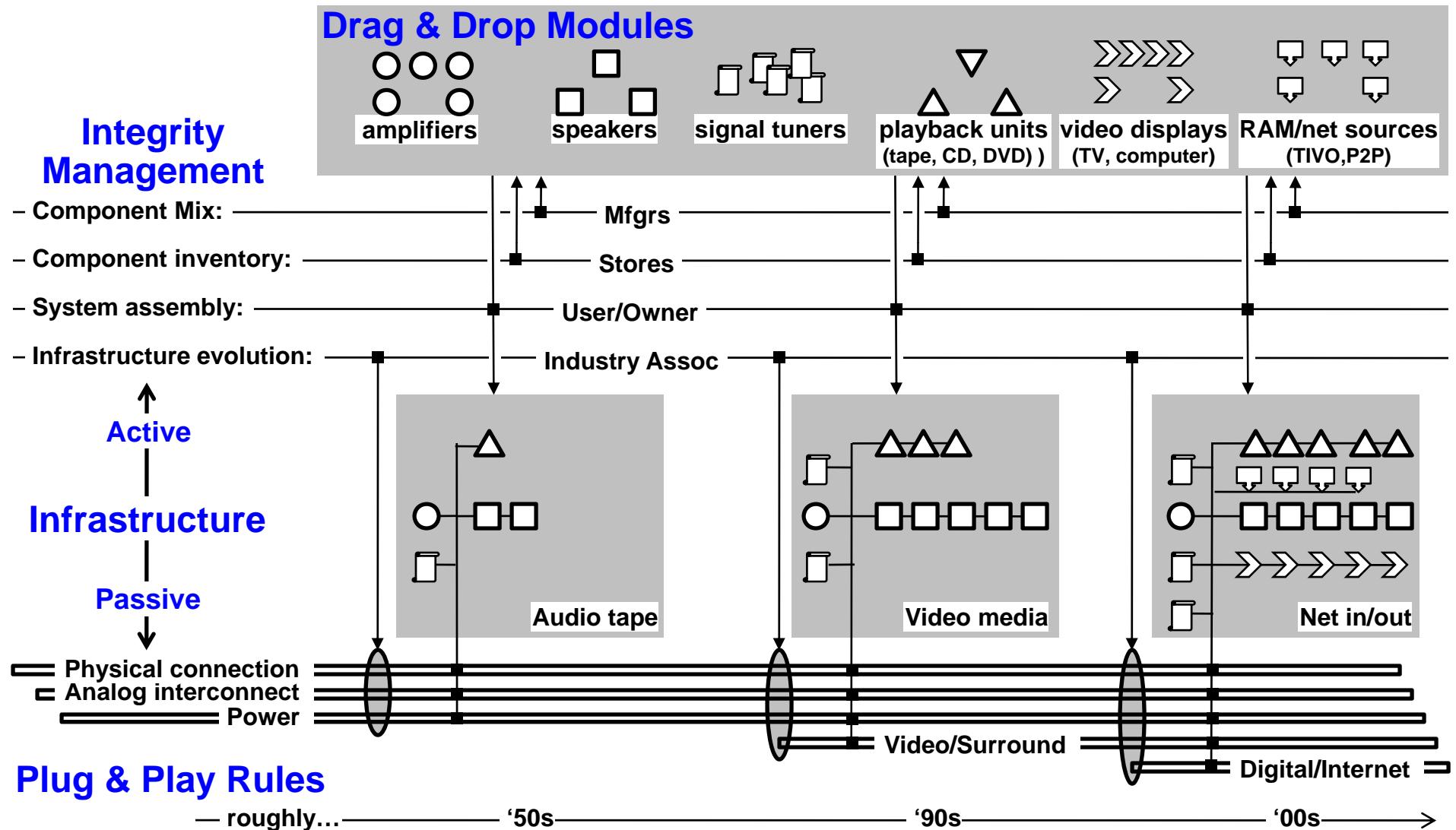
Agile Development-thru-Operations Process

www.parshift.com/Files/PsiDocs/Pap080404Cser2008DevOpsMigration.pdf



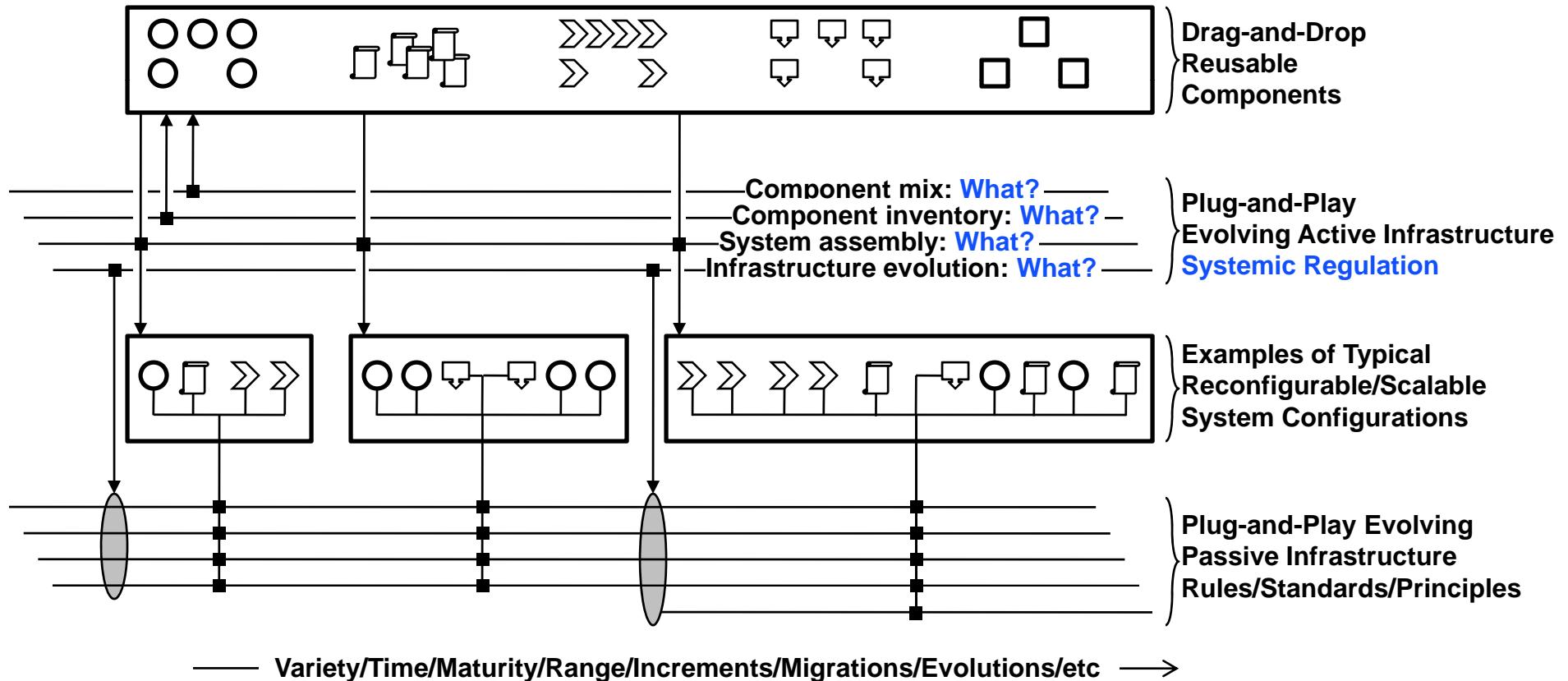
Hi-Fi Migrates to 2nd Gen Home Entertainment Systems

(paper-in-process, on migration across next-generation system boundaries)

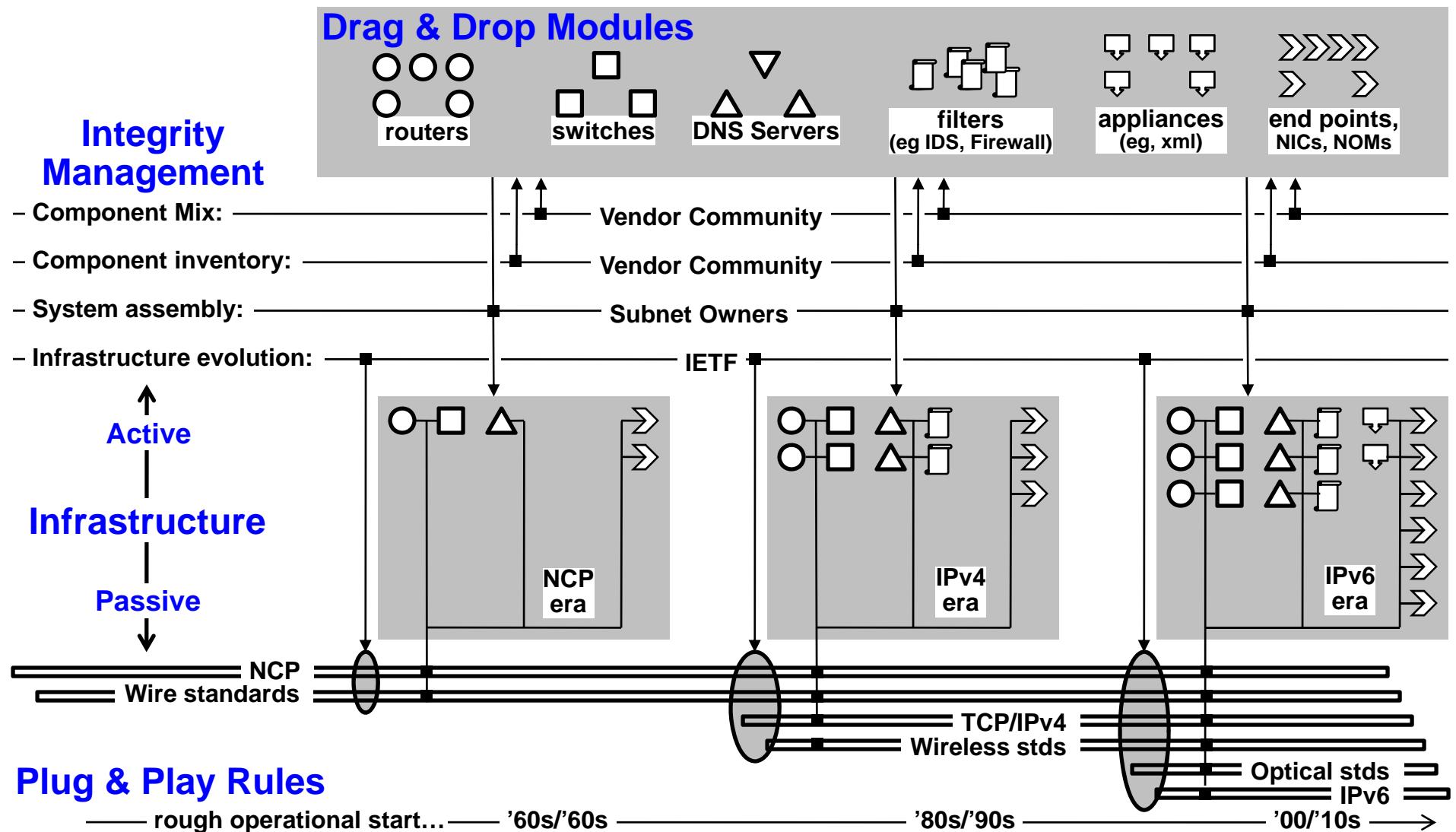


Patterns of Class 2 (reconfiguring) Agile Systems (Self-Organizing Systems-of-Systems)

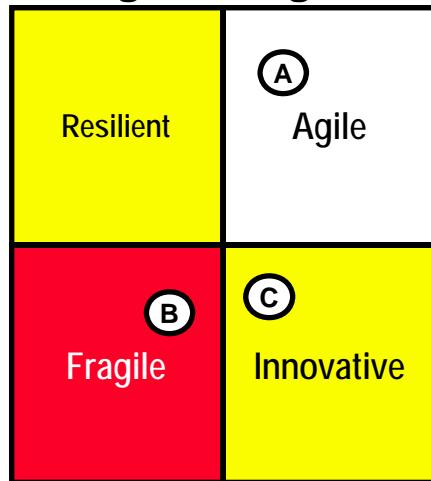
This is a general/conceptual system architecture graphic “pattern”



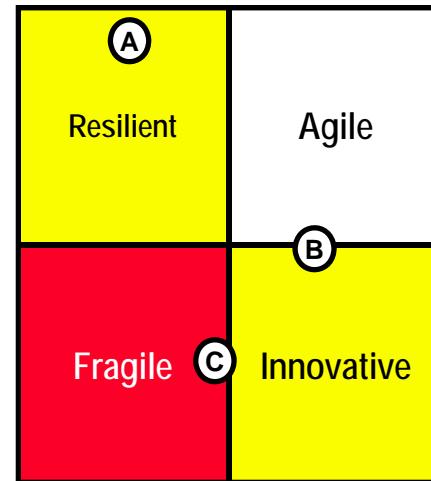
Internet Migration



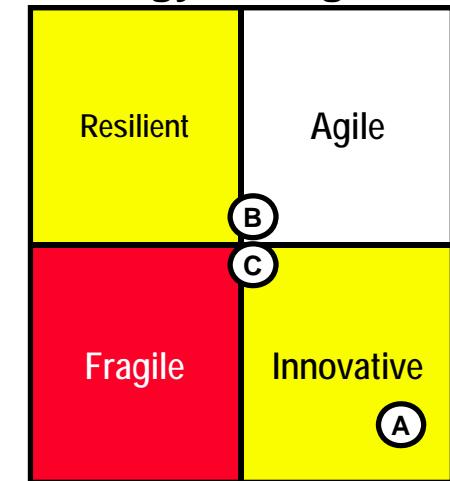
Outage Management



Project Management

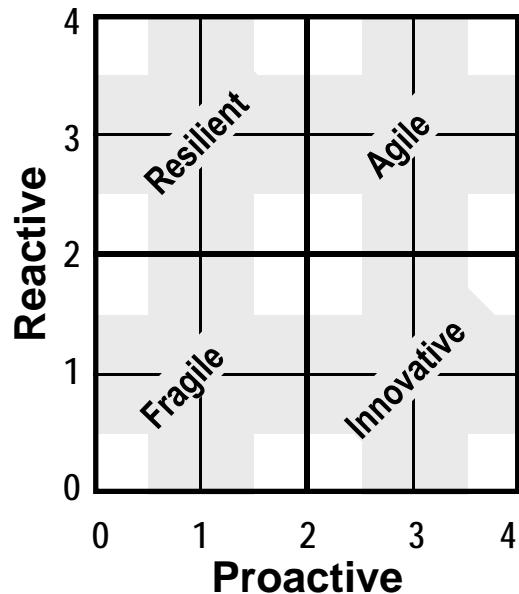


Strategy Management



Comparing Companies A, B, C.

Assessment and Competitive Evaluation

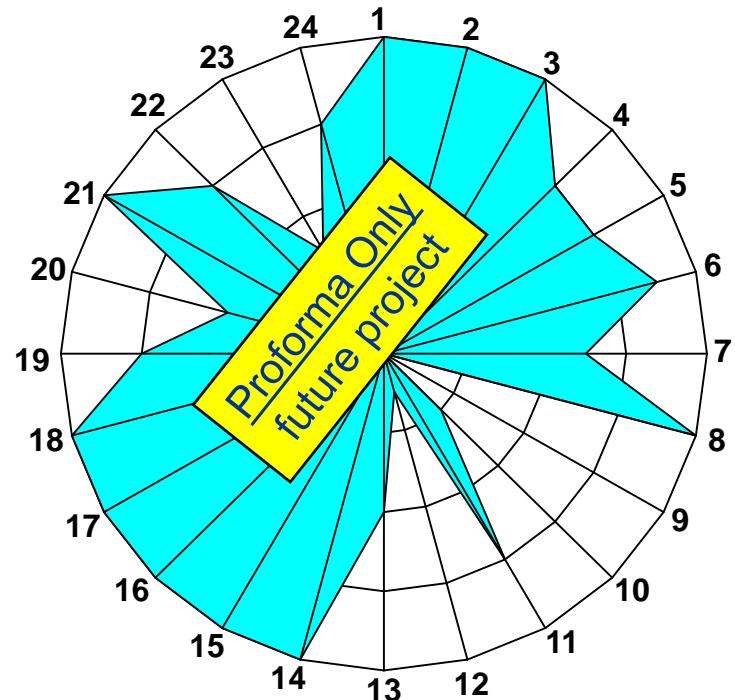


Response Proficiency Maturity Model

| Stages | Metric Focus | Working Knowledge | Competitive Development | |
|--------------|--------------|-------------------|-------------------------|---------------|
| 0 Accidental | Pass/Fail | Examples | Proactive | Reactive |
| 1 Repeatable | Time | Concepts | Creation | Correction |
| 2 Defined | Cost | Metrics | Improvement | Variation |
| 3 Managed | Quality | Rules | Migration | Expansion |
| 4 Mastered | Scope | Principles | Modification | Reconfig'tion |

Benchmarking response proficiency

...across the industry



maturity model metrics

(Example from Electric Utility Industry study proposal)

Critical Business Practice???

- 4.0 1 Regulatory compliance
4.0 2 SOX compliance, controls
4.0 3 Governance
3.0 4 Management development
3.0 5 Creativity and innovation
3.5 6 Asset management
2.5 7 Outage management
4.0 8 Service reliability
0.0 9 Cyber security
1.0 10 Physical security
3.0 11 Customer care
0.5 12 Outsource management
2.0 13 Business process management
4.0 14 Regulatory relationship mgmnt
4.0 15 Business intelligence
4.0 16 Risk management, energy
4.0 17 Risk management, operations
4.0 18 Plant technology migration
3.0 19 Staffing and skill development
2.0 20 Cost management
4.0 21 Disaster management
3.0 22 Business process IT support
1.5 23 Information technology migration
3.0 24 Field operations
- How Would Your Company Score?*

Agile Systems and Enterprises Have Options

... what does that cost?

... what is the value?

Designing Systems for Adaptability by Means of Architecture Options

Avner Engel and Tyson Browning

Abstract: Systems provide value through their ability to fulfill stakeholders' needs and wants. These needs evolve over time and may diverge from a fielded system's capabilities. Thus, a system's value to its stakeholders diminishes over time. As a result, systems are replaced or upgraded at substantial cost and disruption. If a system is designed to be changed and upgraded easily, however, this adaptability adds to its lifetime value. How can adaptability be designed into systems so that they will provide maximum value to stakeholders throughout their lifetime?

We adopt the concept of real options from the field of economics and extend it to the field of systems architecture. We coin the term *architecture options for this next-generation method* and the associated tools for the design of flexible systems. Architecture options provide a quantitative means of implementing the optimal degree of design flexibility in a system to maximize its lifetime value for varied stakeholders.

Engel, A. and Tyson, B. (2006), "Designing Systems for Adaptability by Means of Architecture Options," Presented at INCOSE International Symposium, 2006, forthcoming in *Systems Engineering*, 11(2), 2008,
www.incosc.org/symp2008/dmdocuments/paper_example01.pdf.

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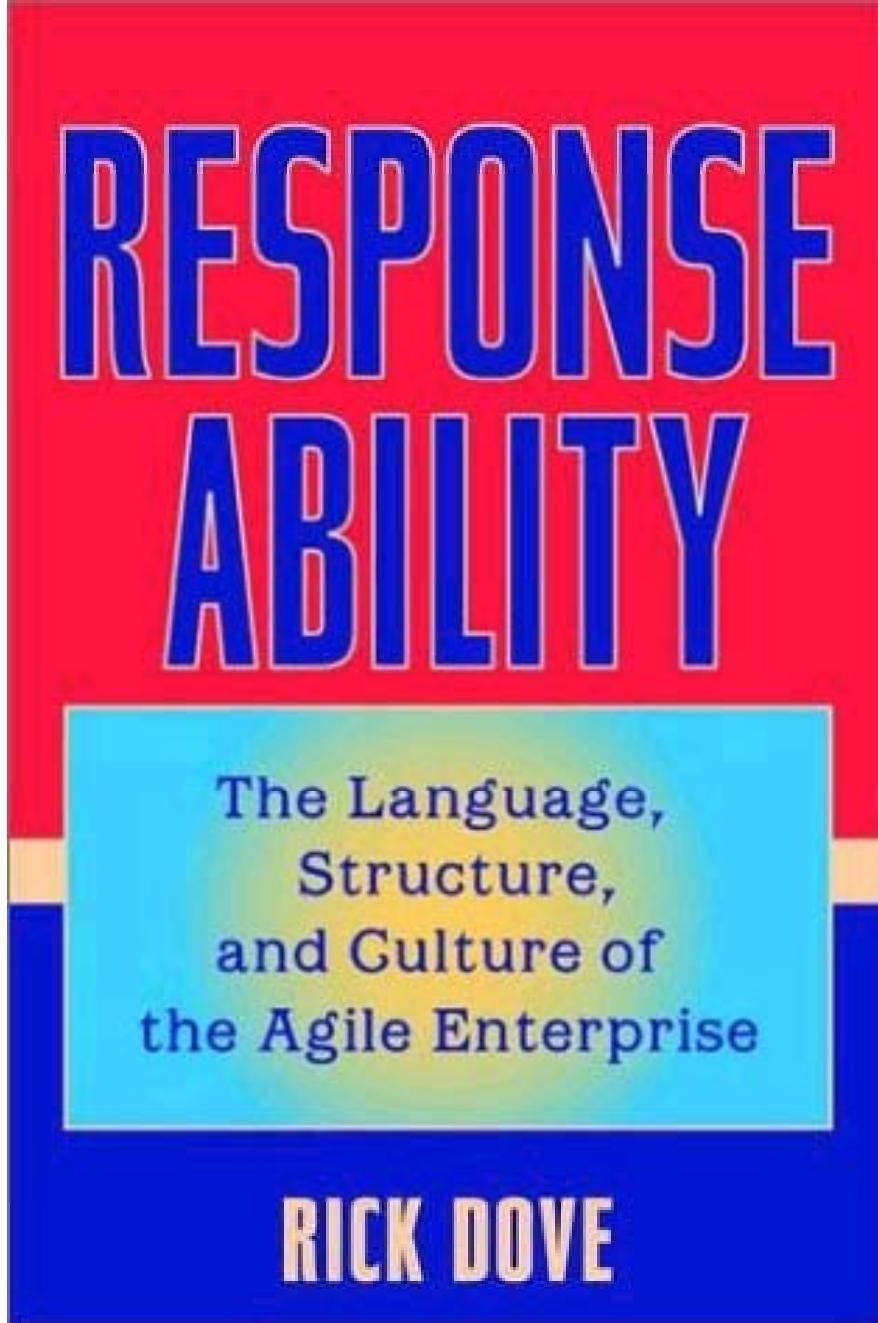
COURSES

| SDOE 675 | SDOE 678 | SDOE 679 | SDOE 683 |
|---|--|--|--|
| Systems "Thinking" Integrating Paradox, Perspectives, and People | Engineering of Agile Systems and Enterprises: Fundamentals of Analysis, Synthesis, and Performance | Architecting the Extended Enterprise: Human-Activity Systems of Systems | Design of Agile Systems and Enterprise: Design Quality and Self Organizing Systems |
| Agile systems and enterprises are the product of thinking that envisions systems holistically – in harmony with their environments, in existence across time, in service to a purpose, and in useful tension with the changing forces of reality. This module provides a fundamental underpinning for organized thought, drawing the practitioner toward insightful vision and strategy; building a solid conceptual foundation for defining, conceiving, and realizing agile systems and enterprises of all kinds. | Agile systems and enterprises are created and enabled by architectures, principles, and operational practices that facilitate responsive configuration and reconfiguration in the continual face of changing needs. This module introduces tools for analyzing and establishing response requirements and performance metrics; and engineering principles for synthesizing architecture and operational practices. | Ability enables the extended enterprise, where purpose is achieved when multiple independent units respond effectively to common opportunity and common threat. This module explores the process and purpose of architecting the extended enterprises, from pick-up teams to alliance networks, from business process to corporate strategy, from local issues to global concerns. | Esthetic quality in systems and enterprises makes the difference between enforced compliance and embraced experience; and determines the positive or negative vectors of self organization and emergence. This module explores the value and nature of esthetic design quality, principles and architectures for harnessing self organized extended enterprise, agility as risk management and reality confrontation, and similar issues at the edge of agile system and enterprise knowledge. |

Intended Audience

This graduate certificate is relevant to engineers, managers, and decision makers in commercial, healthcare, financial and insurance, and defense domains working with systems that must thrive in a dynamic unpredictable environment - especially if they are system of systems or enterprise systems. The graduate certificate and the constituent courses first build a theoretical and philosophical basis for understanding and formulating the interactive and interdependent problem and solution spaces, and then suggest pragmatic and executable approaches to realize the enterprise potential.

Agile Systems and Enterprises



Other reference sources at
www.parshift.com/library.htm

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