



Enterprise Architecture Modeling, Design and Transformation: Defining the Missing Links

by
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Outline

- **Propose a unifying conceptual framework guiding the “front-end” of planned enterprise change (transformation) management process**
 - Enterprise architecture design process (enterprise architecting)
 - Choice of enterprise architecture for emphasis
 - Enterprise architecture modeling strategies
 - Transition moves available for enterprise transformation
- **Show how the framework links together a number of the key design decisions that need to be considered simultaneously, under alternative combinations of major contingency conditions**



Enterprise Transformation -- Typical (Modified) Current Process*



- Short or long jump from *current-state* to a *desired future state*
- *Transition state* -- in-between the current-state and the desired future-state
- *Enterprise change (transformation) management* -- process of steering the enterprise along (through) the transition state, by anticipating and addressing the (predictable) problems & challenges along the way

Modified current process (with “enterprise architecting” emphasis)

- Define current state enterprise architecture
(Note: maybe using an enterprise architecture reference framework)

Pursue change management strategies, practices, processes & methods to move from the current state to the desired future state

- Define desired future state enterprise architecture options
- Evaluate options
- Select the best architecture for execution

*For the See David A. Nadler, et al., *Organizational Architecture: Designs for Changing Organizations* (San Francisco: Jossey-Bass, A Wiley Company, 1992), p.64.
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A Few Problems with the Model

- **Missing a theory-based conceptual framework driving the analysis & action (atheoretical approach)**
 - Enterprise: how is the enterprise conceptualized? As a closed-system? An open-system? A complex adaptive system? Makes a big difference. More on this later.
 - Environment: What are the external contingency conditions that should be considered? How should they be conceptualized for actionable decisions?
 - Change: rich literature on enterprise change, adaptation, evolution not tapped
- **Unconstrained definition (direction of change, attributes) of the desired future-state (e.g., encompassing design of the future-state enterprise architecture)**
 - Actually, direction of change is strongly constrained by the defined contingency conditions
 - Properties of desired future states, as well, are constrained
- **Time-dynamics (temporal dimension) of change process not considered**
 - Both the enterprise and the external environment are co-evolving over time
 - The desired future-state is a moving target. How to deal with this?
 - The transition path itself is not linear, nor completely predictable
- **Nature, pace & direction of the change process is not directly addressed as part of the up-front “change planning package” [enterprise architecting]**
 - Typically left to be addressed as part of the change management process
 - Needs to be considered as an integral part of the change planning process (involving enterprise architecture design [enterprise architecting] process)



The Design-Science Interface in Thinking about Enterprise Transformation

- **Design (Role model: architecture, engineering)**
 - **Marks the principal difference between the professions and the sciences [Simon 1996]**
 - **Basic orientation:** heavy emphasis on future-oriented “solution-finding”; concerned with “systems that do not yet exist” [Romme 2003]
 - **Value system:** will it work? Is it the best solution for the unique problem at hand?
 - **Mode of thinking:** Normative, stresses synthesis
 - **Nature of knowledge:** pragmatic (heuristics, best practices); draws on *design causality* -- knowledge that leads to action and can be validated [Argyris 1993, p. 266]; intuition & creativity
 - **Methodology:** Practical experimentation & tinkering
- **Science (Role model: natural sciences)**
 - **Basic orientation:** develop an understanding of existing phenomena, by discovering and analyzing existing objects
 - **Value system:** disinterestedness, consensual objectivity
 - **Mode of thinking:** analytical, not normative
 - **Nature of knowledge:** representational (descriptive & explanatory of the world as it is)
 - **Methodology:** scientific method (e.g., controlled experimentation, hypothesis testing, computer simulations to understand cause-effect relationships over time)

Cautionary take-away: Enterprise architecture design (architecting) for transformation needs to be more fully grounded in *design propositions* from research-based knowledge on organizations (enterprises) as complex socio-technical systems [that is, be careful about using traditional “engineering” methods!]



Organizations are Complex Systems

- **Closed-systems view** -- Legacy historical perspective [Taylor 1911; Gulick & Urwick 1937; Weber 1947]
 - Grounded in scientific management tradition (even going back to Adam Smith)
 - Primarily concerned with efficiency
 - Static model; “organization as machine metaphor”
- **Open-systems view** -- modern perspective [Katz & Kahn 1966; Thompson 1967; Lawrence & Lorsch 1967]
 - Driven by the thinking that organizations are complex open systems interacting with the external environment, where the central problem is coping with uncertainty
 - The primary concern is *adaptation* in a changing environment
 - Dynamic model, one-way causation (“environment is boss”)
- **Complex adaptive systems view** -- Emerging multilevel co-evolutionary complexity paradigm [Holland 1992; Carley 1997; Dooley 1997; Levinthal & Warglien 1999; Tilebein 2006]
 - Organizations search, adapt & learn in a shifting & complex landscape
 - Landscape complexity depends on the intensity of the web of multilevel interdependencies (internal, external)
 - Main challenge is how to avoid catastrophe of getting stuck in local pockets
 - Dynamic model, two-way causation



Enterprise Transformation as “Enterprise Becoming”: Insights from the Academic Literature

- Enterprises change continuously in adaptive response in a complex coevolutionary process with multilevel interdependencies -- **therefore organizational design [enterprise architecting] should focus on proactively designing & managing (“tuning”) interdependencies (internal, external)** [e.g., Levinthal & Warglien 1999]
- Build-in emergent design (generative properties opening up new possibilities) into the design elements [Garud *et al.* 2006]
- Move from *design* to *designing* as an on-going process [Yoo, Boland & Lyytinen 2006]
- Design organizations that are built to change [Worley & Lawler 2006]
- To cope with environmental complexity and uncertainty organizations should become open learning systems where strategy development and change emerges from the way the company as a whole acquires, interprets and processes information about the environment [Dunphy & Stace 1993]

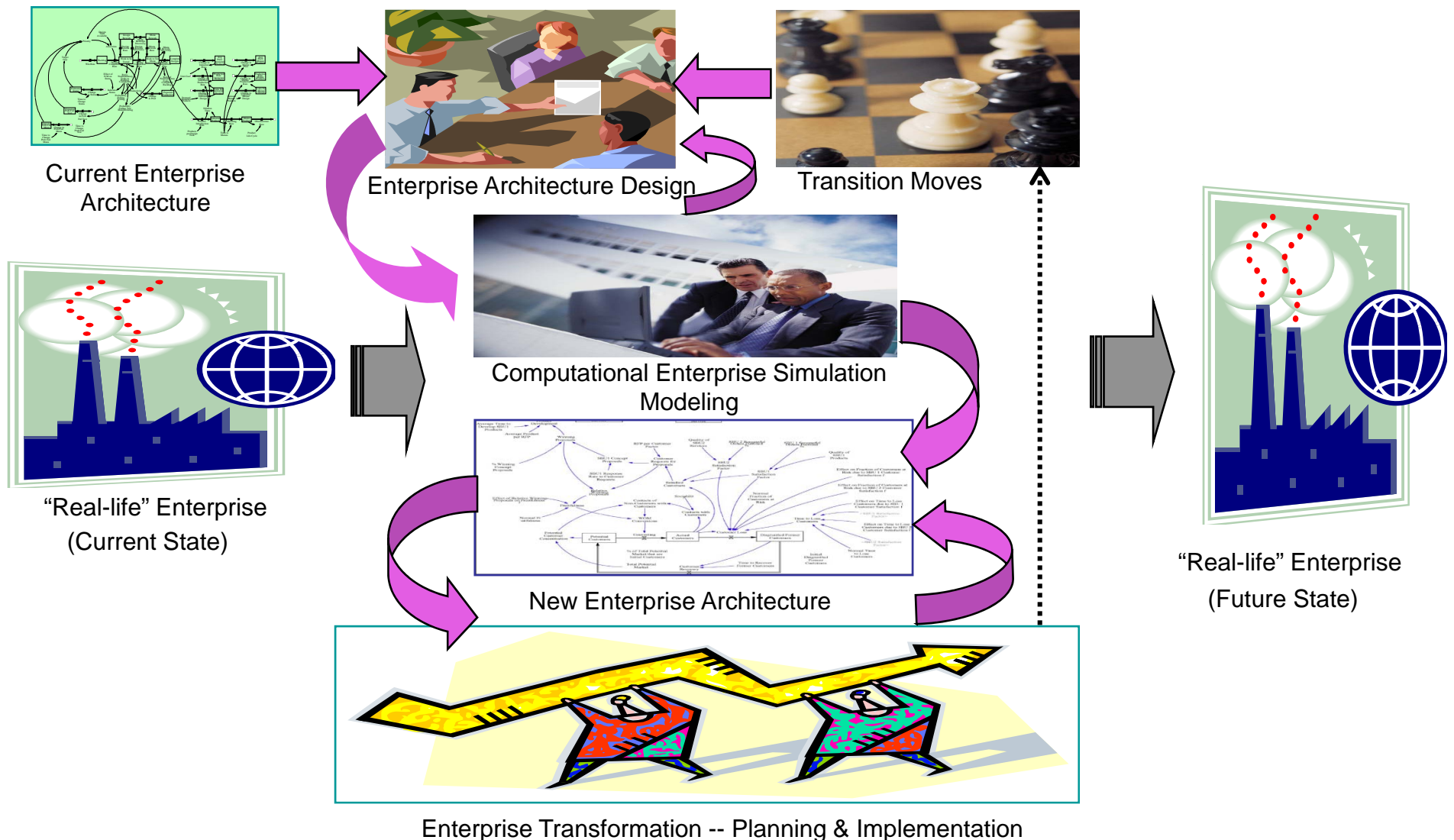
“Organizations rarely do exactly what they are told to do [March 1981]

“The so-called Toyota-style system was not developed all at once by rational strategic decision-making, but gradually evolved during the postwar period (or even since the 1930s)” [Fujimoto 1998]

“Wishing to highlight the pervasiveness of change in organizations, we talk about organizational becoming” [Tsoukas & Chia 2002]

Takeaway: The literature suggests a basic shift emphasis away from a rational, planned, enterprise change process (via enterprise architecting) to one of *guiding* the change process. This, however, is only part of the answer [more on this later]

Proposed Model: Up-front Transformation Planning as a Tightly-Coupled Process





Emerging Holistic View of Enterprises as Complex Adaptive Systems

Working definition: Enterprises are goal-directed complex adaptive socio-technical systems organized to create value for their multiple stakeholders by performing their defined missions, functions or businesses

- **Open systems** -- Interacting with the external environment
- **Complex interactions** -- Both internally and externally
- **Interdependence** -- Large number of interconnected parts
- **Dynamic change** -- The system changes over time, as environment changes
- **Adaptive behavior (*but with intentionality, strategic choice, foresight, unlike in natural systems*)** -- How the system learns and adjusts to external changes shapes its evolution (survival, extinction)
- **Emergence** -- Collective behavior at a given level (scale) cannot be understood from studying microstructure and behavior at a lower level (scale)
- **Self-organization** -- Interaction between system's structure & emergence can create a new structure

Two footnotes: (1) Primary interest in enterprises serving societal ends (e.g., building, operating, sustaining engineering-intensive, technology-based, systems; **(2)** The terms “organizations” and “enterprises” are used interchangeably; latter draws attention to entities often cross-cutting multiple organizational units (e.g., program enterprise; extended enterprise)



Enterprise Architecture (as a Concept)

- **Conceptual abstraction and representation of the architecture of a “real-life” enterprise’s underlying complexity**
 - Idea of the architecture of complex systems goes back to Simon [1962]; now widely used in designing (architecting) engineering systems
 - Main challenge: how best to adapt the concept to organizational context -- need to capture the architecture of *dynamic complexity*
- **Outgrowth of the concept of “organizational design,” occupying a dominant place in organizational science literature over many decades**
 - Driven by the view that organizational design is the **main** source of an organization’s sustained competitive advantage
 - This means one can proactively alter an organization’s design (architecture) to improve its performance and shape its evolutionary direction
 - But there is also some evidence that organizations change for other reasons as well
 - Still, organizational design (enterprise architecture) is viewed as the main determinant of an enterprise’s sustained competitive success
- **Dynamic concept, not a static “snapshot picture”**
- **Still an evolving concept; “work-in-progress”**
- **Important point: There is no “best” architecture under all circumstances**
- **Still, evidence from literature says there are very limited options facing individual enterprises**
- **Takeaway: Provides a unifying conceptual & analytical framework for thinking about, modeling, managing and changing complex enterprises**



- **Can be captured by using a variety of methods**
 - Natural language; causal loop diagramming; Integrated Computer Aided Manufacturing Definition -- IDEF
 - Enterprise modeling using various ontologies -- vocabulary, semantics, axioms, symbology -- (e.g., GEM)
 - Computational enterprise simulation modeling (e.g., system dynamics, agent based modeling)
- **Abstract representation (artifact): “enterprise architecture model” (example below)**
- **Different from, but complementary with, “enterprise architecture reference frameworks” (e.g., Zachman, DODAF, FEA, AFEAF)**
 - (Typically) enterprise information system architecture frameworks supporting business processes
 - Typically based on various enterprise views
- **Serves several important purposes**
 - Descriptive -- defining “current state”
 - Prescriptive -- how enterprise can be better integrated
 - Explanatory -- causal relationships
 - Predictive -- enterprise’s future evolution
 - Training & education -- how the enterprise works
 - What-if analysis (via modeling) -- impacts of decisions
 - A new way of doing science (via modeling) -- virtual experiments

System dynamics model of the basic architecture of an engine manufacturing enterprise (Blake, MIT MS Thesis, 2000; on LAI website)

[illegible]



Enterprise Architecture Modeling

- **Modeling enables us to understand and manage enterprise complexity**
 - Involves abstraction of reality
 - Gives insight into critical relationships & behavioral dynamics
 - Serves as a quick diagnostic tool for improvement
 - Provides “what-if” capability
 - **There has been a virtual explosion in computational (organizational, enterprise) simulation modeling techniques, tools & methods over the past decade -- (right panel)**
 - **Spurred by big “pull” to meet emerging needs as well as “push” from academic world**
 - Enterprise transformation
 - Organizational adaptation
 - Business process improvement
 - Product development
 - Supply chain optimization
 - Intelligent manufacturing systems
 - Defense simulation
 - **A new way of doing science -- conducting virtual experiments to test new hypotheses**
 - **No all-purpose enterprise model -- must define specific purpose for best application & results**
- System dynamics
 - Agent-based modeling
 - NK modeling
 - Network analysis
 - Highly optimized tolerance (HOT)
 - Econometric modeling
 - Neural networks
 - Bayesian networks
 - Boolean networks
 - Petri-nets
 - Evolutionary multi-objective optimization
 - Real options
 - Optimal control
 - Cellular automata
 - Genetic algorithms



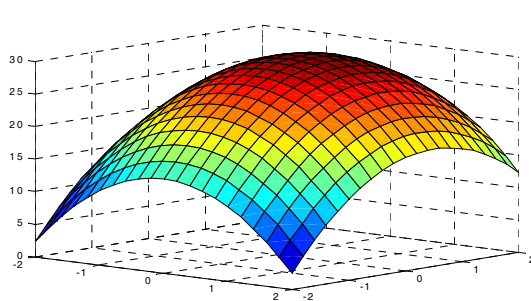
The Concept of Enterprise Architecture

Design [Enterprise Architecting]

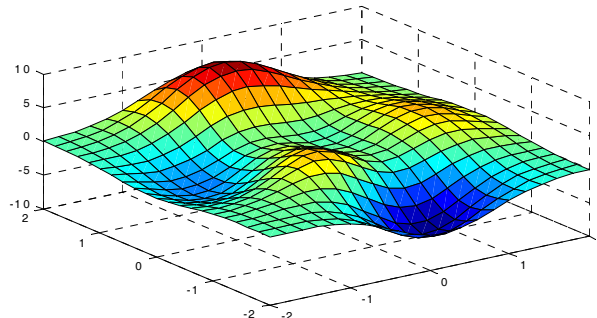
- **Enterprise architecture *design (verb) [enterprise architecting]* is the *PROCESS* of applying holistic thinking to designing an enterprise's going-forward architecture (whose job is delivering desired enterprise attributes)**
 - Define alternative design options (solutions)
 - Evaluate the defined options using evaluation criteria, methods and metrics
 - Select the best one for execution using selection criteria and methods
- **Purpose: serves as the compass guiding the enterprise transformation effort**
 - Defines the end-game, strategic direction, and desired target future enterprise attributes
 - Not a handy AAA-triptik showing how actually to carry out the transformation process
 - The term “architecting” introduces an unnecessary confusion on this point
- **Enabled by enterprise architecture model(ing), but also draws on a lot more (i.e., cumulative enterprise-related knowledge base)**
 - Enterprise science: explicit (formal, codified) research-based knowledge grounded in theory (e.g., causal relationships, principles, methods & tools, design rules)
 - Tacit (experience-based) knowledge (e.g., heuristics, best practices)
 - Creativity, intuition & inspiration
- **Produces actionable knowledge that can be put into practice and that is open to validation (will it work?)**
- **It is a means, not an end -- its function is to deliver the desired “bundle of enterprise attributes” on the other side of the transformation process**

Defining and Modeling the Concept of Enterprise (Fitness) Landscape*

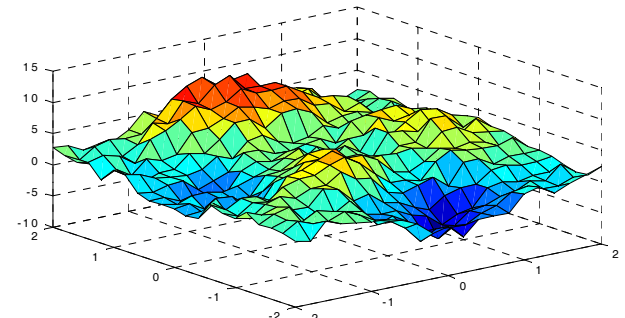
- Enterprise's abstract “payoff surface” -- continuously searching for a higher position (e.g., greater market share)
- **Smooth** (relatively stable, with a single peak -- few interactions) or **rugged** (relatively unstable or turbulent, with multiple peaks -- dense interactions); evolving over time; shaped the enterprise's internal and external interactions.
- **Main idea: landscape design** -- by “tuning” the interdependencies that define the surface (topology) over which adaptation takes place, an enterprise can proactively affect the nature (quality, direction, speed) of its own adaptation process.
- Payoff to a given choice (element, attribute) ($N=1, \dots, n$) depends on its interactions with others ($K=1, \dots, n-1$)
- **Fitness value function** measures the sum total of the relative contribution of each element (organizational element or attribute) to the organization's global “fitness” (performance)
- Genesis in evolutionary biology (**Kaufman 1993**), who proposed the NK model as a mathematical tool for modeling the fitness landscape of biological systems, which has natural analogues in social and economic systems
- A companion theoretical paper provides further technical details [Lin & Bozdogan 2007, in-process]
- **The concept remains abstract and illustrative only at this time; it is being further developed & operationalized**



Smooth with single peak



Smooth with multiple peaks

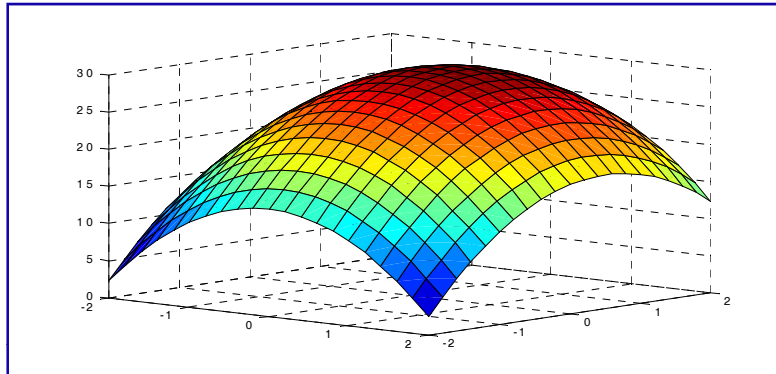


Rugged with multiple peaks

What are the optimal adaptive search (change, transformation) strategies for enterprises over their enterprise fitness landscapes?

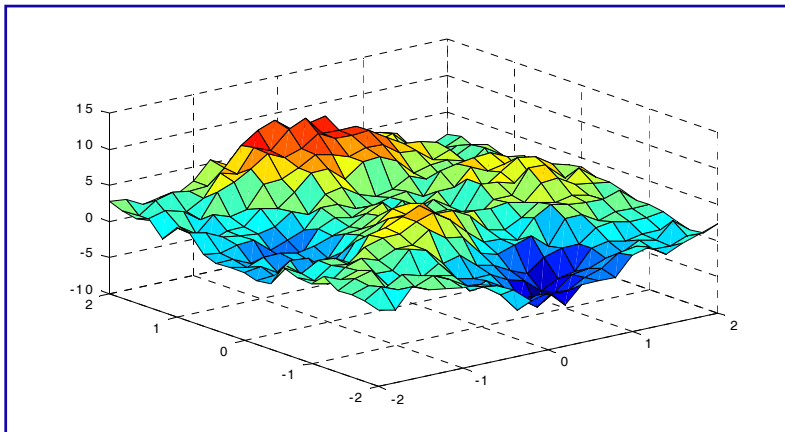
*Landscape graphics in this presentation courtesy of Jijun Lin, MIT (2007)

Simplified View of the External Environment*



Relatively Stable (Corresponds to Smooth Landscape)

- **Source of change:** enterprise's task environment (customers, suppliers, competitors directly interacting with the enterprise) or the general environment (technology, regulatory, social)
- **Frequency:** low
- **Amplitude:** small (shallow)
- **Scope (of change):** limited (to specific enterprise domains, functions or processes)
- **Direction:** predictable



Relatively Unstable (Corresponds to Rugged Landscape)

- **Source of change:** enterprise's task environment or the general environment
- **Frequency:** low or high
- **Amplitude:** small (shallow) or high (deep)
- **Scope:** limited or total (affecting the enterprise's total structure, strategy & behavior)
- **Direction:** very difficult to predict (or unpredictable)

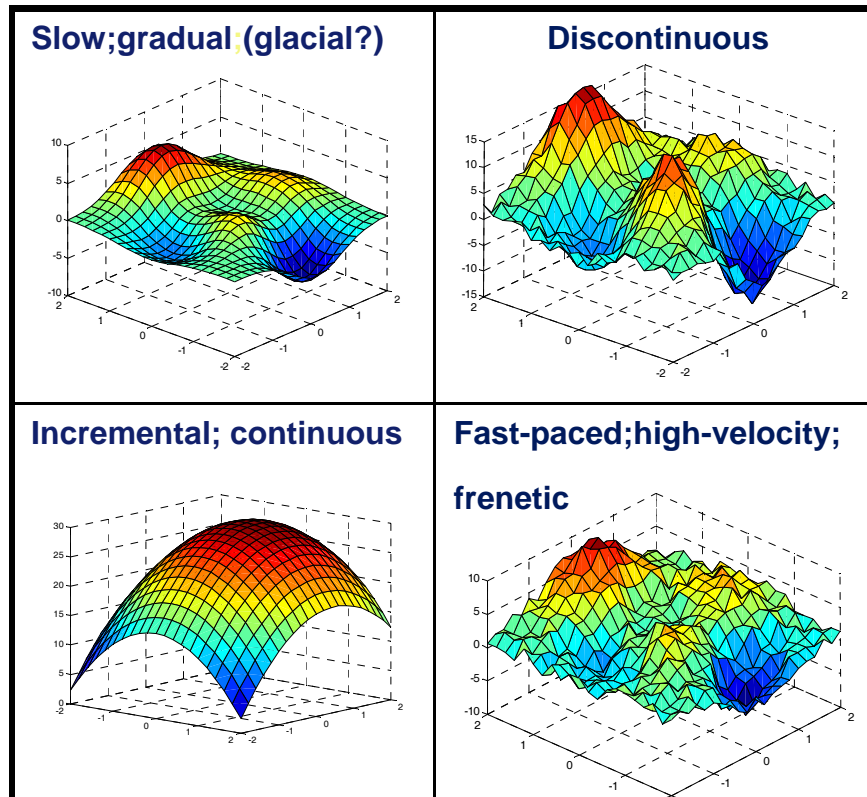
Environment (Corresponds to the Enterprise Fitness Landscape): Conceptualized as having two layers: (1) the direct environment (encompasses customers, suppliers, competitors directly interacting with the enterprise, whose behavior can (might) be influenced or controlled; and (2) the general environment (technology, markets, economy, regulatory, institutional, social), which remain outside the control or influence of the enterprise

Simple Thought Experiment -- Focusing on the External Environment & Time Scale for Planned Change

Time Scale for Change

Long-term

Near-term



Stable (Smooth)

Unstable (Rugged)

External Environment
(Landscape)

- Both the environment and the temporal dimensions of planned change do matter (singly & together)
- The combination suggests distinctly different *change regimes, defining possible future-state attributes*
- Planned change (via enterprise architecture design process) would need to take into account these contingency factors

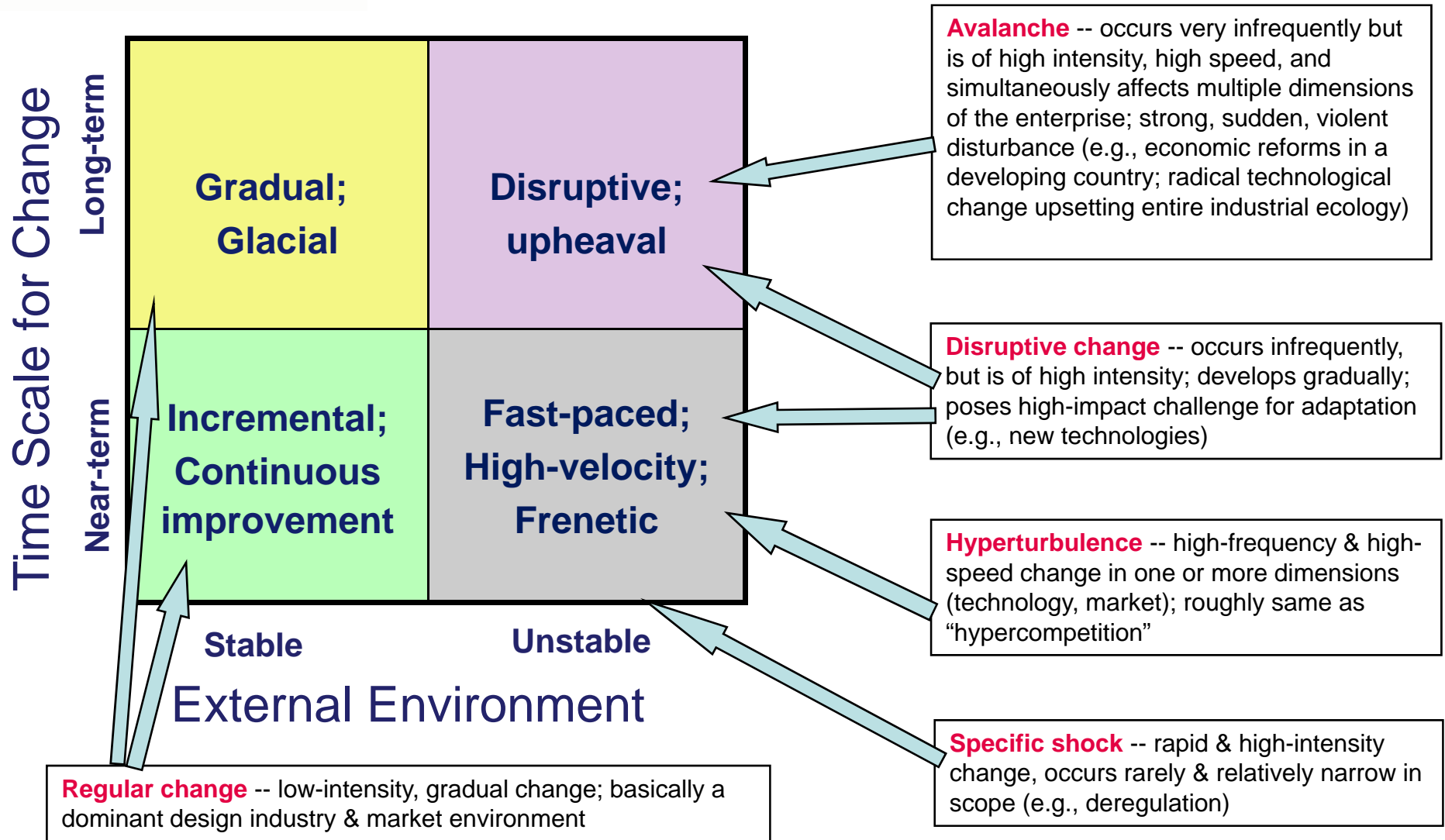


This is Consistent with the (Dominant) *Punctuated Equilibrium Model* of Organizational Transformation*

| Characteristics | Convergent Periods | Reorientation Periods |
|--|--|---|
| Duration of periods | Relatively long | Relatively short |
| Key characteristics | Stability; organizational inertia | Jagged discontinuity; upheaval |
| Type, frequency and duration of change | Incremental; continuous change via series of small steps over long period | Radical, disruptive; one-time change lasting a relatively brief period |
| Major direction & cause of change | Internal and external push for higher performance | Major external jolts (technological, market structure & competition, shifts in customer preferences, institutional) |
| Scale and scope of change | Small improvements within organization's existing design archetype (architecture) | Frame-breaking change; shift to a different design archetype (architecture) |
| Focus of change | Better organizational alignment; process improvement | Complete transformation of basic concept, structure & behavior |
| Implications for planned enterprise change | Change can occur typically within the limits of an existing design archetype track; options are few and rather limited | Change occurs as a shift from an existing design archetype to another design archetype (architectural transformation); planned change must anticipate such contingency conditions |

*See Tushman & Romanelli (1985, 1994); Romanelli & Tushman (1986, 1994); Tushman, Newman & Romanelli (1986); Gersick (1991); Sastry (1997); Hannan & Freeman (1977, 1984)

Extensions of the Punctuated Equilibrium Model*



*Draws on Suarez & Oliva (2005)

Thinking about Interactions*

| Description | | Locus of interactions | |
|-----------------------------|------------------|---|---|
| | | Internal | External |
| Type of interactions | Strategic | <ul style="list-style-type: none"> • Vision; business model; metrics • R&D strategy; core capabilities • New product development • Investment (plant & equipment) • Organizational form & structure • Decision rights (authority) • Reward & incentive systems • Human resources policies | <ul style="list-style-type: none"> • Stakeholders; customers; competitors • Joint ventures; acquisitions; technology licensing • Access to capital markets (funding) • Strategic alliances; supplier partnerships; forming virtual enterprises • Institutions (e.g., regulatory) |
| | Tactical | <ul style="list-style-type: none"> • Coordination mechanisms • Business processes • Supporting infrastructure systems (e.g., information systems) • Knowledge management • Human resources practices • Training & education | <ul style="list-style-type: none"> • Logistics (in-bound, out-bound) • External communications (general) • Supplier relationships (certification, quality, process improvement, electronic linkages) • Public relations • Environmental scanning • Technology scouting |

* Illustrative; intended only to highlight major decision elements expected to have important interactions with other enterprise domains (e.g., engineering, manufacturing), functions, processes, activities

Why Focus on Managing Interactions?

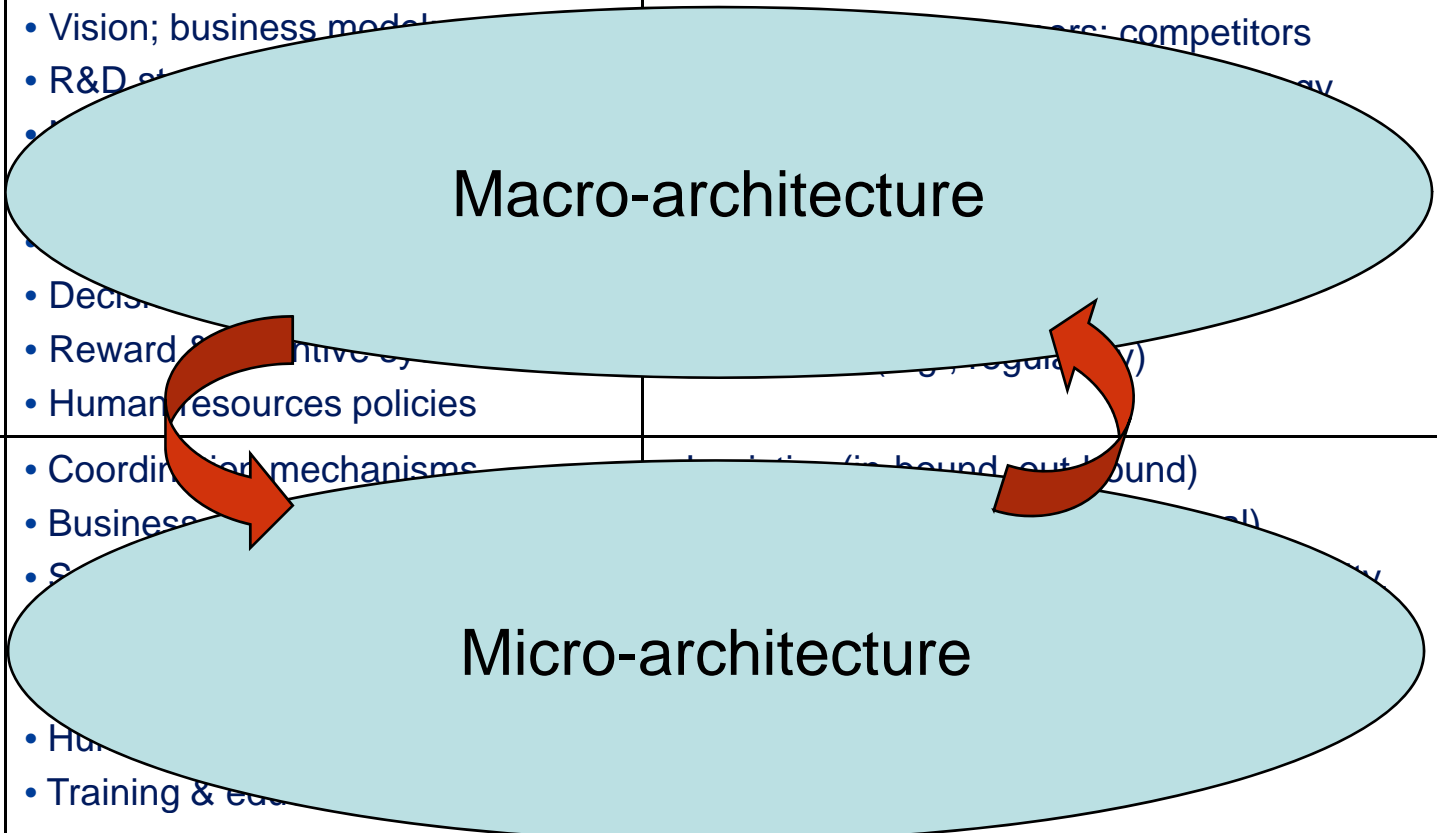
- **The cost (total, average, marginal) of managing external interactions exceeds the cost of managing internal interactions** -- extensive literature on this subject (e.g., Coase [1937 classic -- why firms exist], Williamson [1975, 1979, 1981, 1998 -- transaction cost economics])
- **Argument (1)** When the external environment is *relatively stable*, organizations (enterprises) will generally place relatively greater emphasis on managing *internal* interactions, since the net returns (benefits minus costs) associated with managing internal interactions will exceed the net returns from managing external interactions
- **Argument (2)**: When the external environment is *relatively unstable*, organizations (enterprises) will place relatively greater emphasis on managing *external* interactions, since the net returns from managing external interactions will exceed the net returns from managing internal interactions (*strong conjecture*)

Definition: Net returns from managing external interactions = opportunity cost of *not* managing external interactions (i.e., foregone benefits) *minus* the actual transaction costs associated with managing external interactions.

Note: Traditional theory is generally concerned only with the cost side of managing internal vs. external interactions, not with the benefits side.

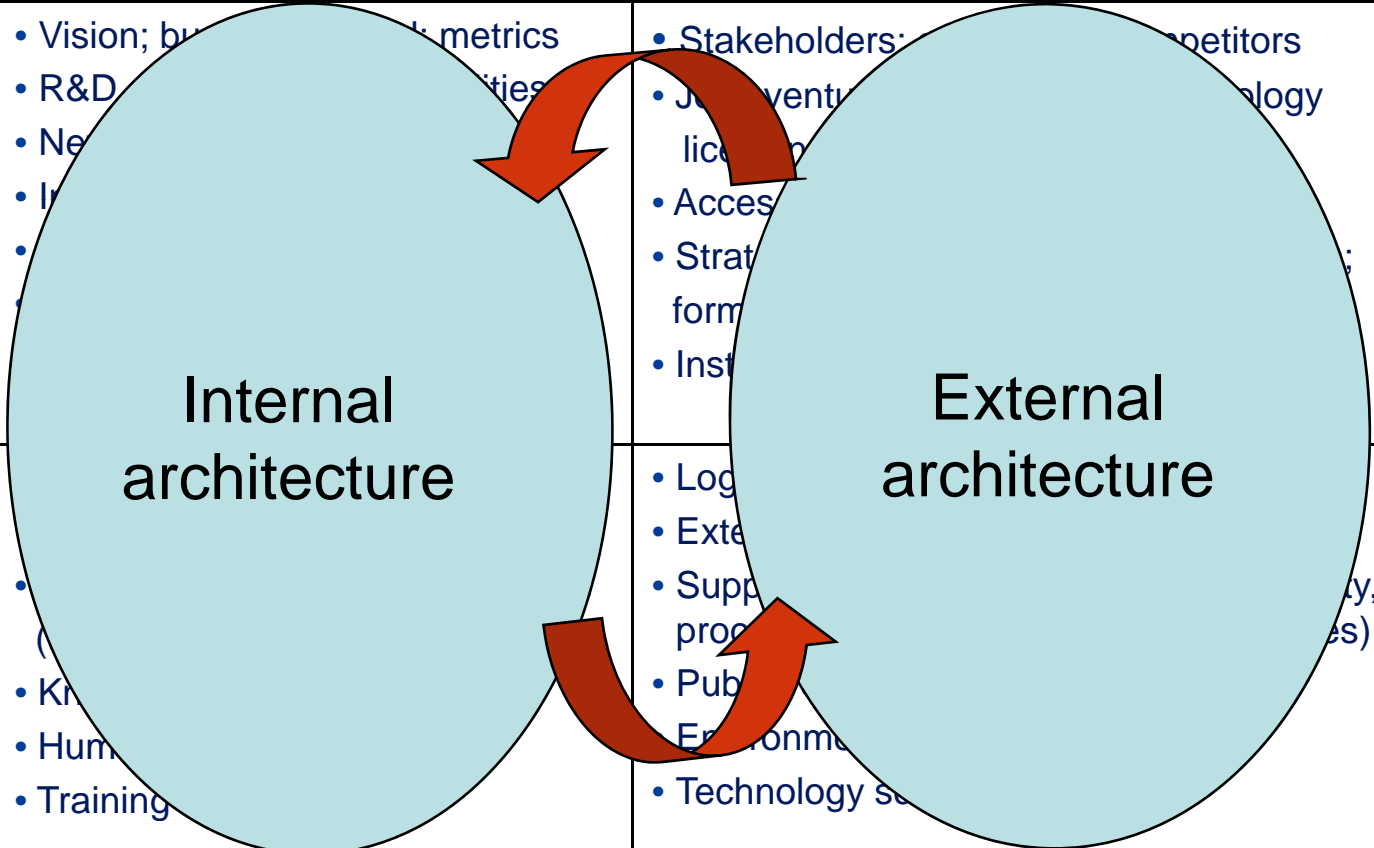
Thinking about Interactions*-- Enterprise Architecture Partitioning - 1

| Description | | Locus of interactions | |
|----------------------|-----------|--|--|
| | | Internal | External |
| Type of interactions | Strategic | <ul style="list-style-type: none"> • Vision; business model • R&D strategy • Decision-making • Reward & incentive system • Human resources policies | <ul style="list-style-type: none"> • Customers; competitors • Suppliers • Regulatory (e.g., Federal Aviation) |
| | Tactical | <ul style="list-style-type: none"> • Coordination mechanisms • Business processes • Systems • Human resources • Training & education | <ul style="list-style-type: none"> • Suppliers (inbound/outbound) • Customers • Suppliers |



* Illustrative; intended only to highlight major decision elements expected to have important interactions with other enterprise domains (e.g., engineering, manufacturing), functions, processes, activities

Thinking about Interactions*-- Enterprise Architecture Partitioning - 2

| Description | | Locus of interactions | |
|----------------------|-----------|---|---|
| | | Internal | External |
| Type of interactions | Strategic | <ul style="list-style-type: none"> • Vision; business metrics • R&D capabilities • New products • Intellectual property • Internal processes • Financial performance  <p>Internal architecture</p> | <ul style="list-style-type: none"> • Stakeholders: customers, competitors • Joint ventures, technology • Licensing • Access to resources • Strategic alliances • Information systems • Infrastructure <p>External architecture</p> |
| | Tactical | <ul style="list-style-type: none"> • Logistics • Knowledge management • Human resources • Training | <ul style="list-style-type: none"> • Logistics • External processes • Supply chain management • Public relations • Environmental impact • Technology standards |

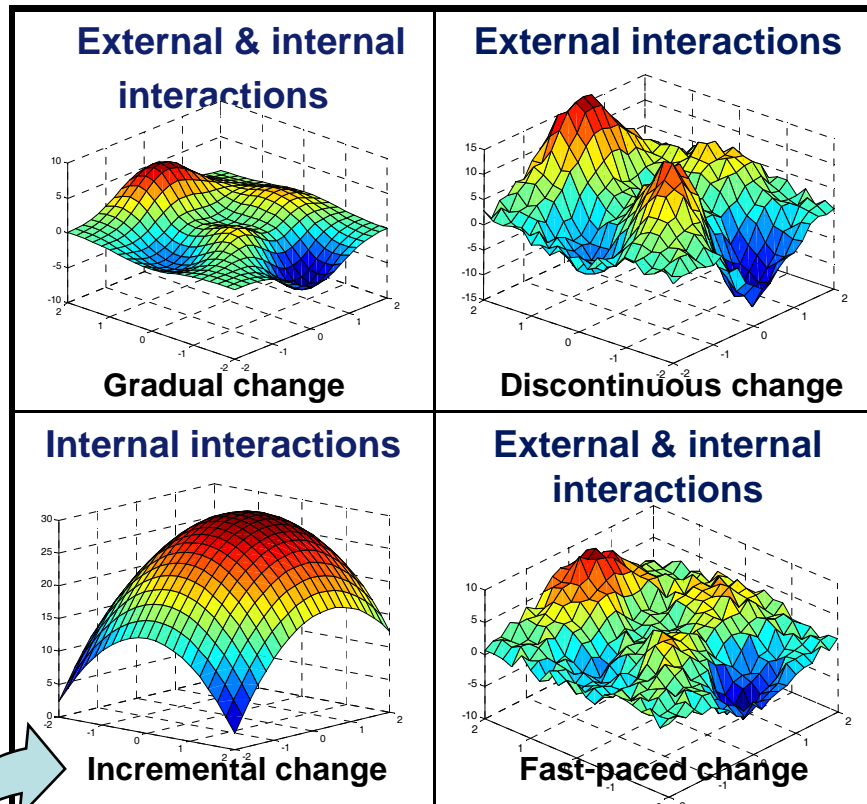
* Illustrative; intended only to highlight major decision elements expected to have important interactions with other enterprise domains (e.g., engineering, manufacturing), functions, processes, activities

Propositions -- Managing Interactions

Time Scale for Change

Long-term

Near-term



Stable (Smooth)

Unstable (Rugged)

External Environment
(Landscape)

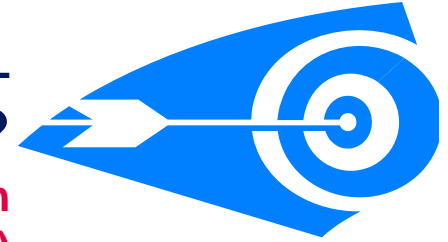
Change regime

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- **Proposition 1.1:** If the time-horizon is closer to the present (near-term, e.g., 1-3 yrs.), place relatively greater emphasis on managing *internal (strategic and/or tactical)* interactions
- **Proposition 1.2:** If the time-horizon is further away from the present (longer-term, e.g., 3-10 yrs.), place relatively greater emphasis on managing *external* interactions
- **Proposition 1.3:** If the external environment is relatively stable, place relatively greater emphasis on managing *internal* interactions
- **Proposition 1.4:** If the external environment is relatively unstable, place relatively greater emphasis on managing *external* interactions

Transformation to What ?

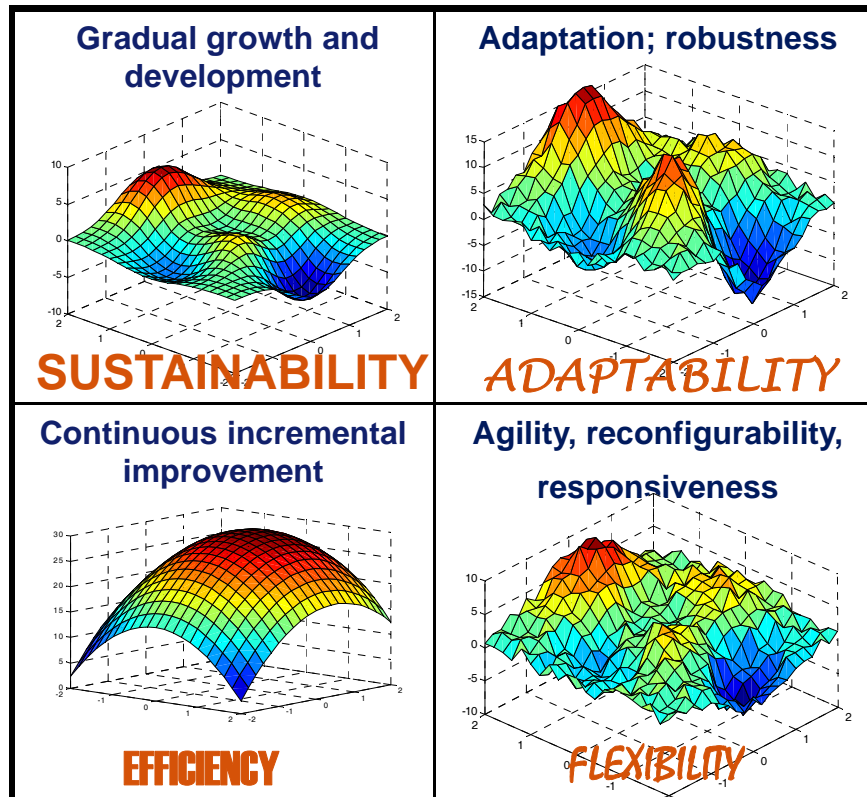
What the Enterprise Architecture Design
Process Should Deliver (“bull’s eye” targets)



Time Scale for Change

Long-term

Near-term



Stable (Smooth)

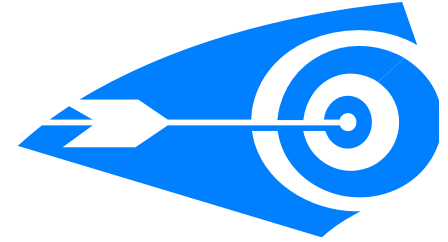
Unstable (Rugged)

External Environment
(Landscape)

- **ASSUMPTION:** (Myopic) local search -- staying put within each defined generic “terrain” over defined time-horizons
- **EFFICIENCY:** Achieving greater efficiency gains (product, process) through relatively greater emphasis on managing **internal interactions**, concentrating on tactical/operational interdependencies (Propositions 1.1 & 1.3)
- **SUSTAINABILITY:** Achieving sustained growth and development by placing emphasis on managing **both external and internal strategic interactions** (value stream integration), concentrating on consolidation, alignment, congruence, competitiveness differentiators (Propositions 1.2 & 1.3)
- **ADAPTABILITY:** Relatively greater emphasis on managing **external interactions**, concentrating on managing uncertainty & risk (Propositions 1.2 & 1.4)
- **FLEXIBILITY:** Emphasis on **both internal and external interactions**, focusing on creation of agile “sense-and-respond” capabilities (Propositions 1.1 & 1.4)

LOCAL SEARCH MODEL Transformation How?

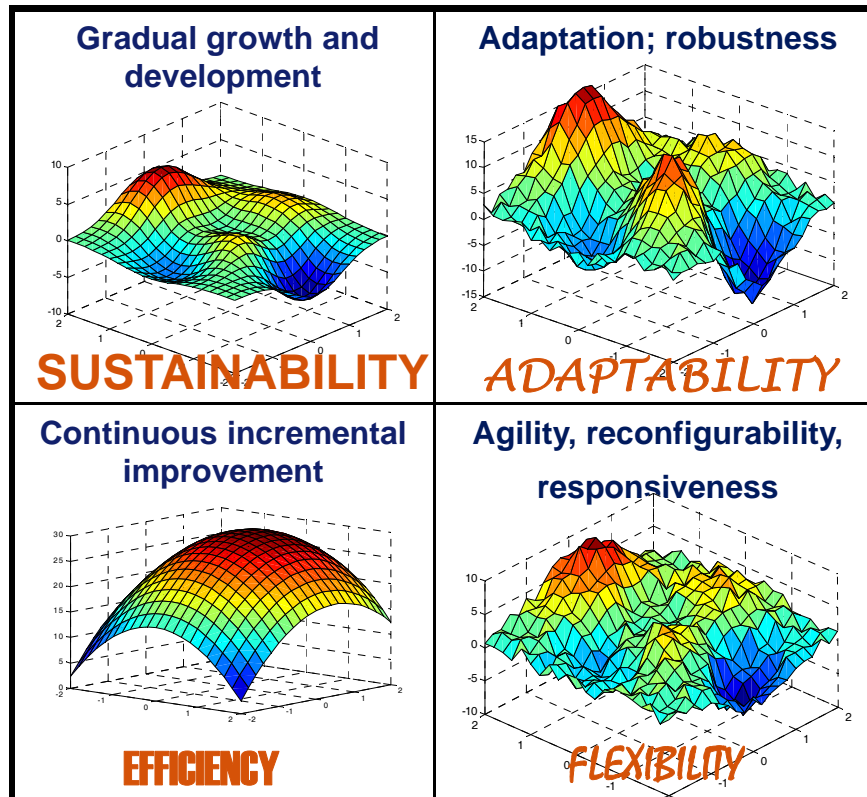
Enterprise Architecture Definition (Choice)



Time Scale for Change

Long-term

Near-term



Stable (Smooth)

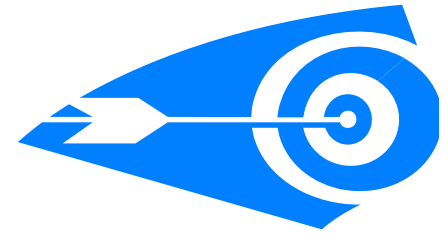
Unstable (Rugged)

External Environment
(Landscape)

- **ASSUMPTION:** (Myopic) local search -- staying put within each defined generic "terrain" [quadrant] over the defined time-horizon
- **PROPOSITION:** Enterprise architecture definition (choice) is a function of the interactions requiring greater management emphasis
- **EFFICIENCY:** Relatively greater emphasis on managing internal interactions -- **Internal architecture** (Propositions 1.1 & 1.3)
- **SUSTAINABILITY:** Emphasis on managing both external and internal interactions -- **Total enterprise architecture (external & internal; macro & micro)** (Propositions 1.2 & 1.3)
- **ADAPTABILITY:** Relatively greater emphasis on managing external interactions -- **external architecture** (Propositions 1.2 & 1.4)
- **FLEXIBILITY:** Emphasis on managing both internal and external interactions -- **Total enterprise architecture (external & internal; macro & micro)** (Propositions 1.1 & 1.4)

Transformation How?

Implications for Enterprise Architecture Modeling Strategies LOCAL SEARCH MODEL

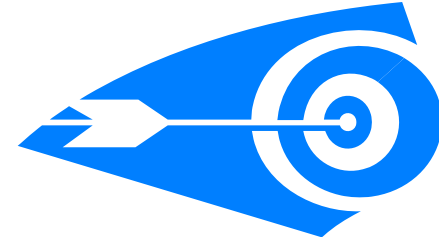


| | | | |
|-----------------------|-----------|--|---|
| Time Scale for Change | Long-term | <p>Internal & external (macro & micro) architecture)</p> <ul style="list-style-type: none"> • Linked system dynamics & agent based modeling (e.g., studying longer-term co-evolution of linked macro & micro architectures) • Evolutionary multiobjective optimization (e.g., designing product platforms) <p>SUSTAINABILITY</p> | <p>External architecture</p> <ul style="list-style-type: none"> • NK modeling (e.g., external interactions) • Real options (e.g., response strategies) • Genetic algorithms (e.g., selecting among a large number of design options) • Agent based modeling (e.g., survivability of supplier networks) <p>ADAPTABILITY</p> |
| | Near-term | <p>Internal architecture</p> <ul style="list-style-type: none"> • Linked system dynamics & agent based modeling (e.g., enterprise integration) • Discrete event simulation (e.g., processes) • Petri-nets modeling (e.g., workflow) • Boolean networks (e.g., modeling enterprise interactions) <p>EFFICIENCY</p> | <p>External & internal (macro & micro) architecture)</p> <ul style="list-style-type: none"> • NK modeling (e.g., changes in enterprise fitness landscape topology) • Network analysis (e.g., unanticipated disruptions in supply chains) • Agent based modeling (e.g., emergent behavior in fast-response environments) <p>FLEXIBILITY</p> |
| | | Stable (Smooth) | Unstable (Rugged) |
| | | External Environment (Landscape) | |

GLOBAL SEARCH MODEL (Illustration)

Transformation to What & How?

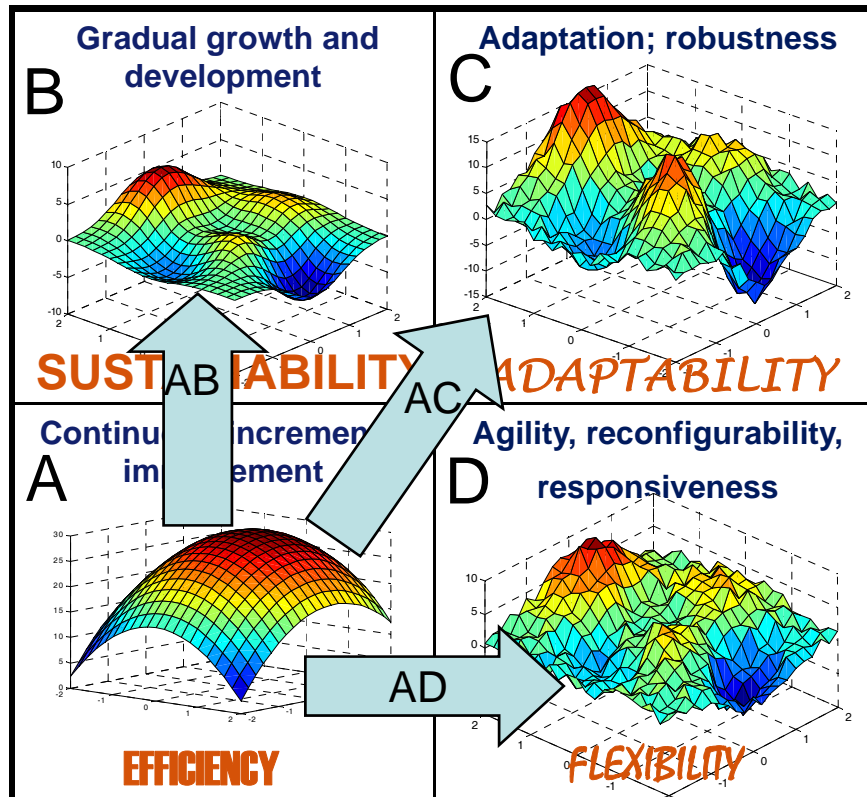
What/How the Enterprise Architecture Design Process Should Deliver



Time Scale for Change

Long-term

Near-term



Stable (Smooth) Unstable (Rugged)

External Environment
(Landscape)

ASSUMPTION: Global search (with foresight; example: $A \rightarrow B$; $A \rightarrow C$; $A \rightarrow D$)

- **Current State: EFFICIENCY** -- Achieving greater efficiency gains (product, process) through relatively greater emphasis on managing internal interactions, concentrating on tactical/operational interdependencies
- **Transition Move AB:** Toward sustainability (consolidate efficiency gains) -- from internal to linked external & internal (macro & micro) architecture
- **Transition Move AC:** Toward adaptability (balance efficiency & adaptability)-- from internal to external architecture
- **Transition Move AD:** Toward flexibility (balance efficiency & flexibility) -- from internal architecture to linked external & internal (macro & micro) architecture

RESULTS:

- Global search (transition) moves suggest quite different mix of objectives
- Architecting must explicitly consider alternative available transition moves (limited in number)
- Architecture definitions (choices) & modeling strategies depend on not only on what interactions to emphasize but also on “from-to” transition moves

Main Conclusions - 1

- **Proposed a unifying contingency-theory-based conceptual framework guiding up-front enterprise transformation planning process, resulting in a number of important results:**
 - Definition of alternative generic *enterprise change regimes*, each suggesting a different relative emphasis in terms of managing enterprise interactions (internal, external)
 - Definition of alternative “bull’s eye” desirable future-state enterprise attributes (efficiency, sustainability, adaptability, flexibility) that the enterprise architecture design process, in general, should deliver (transformation to what?)
 - Identification of enterprise architecture choices for emphasis in the enterprise architecture design process (transformation how?)
 - Identification of enterprise modeling strategies to serve specific defined transformation-related purposes (transformation how, enabled by enterprise architecture modeling)
- **Enterprise architecture design [enterprise architecting] for transformation involves a tightly-coupled process where key design decisions, enterprise modeling strategies, and transition moves need to be addressed simultaneously**
 - Expanding the framework from “local search” to “global search” suggests important balancing & tradeoff decisions on desirable future-state enterprise attributes (e.g., efficiency vs. flexibility, etc.)
 - Also suggests quite different enterprise architecture design strategies, enterprise architecture choices, and enterprise architecture modeling approaches

Main Conclusions -- 2

- **Propose a two-track enterprise transformation strategy (governing enterprise architecture design, enterprise architecture choice, and enterprise modeling approaches)**
 - **Planned change:** well-suited for the relatively stable environment case; performed over regular time periods (e.g., reset near-term every year; reset longer-term every 3-5 yrs.) -- lean enterprise thinking (and six sigma, etc.) represent good fit here
 - **Emergent (guided) change:** well-suited for the relatively unstable environment case; performed on an on-going basis (more in tune with “the organizational becoming” idea); near-term & longer-term linked on a rolling basis; need to consider alternative change strategies with “generative properties” (opening up new future improvement possibilities), stressing greater agility, flexibility, responsiveness, reconfigurability of capabilities as well as longer-term adaptability properties



BACKUP REFERENCE SLIDES