

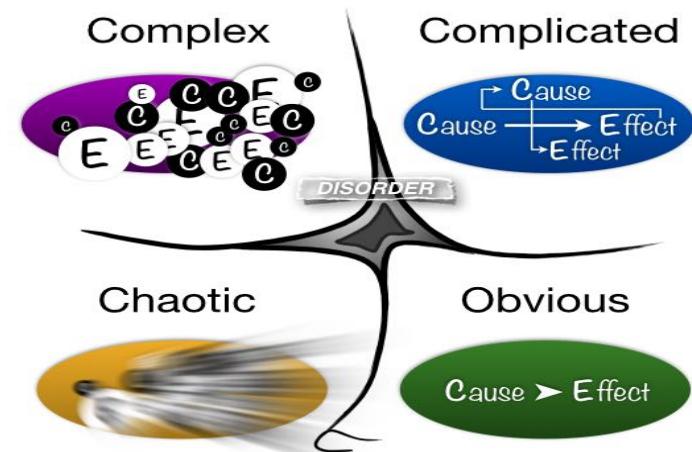


28th Annual **INCOSE**
international symposium

Washington, DC, USA
July 7 - 12, 2018

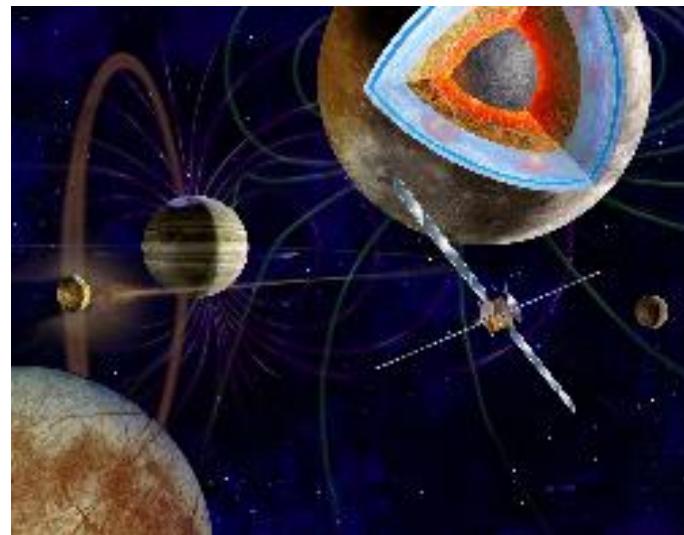
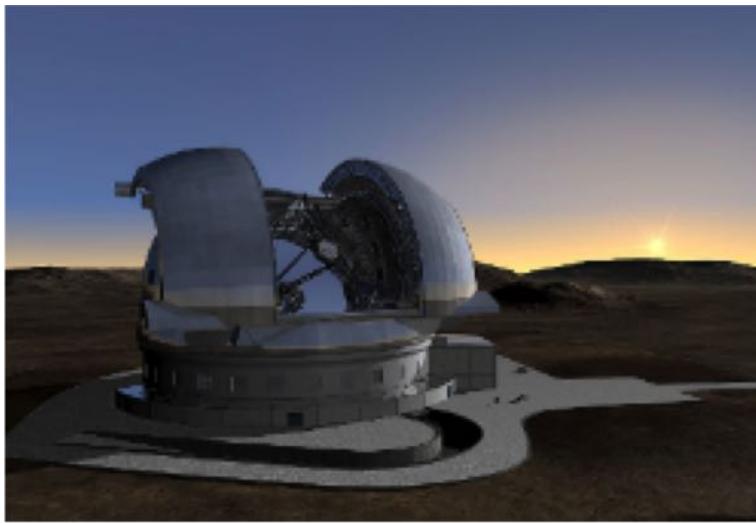
The Cynefin Framework and Technical Competencies. A New Guideline to Act in the Complexity

D. Fierro, L. Tirone





INAF – National Institute For Astrophysics



Project Life Cycle



Generic Life Cycle (ISO 15288:2008)

Exploratory Stage	Concept Stage	Development Stage	Production Stage	Utilization Stage	Retirement Stage
				Support Stage	

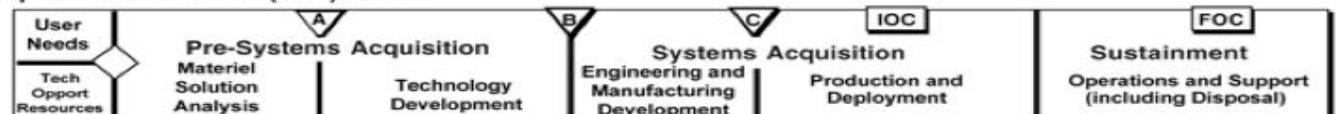
Typical High-Tech Commercial Systems Integrator

Study Period			Implementation Period			Operations Period			
User Requirements Definition Phase	Concept Definition Phase	System Specification Phase	Acq Prep Phase	Source Select. Phase	Development Phase	Verification Phase	Deployment Phase	Operations and Maintenance Phase	Deactivation Phase

Typical High-Tech Commercial Manufacturer

Study Period			Implementation Period			Operations Period		
Product Requirements Phase	Product Definition Phase	Product Development Phase	Engr Model Phase	Internal Test Phase	External Test Phase	Full-Scale Production Phase	Manufacturing, Sales, and Support Phase	Deactivation Phase

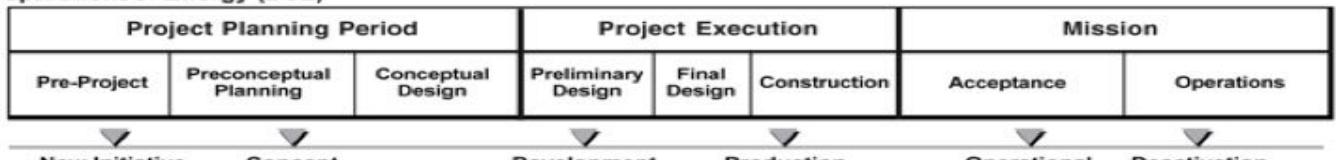
US Department of Defense (DoD) 5000.2



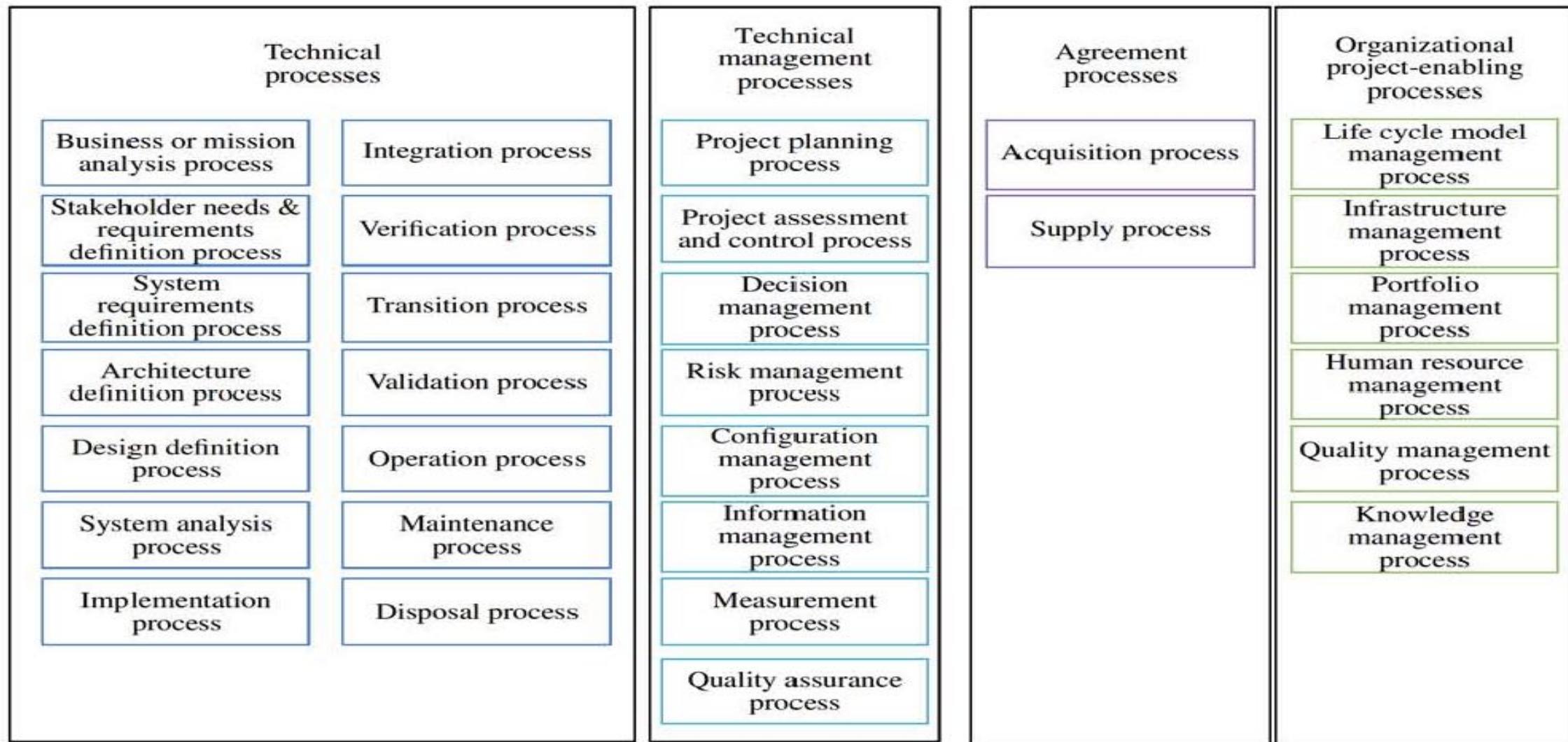
NASA



US Department of Energy (DoE)



Processes





Knowledge

- Know-why Learning by studying
- Know-how Learning by doing
- Know-what Learning by using

Prof. John Dutton and Annie Thomas

Graduate School of Business Administration, New York University

Cynefin Framework



Complex

The relationship between cause and effect can only be perceived in retrospect.

unknown knowns

Probe - Sense - Respond



Chaotic

No relationship between cause and effect at systems level.

unknown unknowns

Act - Sense - Respond



Complicated

The relationship between cause and effect requires analysis or some other form of investigation and/or the application of expert knowledge.

known unknowns

Sense - **Analyze** - Respond



Simple

The relationship between cause and effect is obvious to all.

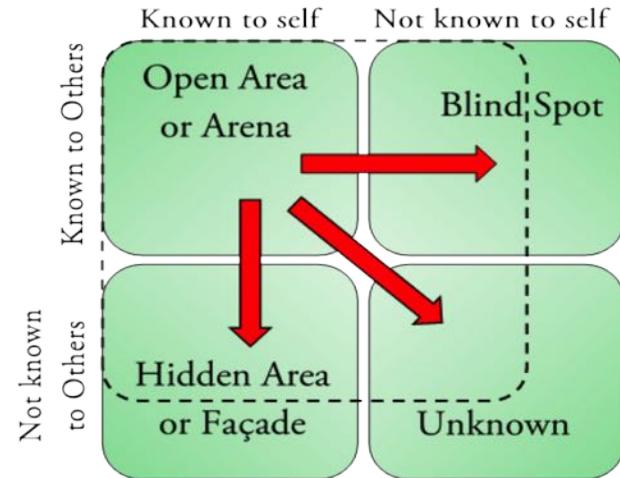
known knowns

Sense - **Categorize** - Respond

[Cynthia F. Kurtz](#), [David J. Snowden](#)

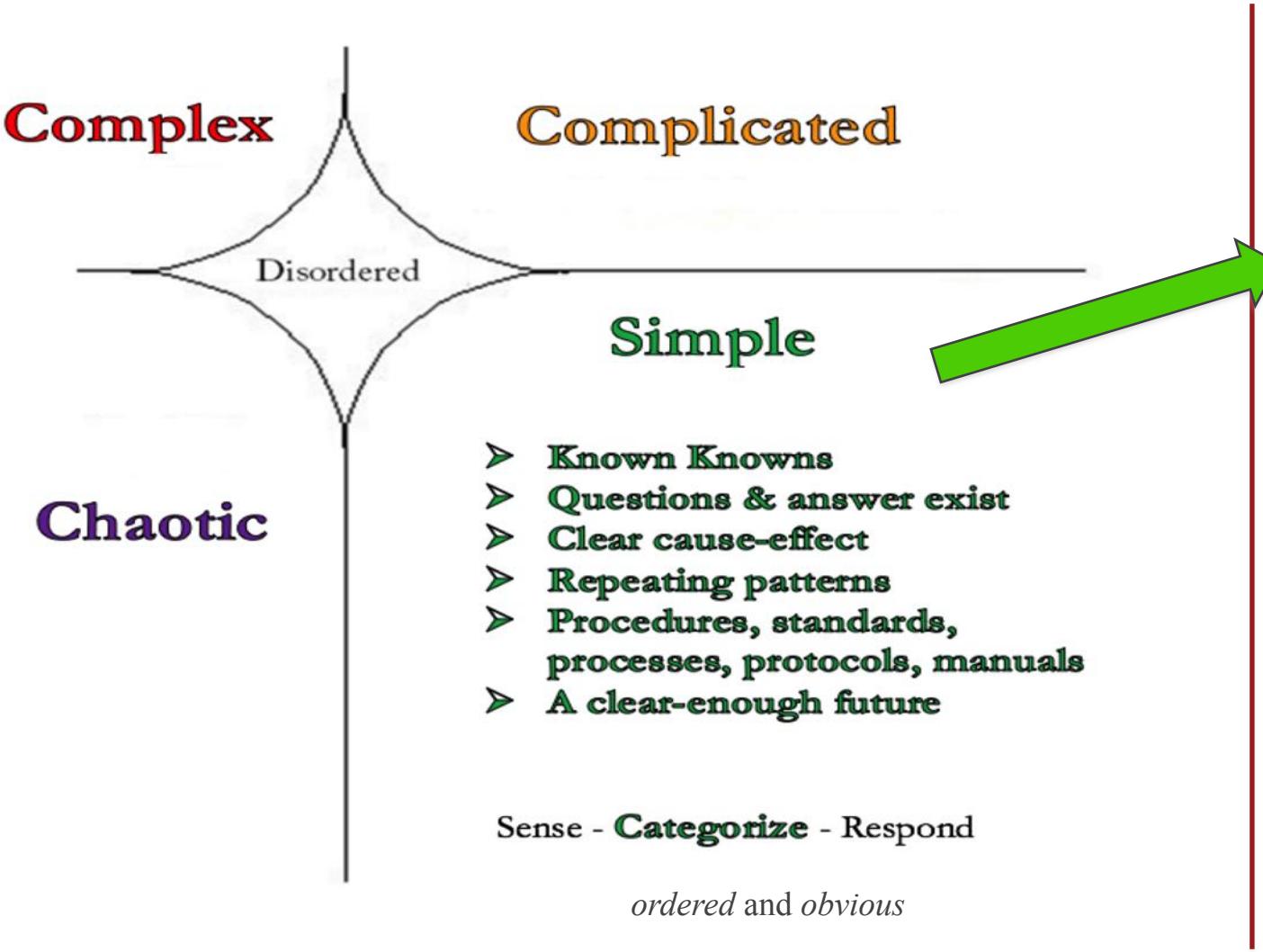
The new dynamics of strategy: sense-making in a complex and complicated world

U.S. Department of Defense (DoD) on February 12, 2002

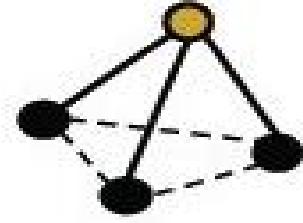


...something hasn't happened are always interesting to me, because as we know, there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know.

Simple



Management approach



- Sense, categorize, respond
- Fact Based Management
- Best practices
- Authority command and control
- Instructions to collaborators
- Correct language-no ambiguity
- Waterfall model

Risks

- Mis-categorization-Wrong procedures
- Entrenched thinking
- Complacency & Resistance to change

Complicated

Complex

Disordered

Chaotic

ordered – not-obvious realm of experts

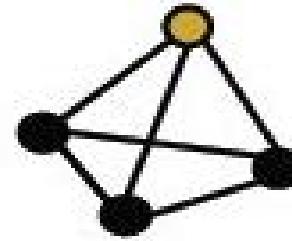
Complicated

- Known Unknowns
- Questions & several right answers
- Discoverable cause-effect
- Experts domain
- Procedures, standards, processes, protocols, manuals
- Alternate future

Sense - **Analyze** - Respond

Simple

Management approach



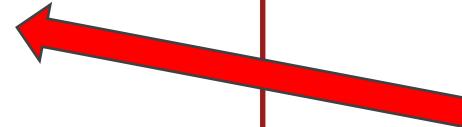
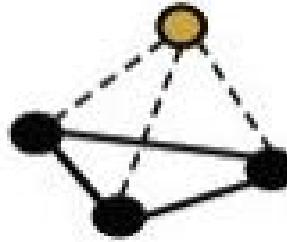
- Sense, analyse, respond
- Reductionism, system elements
- Oligarchic approach
- Fact Based Management, Good practices
- Flexible, open and analytical mindset to encourage and evaluate contributions
- Incremental

Risks

- Over-confidence, overlook-lost opportunities
- Over-analysis-paralysis
- Entrenched thinking

Complex

Management approach



Realm of unordered—obvious in hindsight

- Probe, sense, respond
- Investigate and do experiment before action
- Visionary, pioneer, researcher
- Creative, agile and innovative approach
- Holism, synthesis
- Pattern Based Management
- Ride emergent practices
- Fail fast & safe, learn fast, risk mitigation
- Evolutionary

Risks

- No learn, scarce tolerance to failure
- Impatience
- Revert to simple strategies
- Determinism, over-control

Complex

- **Unknown Knowns**
- **Unpredictability**
- **No questions & answers clear in hindsight**
- **Cause-effect clear in hindsight**
- **Emergent patterns**
- **Many competing ideas**

Probe - Sense - Respond

Complicated

Chaotic

Disordered

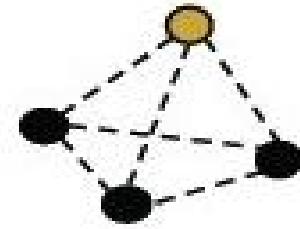
Simple





Chaotic

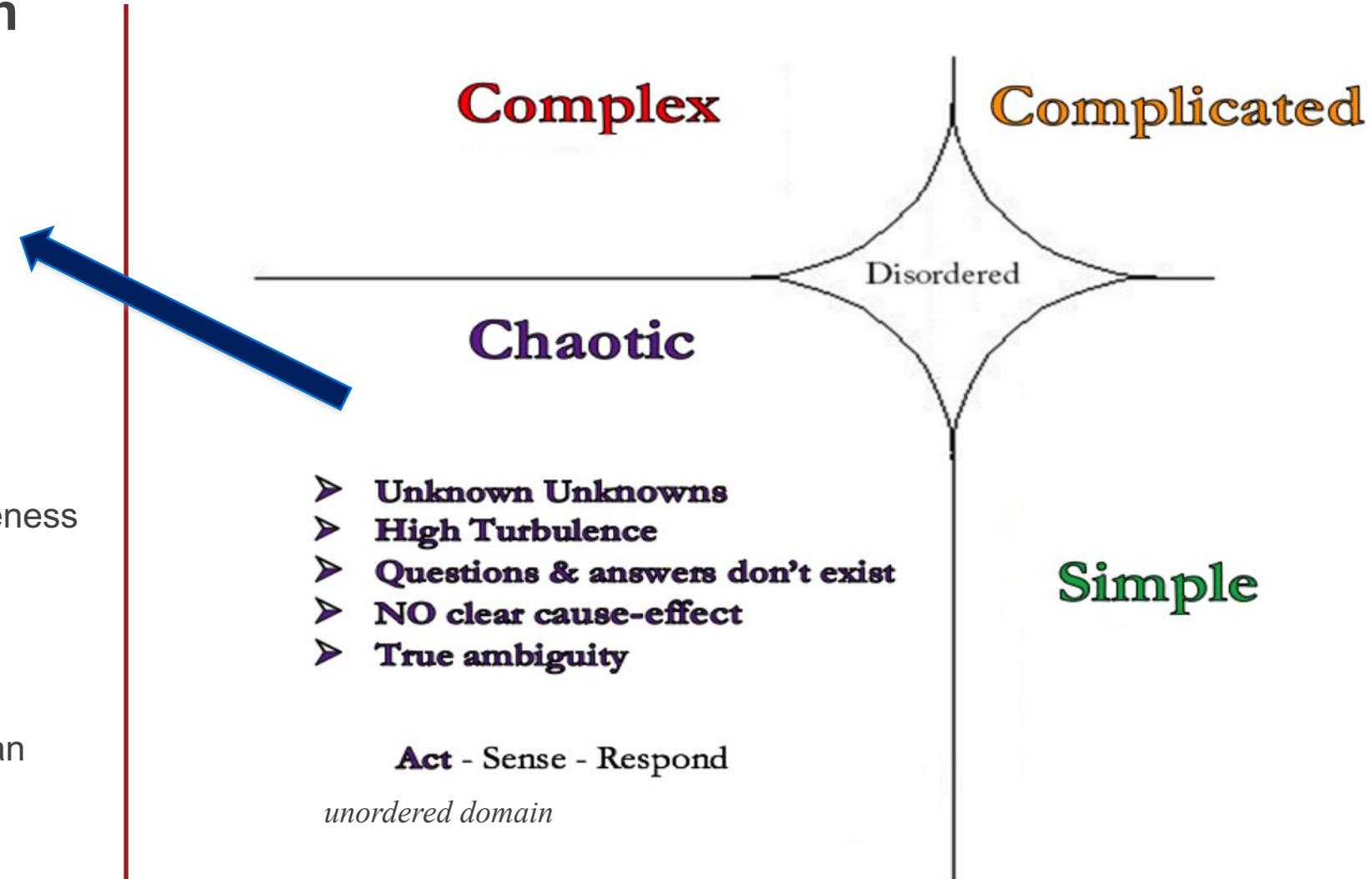
Management approach



- Act, Sense, Respond
- Act decisively to avoid collapse
- Entice the crowd to follow us
- Hero/Draconian approach
- Command and control
- Authority, charisma, authoritativeness
- Novel practices (bright, original)
- Many decision, no time

Risks

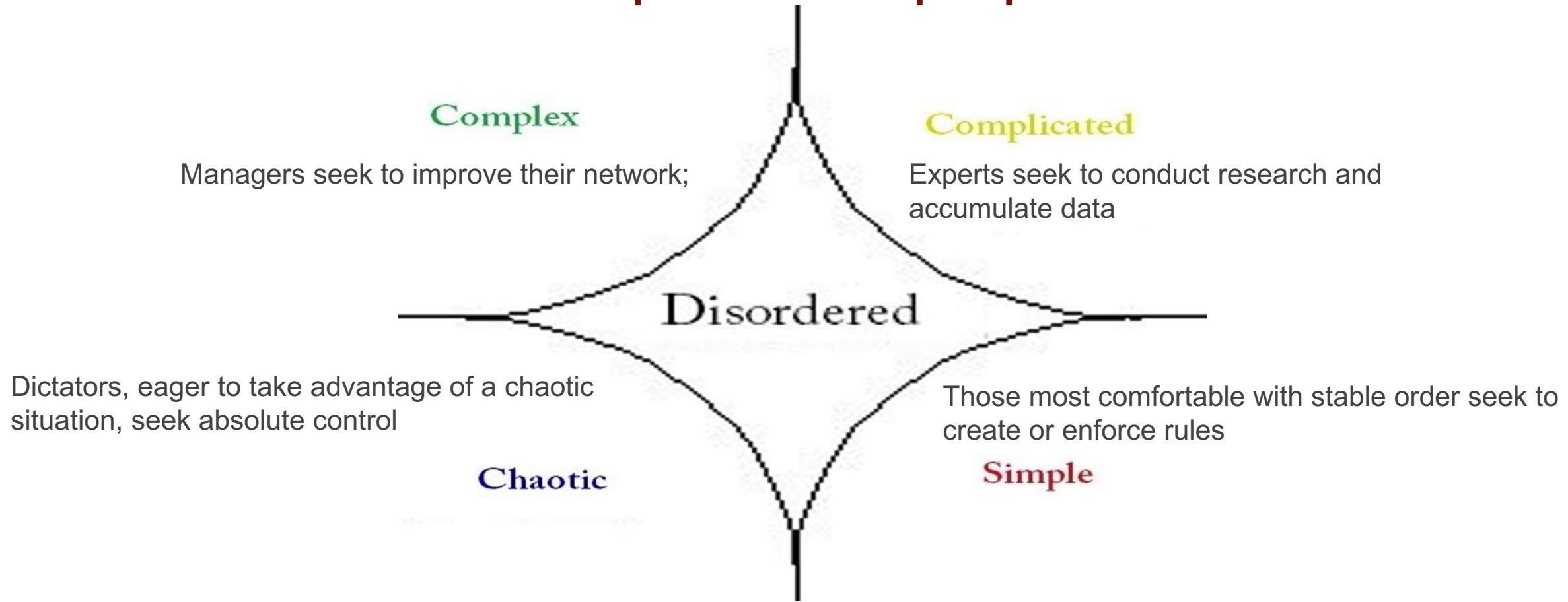
- Command and control longer than needed, enforcing chaos
- Missed opportunity



Disordered



In this scenario people try to move towards the one of the four contexts on the basis of their individual capabilities and perspectives.



Leadership Table



Contest's characteristics		Leader's job	Danger signals	Response to danger signals
Simple	<p>Repeating patterns and consistent events</p> <p>Clear cause-and-effect relationships evident to everyone; right answer exists</p> <p>Known knowns</p> <p>Fact-based management</p> <p>Standard rules procedures, protocols or manuals</p>	<p>Sense, categorize, respond</p> <p>Ensure that proper processes are in place</p> <p>Delegate</p> <p>Best practices</p> <p>Communicate in clear, direct ways</p> <p>Understand that extensive interactive communication may not be necessary</p> <p>Clear line of authority</p> <p>No ambiguity</p> <p>Command – Control style</p> <p>Waterfall approach</p>	<p>Complacency and comfort</p> <p>Desire to make complex problems simple</p> <p>Entrained thinking</p> <p>No challenge of received wisdom</p> <p>Overreliance on best practice if context shifts</p> <p>Wrong categorization</p>	<p>Create communication channels to challenge orthodoxy</p> <p>Stay connected without micromanaging</p> <p>Don't assume things are simple</p> <p>Recognize both the value and the limitations of best practice</p> <p>Johari window</p> <p>ADKAR model</p>
Complicated	<p>Expert diagnosis required</p> <p>Cause-and-effect relationships discoverable but not immediately apparent to everyone; more than one right answer possible</p> <p>Known unknowns</p> <p>Fact-based management</p> <p>Standard rules procedures, protocols or manuals</p> <p>Methodology</p> <p>Reductionism</p>	<p>Oligarchic style</p> <p>Sense, analyze, respond</p> <p>Create panels of experts</p> <p>Listen to conflicting advice</p> <p>Good practice</p> <p>Iterative approach</p>	<p>Experts overconfident in their own solutions or in the efficacy of past solutions</p> <p>Over - analysis</p> <p>Expert panels</p> <p>Viewpoints of nonexperts excluded</p>	<p>Encourage external and internal stakeholders to challenge expert opinions to combat entrained thinking</p> <p>Use experiments and games to force people to think outside the familiar</p> <p>Johari window</p> <p>ADKAR model</p>





Leadership Table

Complex	Flux and unpredictability	Probe, sense, respond Create environments and experiments that allow patterns to emerge	Temptation to fall back into habitual, command-and-control mode	<p>Be patient and allow time for reflection</p> <p>Use approaches that encourage interaction so patterns can emerge</p>
	No right answers; emergent instructive patterns	Increase levels of interaction and communication	Temptation to look for facts rather than allowing patterns to emerge	
	Unknown unknowns	Use methods that can help generate ideas: Open up discussion (as through large group methods); set barriers; stimulate attractors; encourage dissent and diversity; and manage starting conditions and monitor for emergence	Desire for accelerated resolution of problems or exploitation of opportunities	
	Many competing ideas	Emergent practice	Failure to learn	
	A need for creative and innovative approaches	Fail fast, learn fast, fail safe	Impatience	
	Pattern-based leadership	Holistic and synthesis skills	Over control	
	Know in hindsight	Agile, Evolutionary approach		
	Black swan theory	OODA loop		
	Research			
Chaotic	High turbulence	Act, sense, respond		<p>Set up mechanisms (such as parallel teams) to take advantage of opportunities afforded by a chaotic environment</p> <p>Encourage advisers to challenge your point of view once the crisis has abated</p> <p>Work to shift the context from chaotic to complex</p>
	No clear cause-and-effect relationships, so no point in looking for right answers	Look for what works instead of seeking right answers	Applying a command-and-control approach longer than needed	
	Unknowables	Take immediate action to reestablish order (command and control)	"Cult of the leader"	
	Many decisions to make and no time to think	Provide clear, direct Communication	Missed opportunity for innovation	
	High tension	Super hero	Chaos unabated	
	Pattern-based leadership	Draconian order imposition		
		Dictatorial and charismatic		
		Novel practice		

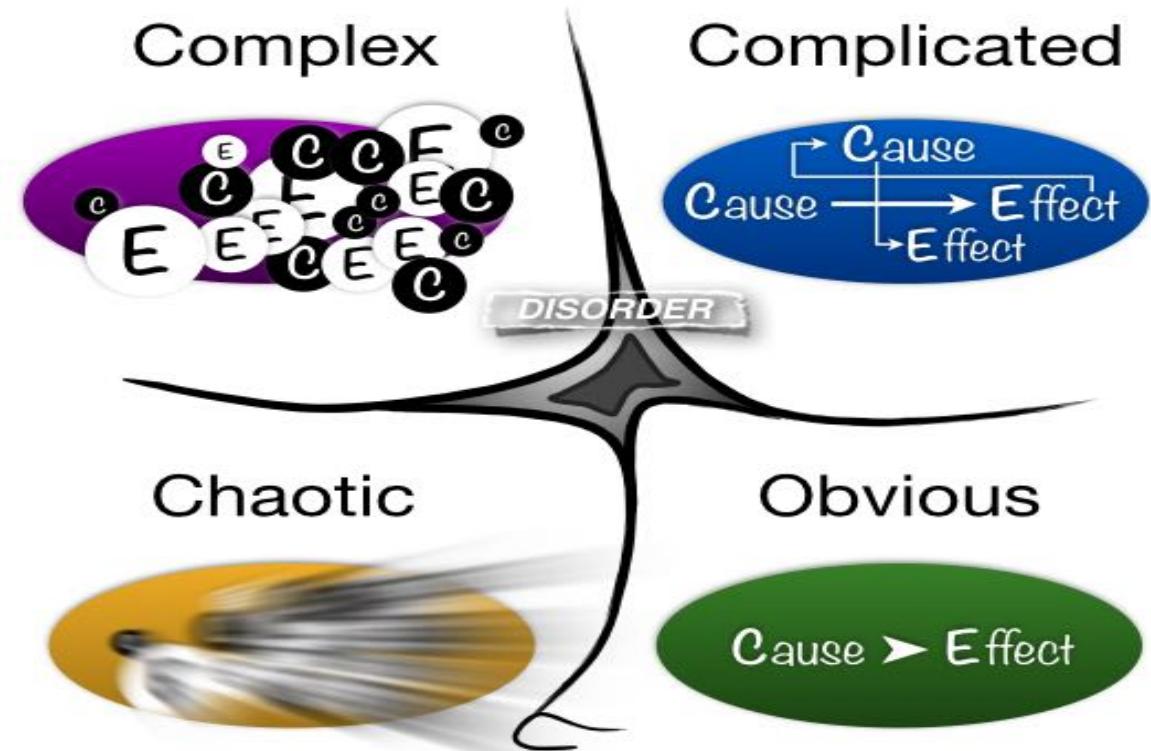


Cynefin dynamics



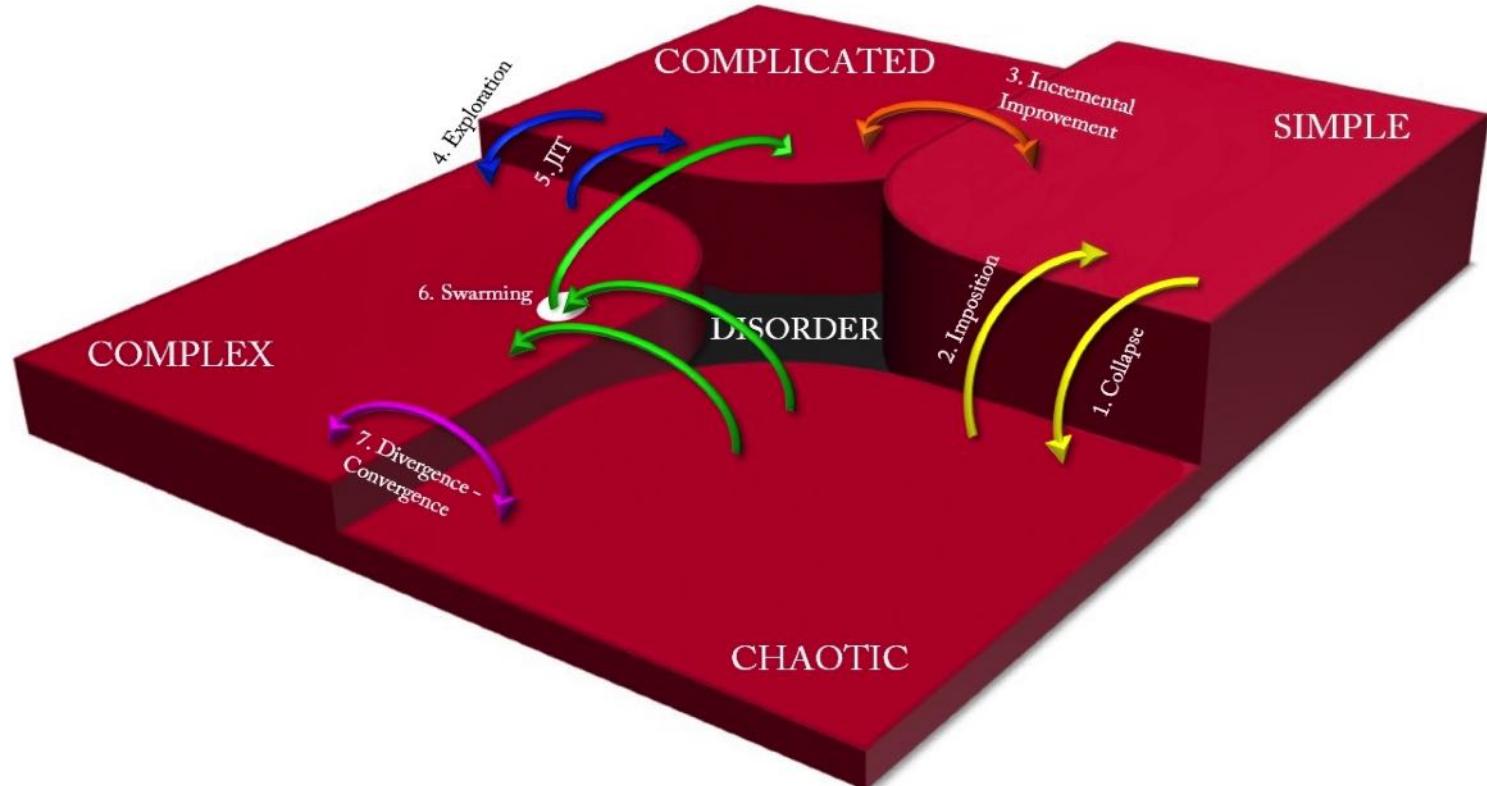
The moving paths between Cynefin domains are as important as the domain characteristics themselves;

A leader should take significant advantages moving across boundaries but this requires a shift to a different model of understanding as well as a different leadership style.





Cynefin dynamics

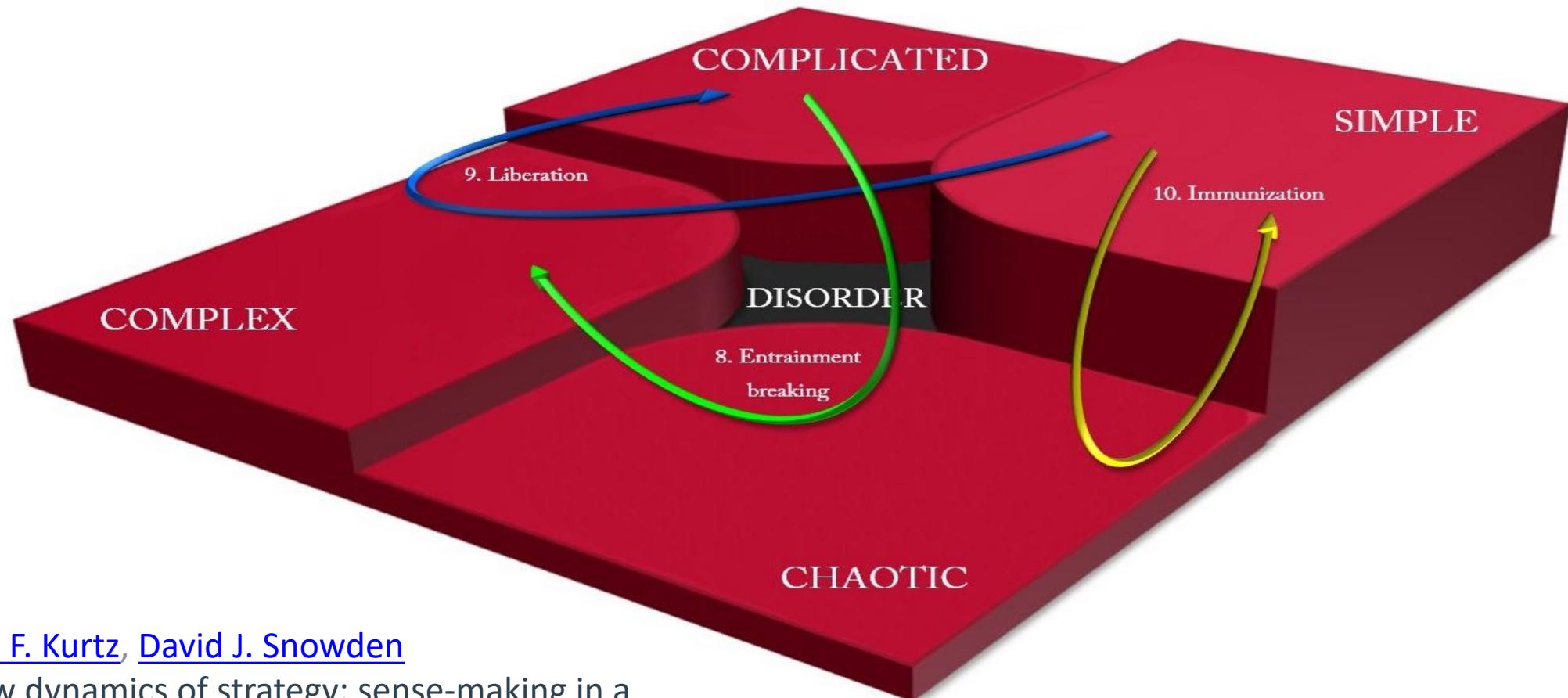


[Cynthia F. Kurtz](#), [David J. Snowden](#)

The new dynamics of strategy: sense-making in a complex and complicated world



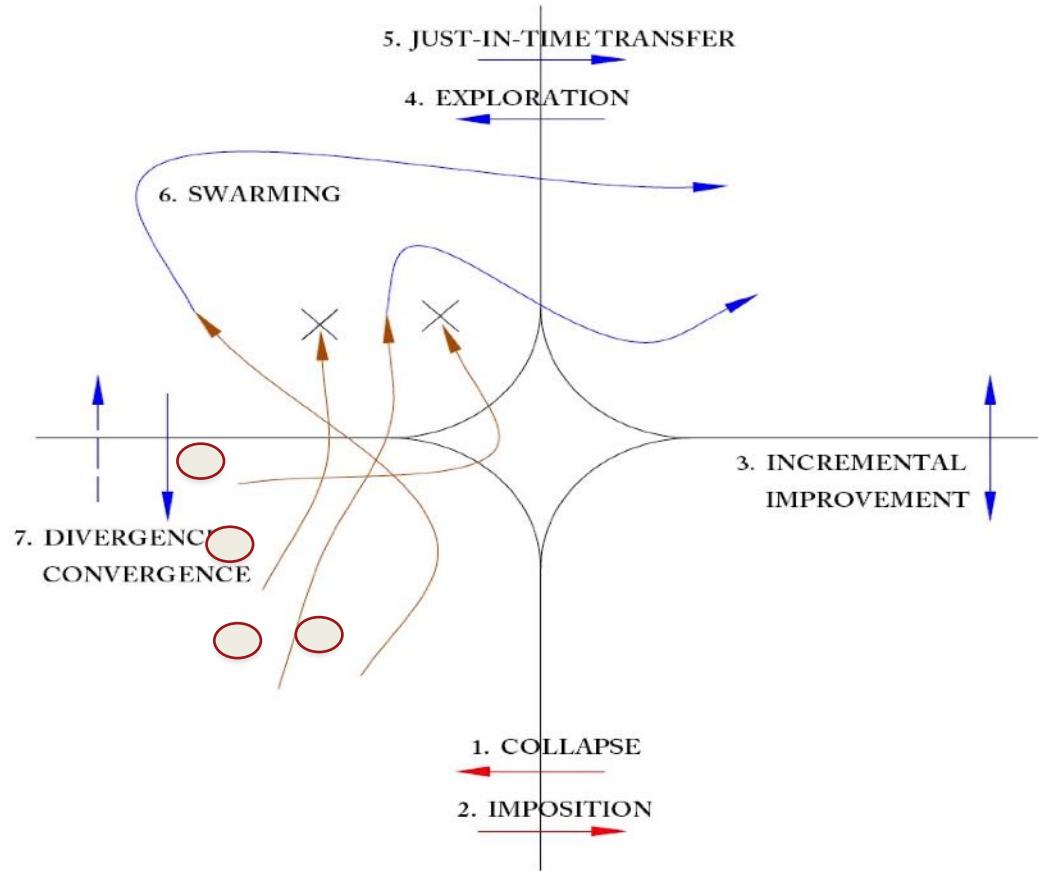
Cynefin dynamics



[Cynthia F. Kurtz](#), [David J. Snowden](#)

The new dynamics of strategy: sense-making in a complex and complicated world

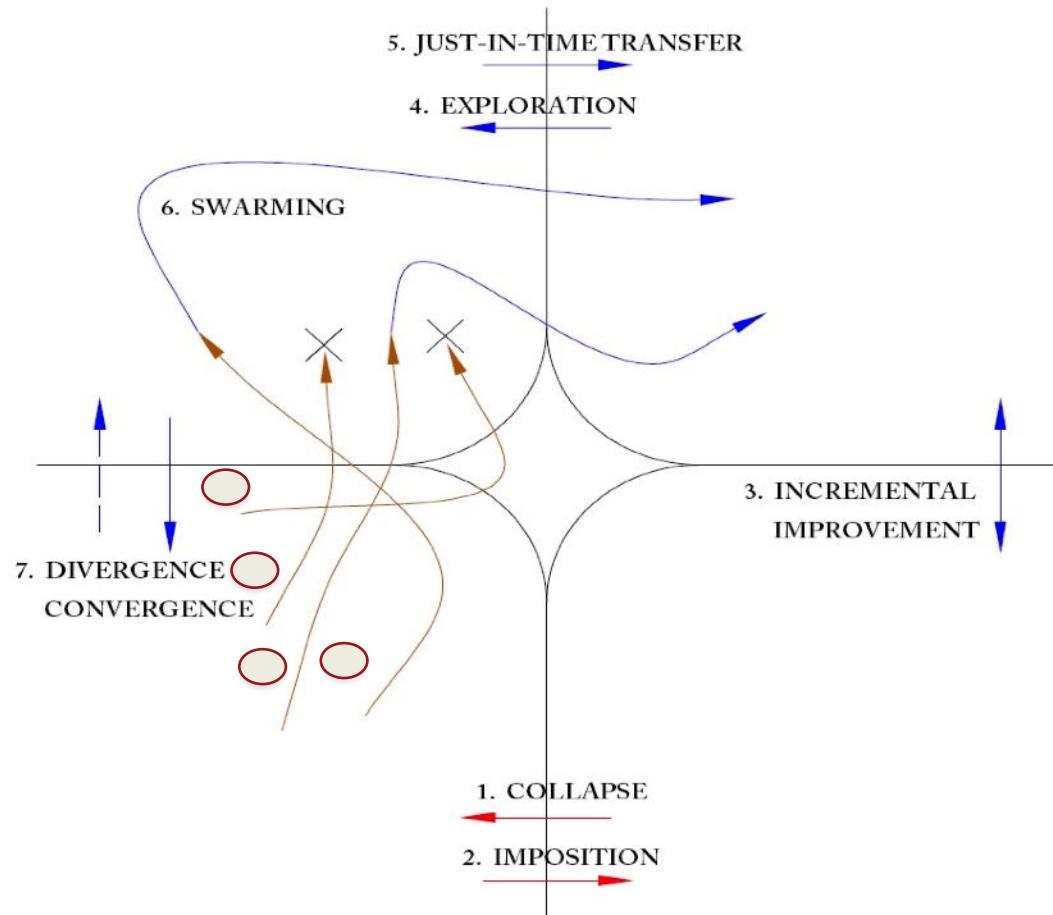
Asymmetric collapse



1,2 Movements at the known-chaos boundary

Asymmetric collapse (Item 1) is movement from simple to chaotic domain, disastrously. The leader does not see what is going on outside border of his small horizon, and he continue not to see them until finally the system breaks and falls in chaos. Chaos is also a space we can enter into consciously to brake the chain of entrenched thinking and create the conditions for new possibilities .

Imposition



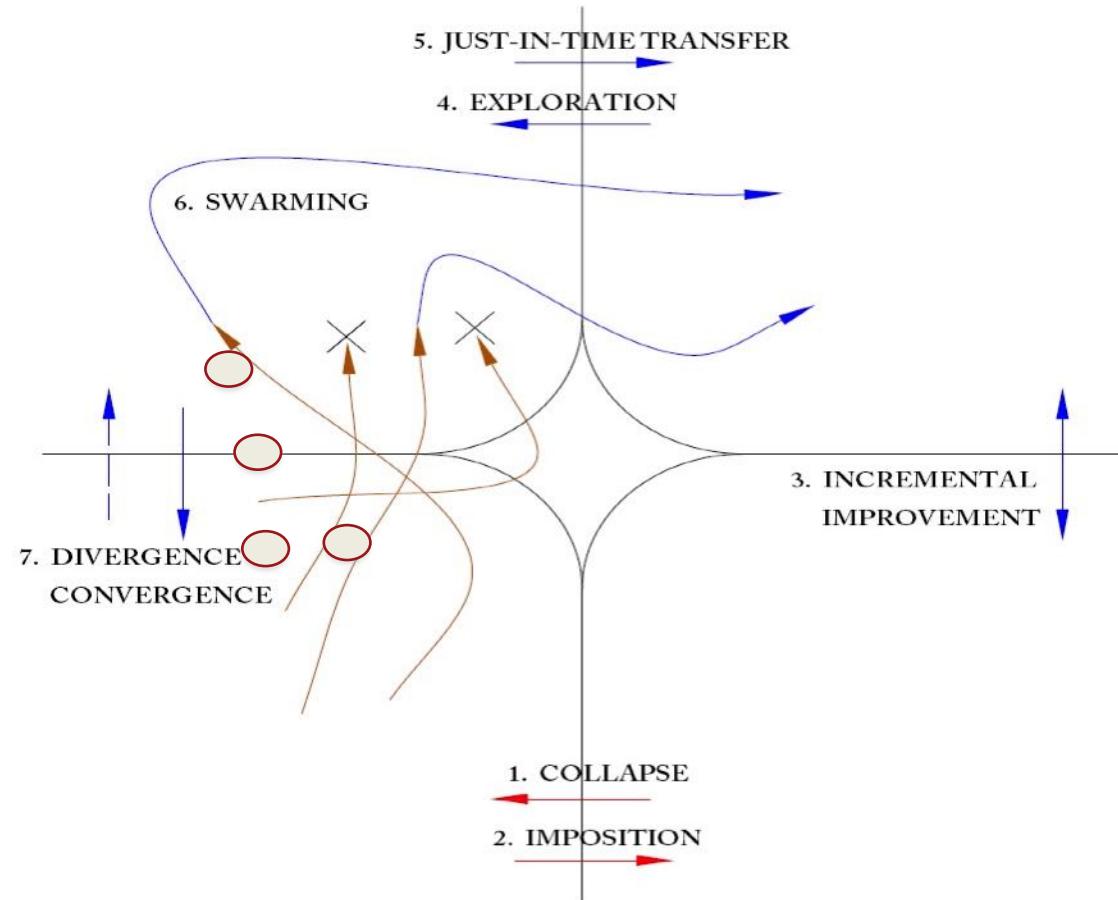
1,2 Movements at the known-chaos boundary

Imposition (Item 2) is the forceful movement from chaotic to simple domain. The consequence of collapse is chaos, and the consequence of chaos is frequently imposition of order. In catastrophic situations, as the price of order, are usually tolerated conditions that would have previously been unacceptable.



Incremental improvement

3 Movement at the known-knownable boundary

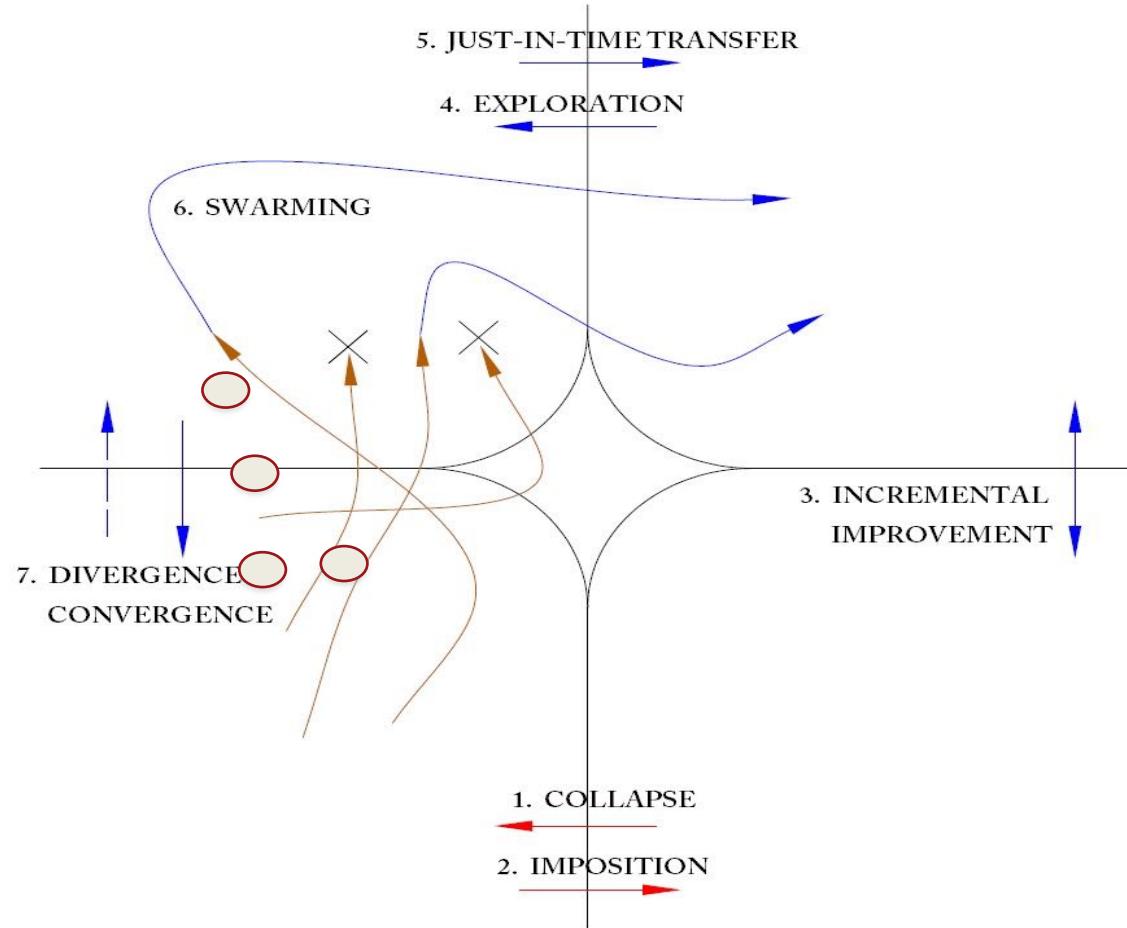


Incremental improvement (Item 3) is movement from simple to complicated domain and back to ask for experts supports. This is the engine of **technological growth**.

Exploration



4,5 Movements at the knowable-complex boundary

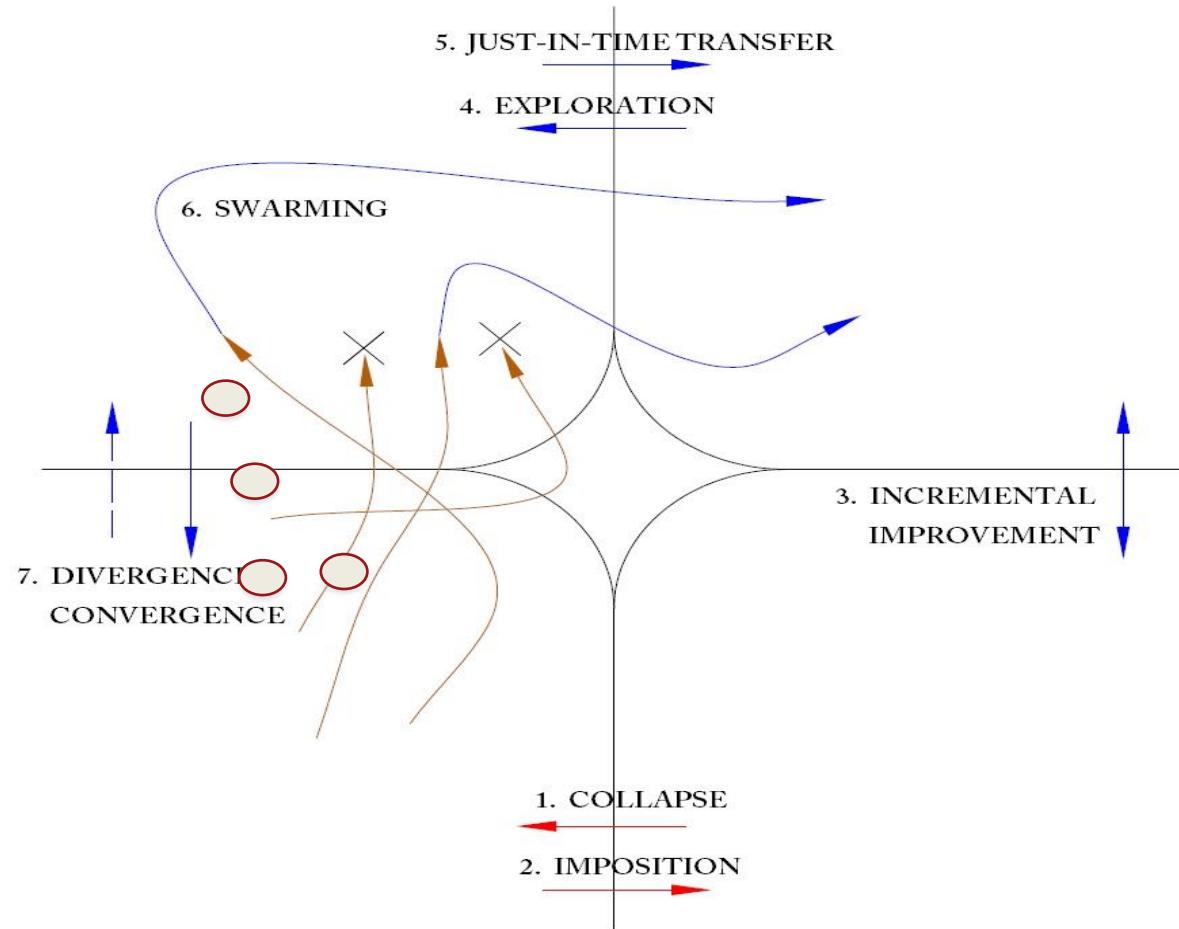


Exploration (Item 4) is movement from complicated to complex domain very useful to the growing of new ideas and opportunities, in other terms... Innovation



Just-in-time (JIT) transfer

4,5 Movements at the knowable-complex boundary



Just-in-time (JIT) transfer, exploitation (Item 5) is movement from complex to complicated domain to stabilize useful patterns in complex space when it is needed (just-in-time).

Case Study

Sardinia Radio Telescope



ph. Gianni Avata

SRT Refurbishment dynamics



Tender for “competitive debate” for new innovative solutions

Set of viable solutions stabilized in....

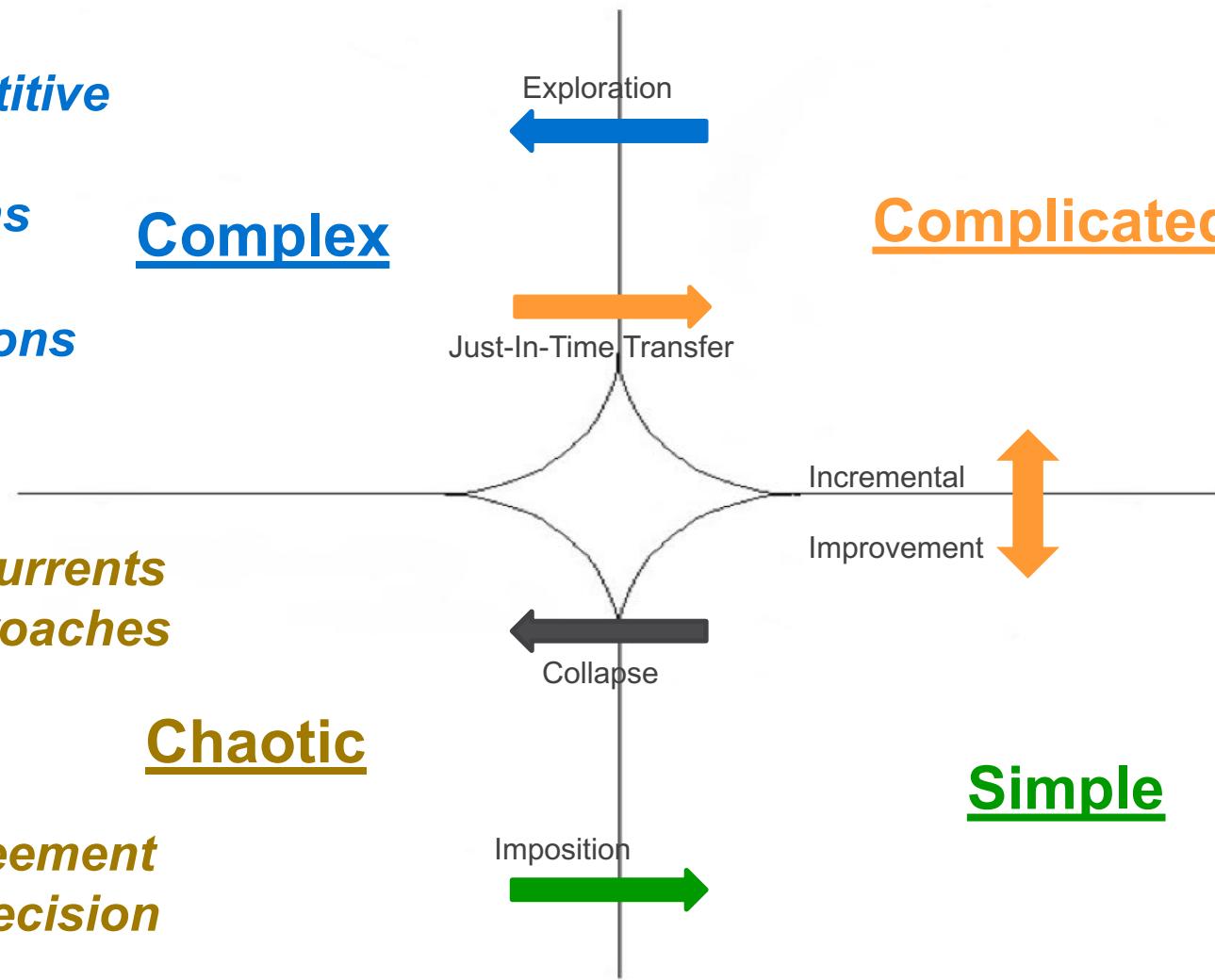
Different thought currents and divergent approaches

ASI-NASA-JPL agreement INAF's President Decision

Complex

Complicated

Simple



SRT Radio Telescope was delivered ten days in advance with respect to the scheduled time.



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ASI - AGENZIA SPAZIALE ITALIANA NEWS

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 Mezzo secolo di missioni spaziali italiane. La storia dello spazio in Italia dal 1964 ad oggi.

EVENTI  Gli eventi ASI Convegni scientifici e istituzionali, i workshop tematici, le fiere e manifestazioni per il pubblico a cui partecipa l'ASI. »

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ACCORDO ASI-NASA

L'Italia entra nel Deep Space Network

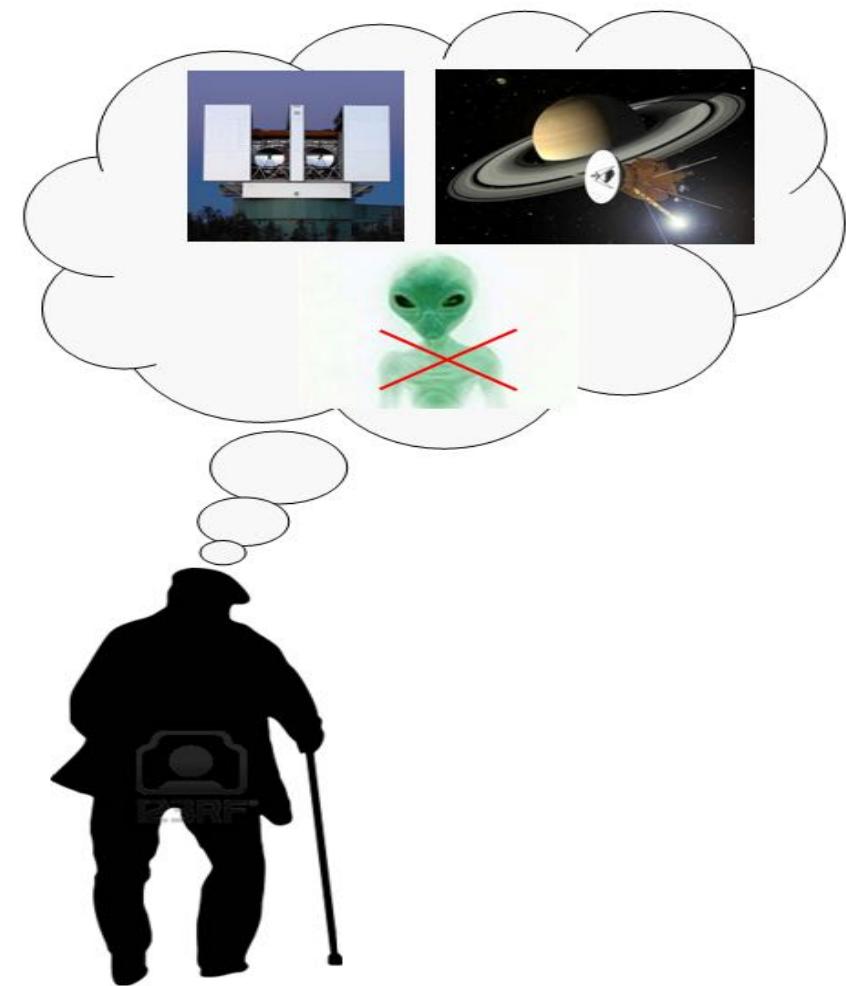
Entra in attività il nuovo centro dell'ASI SDSA (Sardinia Deep Space Antenna) che si avvale del Sardinia Radio Telescope dell'INAF per tracciare le sonde interplanetarie. Si comincia con Cassini e il Grand Finale

di Redazione Web Follow @ASI_spazio Venerdì 01 Settembre 2017



Prendono oggi il via dal **Sardinia Deep Space Antenna** (SDSA) le operazioni di "tracking" della sonda NASA-ESA-ASI **Cassini** che tra qualche giorno compirà l'ultimo atto della sua ventennale missione dedicata al sistema di Saturno. Il SDSa dell'**Agenzia Spaziale Italiana** (ASI) costituisce una nuova configurazione sviluppata l'impiego a supporto di **missioni interplanetarie**, equipaggiando in modo adeguato il **Sardinia Radio Telescope** (SRT) realizzato dall'**INAF** (Istituto Nazionale di Astrofisica) in collaborazione con l'Agenzia Spaziale Italiana, la Regione Sardegna e il Ministero dell'Istruzione, Università e Ricerca, e destinato allo studio dell'universo e dei suoi misteri.

Il **Sardinia Deep Space Antenna** (SDSA) a partire da gennaio diventerà ufficialmente operativo nell'ambito del **Deep Space Network** della NASA, ma fornirà **servizi di comunicazione e navigazione anche per le sonde interplanetarie europee**, specializzandosi in particolare per quelle marziane, in vista della Human Exploration del pianeta. Il SDSA nasce grazie ad accordi tra l'ASI e l'INAF ed a uno specifico accordo ASI - NASA, che ne assicura l'impiego per una molteplicità di missioni interplanetarie in collaborazione con il Jet Propulsion Laboratory - (JPL). Il suo debutto è legato alla fase cruciale *The Grand Finale* della missione di Cassini nel sistema di Saturno. Il SDSA seguirà gli ultimi giorni del lungo viaggio della sonda prima del suo tuffo finale sul pianeta fissato per il 15 settembre prossimo.





Thank you.....

fierro@inaf.it



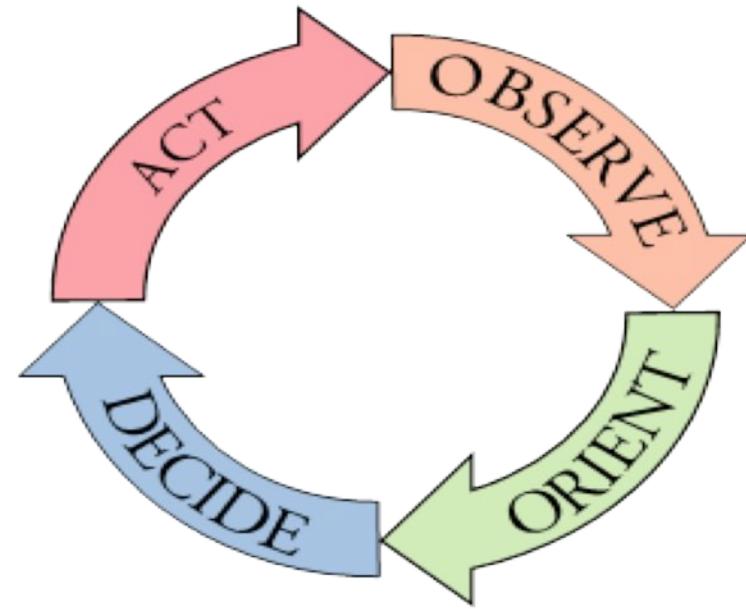


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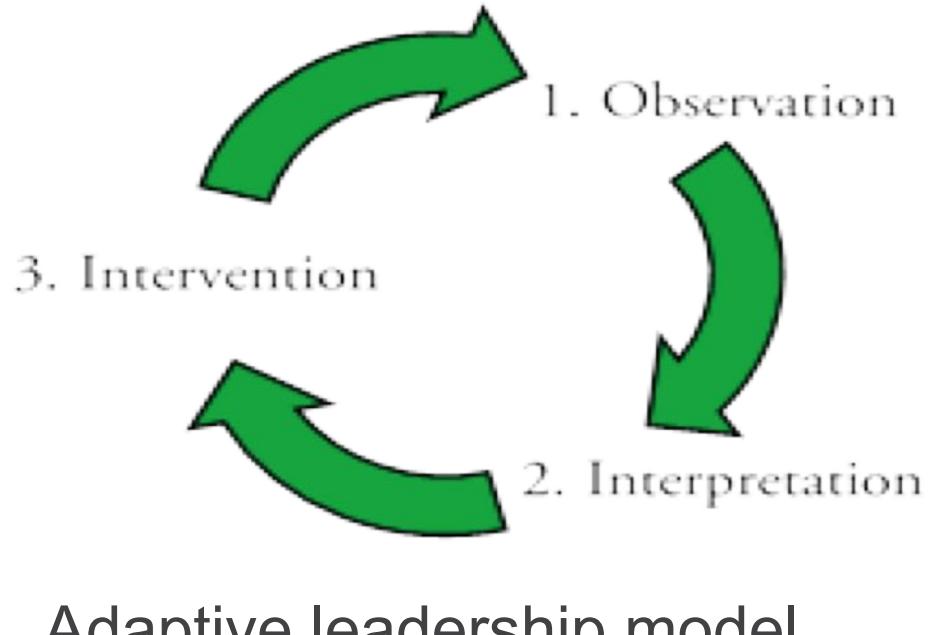
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Adaptive Methodologies



OODA loop

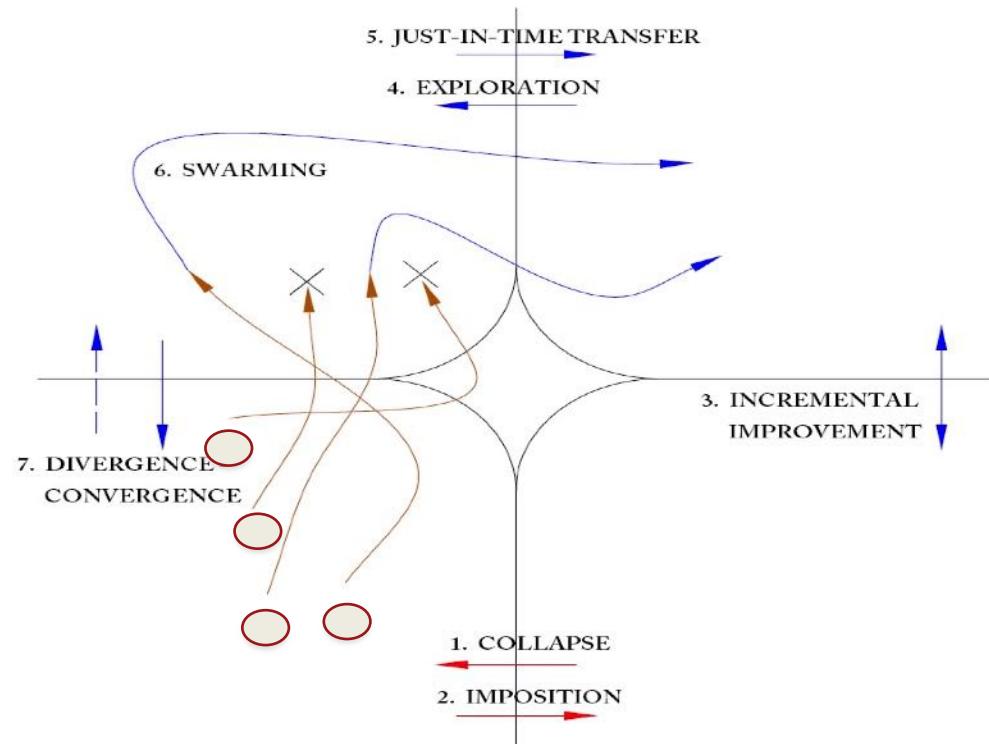


Adaptive leadership model

Swarming



6, 7 Movements at the complex-chaotic boundary

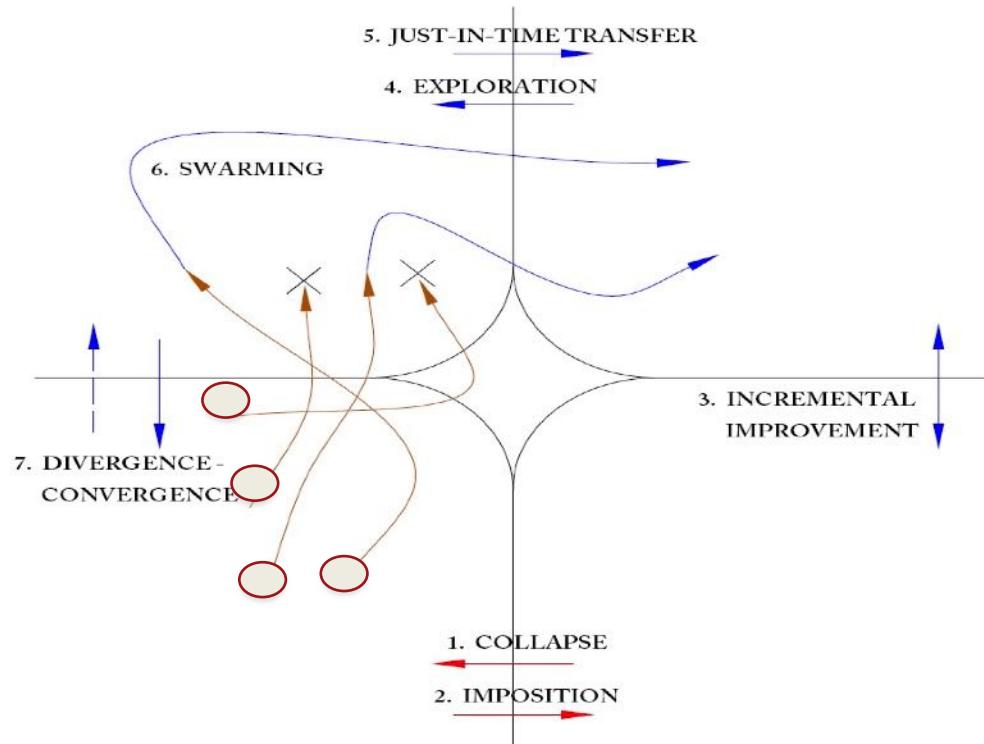


Swarming (Item 6) is movement from chaotic to complicated throughout the complex domain. The transition from chaotic to complex is carried out by creating multiple attractors, or swarming points, as seeds of future patterns, whereas a transition from chaotic to simple domain requires a single strong attractor. In the complex domain leader has the possibilities to see the growing of such patterns forming around the attractors; those he finds desirable he stabilizes in the complicated domain; the undesirable ones are destroyed.



Divergence-convergence

6, 7 Movements at the complex-chaotic boundary

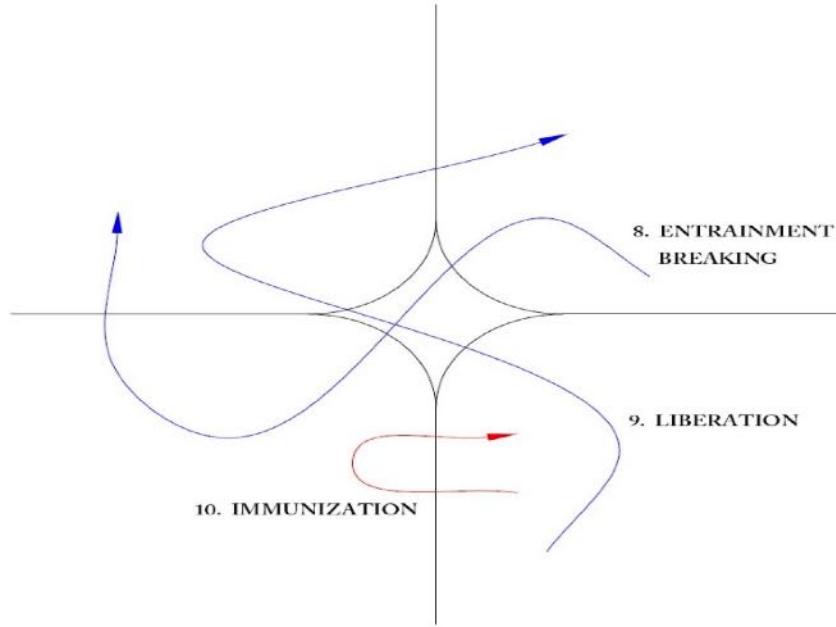


Divergence-convergence is the cyclic movement from complex to chaotic. This allow the generation of a rich variety of patterns to facilitate sense-making.



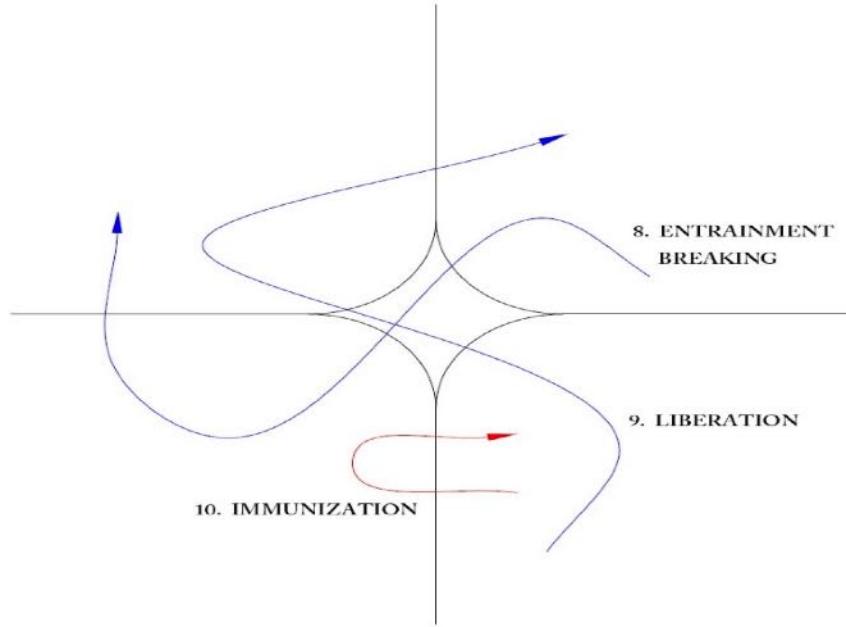
Entrainment breaking

8, 9, 10 Movements through chaos



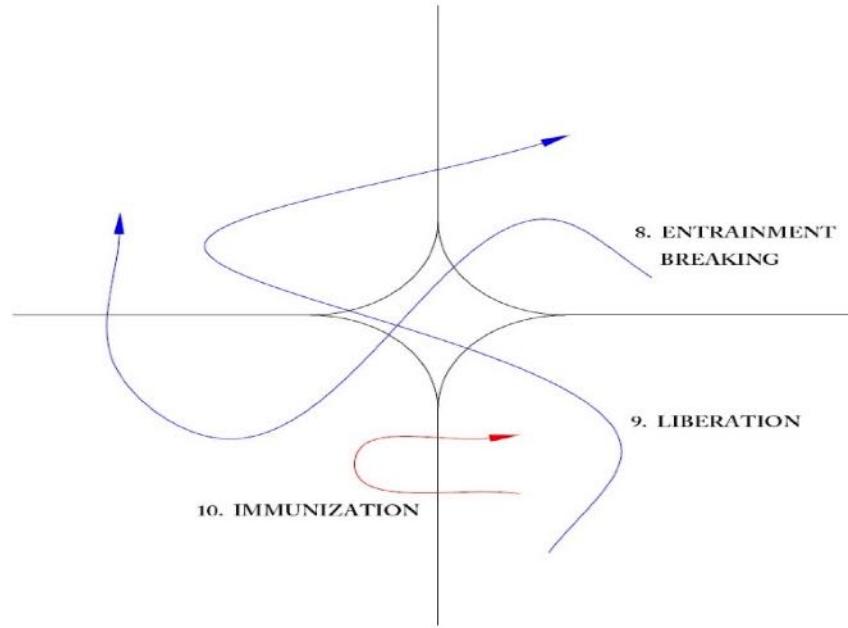
Entrainment breaking (Item 8) is the periodic movement from complicated to chaotic to complex domain. This is sometimes referred to as “creating a burning platform”. This is a common approach to disrupt the entrained thinking of experts by creating a more fertile space of interactions from which leaders can select stabilization points for the movement to the complicated domain. This method is used to create and validate new sources and structures for decision-making.

Liberation



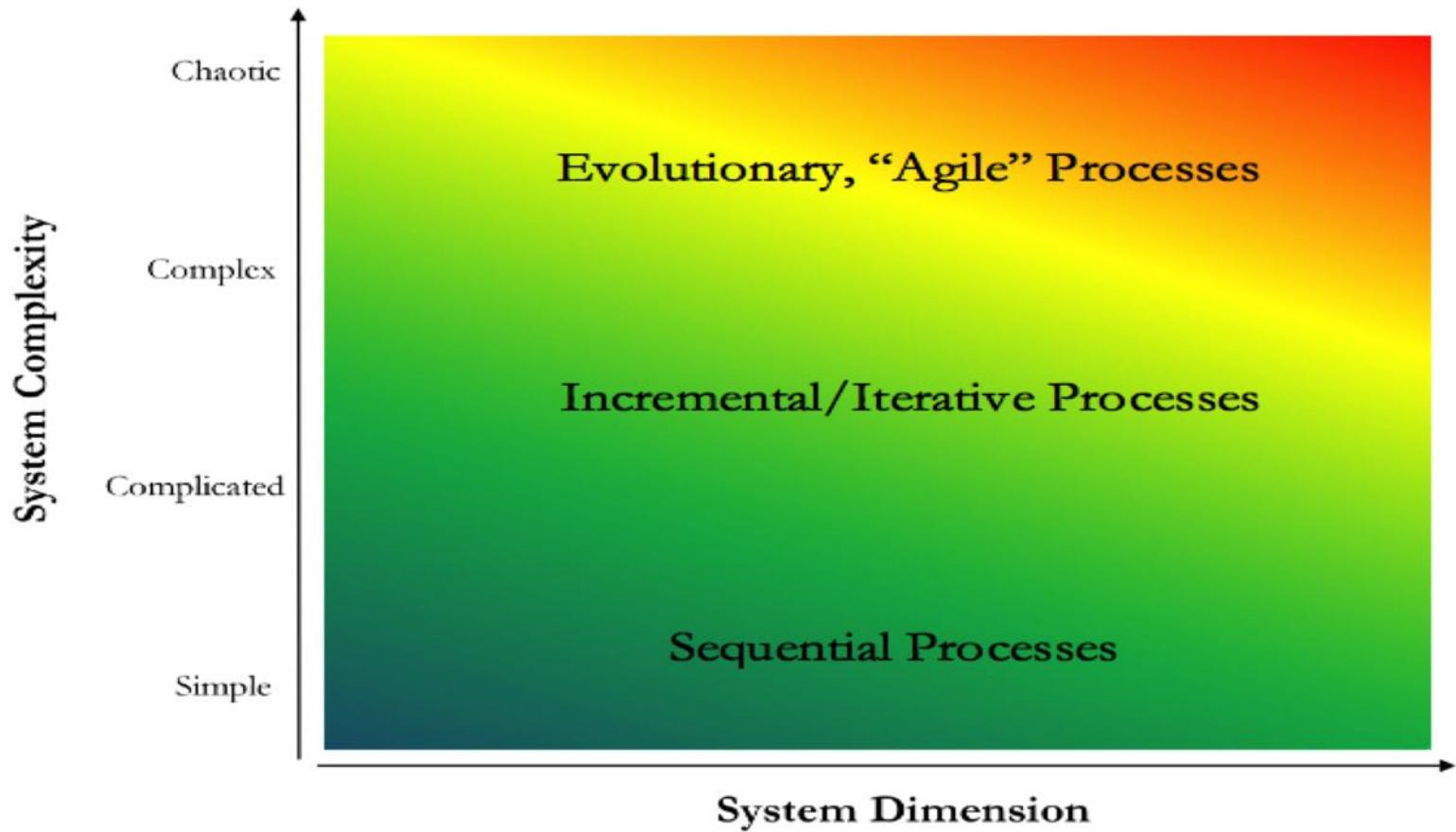
Liberation (Item 9) is the periodic movement from simple to complex to complicated domain. Enterprises operating in simple domain often need to change the status quo in order to facilitate the creation of new emerging ideas and opportunities. They, so, have to move in the complex domain by, for example, recruiting external specialist staff or redistributing new responsibilities in the organization. Then, analytically and methodically, leaders can choose the most viable ones moving toward complicated domain.

Immunization



Immunization (Item 10) is the temporary movement from simple to chaotic domain not enough to destabilize the whole system. It serves mainly two purposes. First, it shows the devastating force of chaos preparing leaders to face those forces. Second, immunization brings new perspectives, which cause radical disruptions in stable patterns of thought and lead to changes and new complex patterns. This movement enable lateral thinking, prevent entrainment of attitudes destroying the glue of stagnant views.

Engineering Models



Cynefin dynamics

