# Flexibility Theory™ as a Transdisciplinary Science

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# Flexibility Theory™ – Context

- "And so what I asked for was the two brigades and the ability to maintain a reserve in Kuwait, in case I needed additional flexibility." Gen. George Casey, responding to a question from Sen. John Warner, February 2007
- "But having the flexibility to have the other three brigades on a deployment cycle gives us and Gen. Petraeus great flexibility." Gen. George Casey, responding to a question from Sen. John McCain, February 2007
- "In a Changing World, Only the Flexible Survive," Robert J. Samuelson, The Washington Post, November 30, 2005, saying that General Motors executive management team needs to be more flexible to respond to current pressures.

# Quotes on Risk Taking

- "Only those who dare to fail greatly can ever achieve greatly."

  Robert F. Kennedy

- "Only those who risk going too far can possibly find out how far they can go."

  T. S. Eliot

- "Test fast, fail fast, adjust fast."

  Tom Peters

- "If things seem under control, you are just not going fast enough."

  Mario Andretti

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# Flexibility – Definition in Wikipedia

- **Flexibility** is used as an attribute of various types of systems. In the field of engineering systems design, it refers to designs that can adapt when external changes occur.
- Flexibility has been defined differently in many fields of engineering, architecture, biology, economics, etc.
- In the context of engineering design one can define flexibility as the ability of a system to respond to potential internal or external changes affecting its value delivery, in a timely and cost-effective manner.
- Thus, flexibility for an engineering system is the ease with which the system can respond to uncertainty in a manner to sustain or increase its value delivery.
- It should be noted that uncertainty is a key element in the definition of flexibility. Uncertainty can create both risks and opportunities in a system, and it is with the existence of uncertainty that flexibility becomes valuable.

# Cognitive Flexibility

- "…includes the ability to represent knowledge from different conceptual and case perspectives and then, when the knowledge must later be used, the ability to construct from those different conceptual and case representations a knowledge ensemble tailored to the needs of the understanding or problem-solving situation at hand."

  Spiro, *et al.* (1991)

# Flexibility Theory – Postulates

- Unforeseeable uncertainty can only be dealt with if the decision maker's response to nature's moves is not fixed in advance but is itself uncertain.
- Fayol (1916) emphasized that, to function adequately, a business organization needs a plan which has "unity, continuity, flexibility and precision," flexibility being the ability to be adapted to changing circumstances.
- Flexibility Theory postulates that the emphasis should be on how to handle the uncertainty of the environment (exogenous uncertainty) as well as the endogenous uncertainty within the organization by explicitly modeling the dynamics of flexibility.

# Transdisciplinarity

- Desmond Manderson argues that the aim of bringing together diverse disciplines in a transdisciplinary project is not to transcend that knowledge base rather to transform it.
- Research emerging from a transdisciplinary approach reflects a true integration and synthesis of knowledge from each discipline rather than a mere compilation of knowledge.
- It results in truly new perspectives that are more than the sum of the parts.

# Transdisciplinarity

- I would define transdisciplinarity to mean the conversion of information into knowledge through the mind traveling across various disciplines and reaching knowledge outside the disciplines.
- The fragmentation of knowledge by compartmentalizing it into ‘disciplines’ is an ineffective way to advance and unite knowledge.
- When we figure out how to efficiently integrate knowledge across disciplines, we could approach “completeness” in the sense of mastering and harnessing knowledge.

# Transdisciplinarity

- What makes transdisciplinarity unique and cohesive is the ability to simultaneously expand both the breadth and depth of knowledge.
- Familiarity within a specialty makes them lose sight of the "big picture" and leads to erroneous predictions as well as paradoxical conclusions within the discipline.
- Disciplines, when left in isolation, cannot cope with the real world complexity, which requires a coherent framework to transform the boundaries between disciplines.

# Transdisciplinarity

- An important property of transdisciplinarity states that contributory disciplines should not be disaggregated once the integration of knowledge is complete. It is exactly in this context, where FT can be considered as a legitimate transdisciplinary science.
- In one of the great books of the 20th century, "Consilience," the Pulitzer prize-winning author, Edward O. Wilson (1998) makes the argument that social scientists spurn the idea of the hierarchical ordering of knowledge that unites and derives the natural sciences.

# Flexibility Theory™ – Goals

- Combine the benefits of optionality, hedging and diversification
- Incorporate *path dependency*
- Build on the *logic of control*
- Keep the targets moving
- Truncate the downside risk while preserving the upside
- Do not focus on tactics at the expense of strategy
- Do not amplify volatility for the sake of tactics

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# Flexibility Theory™ – Value Added

- It integrates the effects of competitive dynamics in the valuation of flexibility to make effective investment decisions at the strategic level.
- It provides the tools necessary to deal with the *Knightian Uncertainty* by balancing strategic and tactical initiatives.
- It helps corporations avoid *false negatives*, in which valuable opportunities are foregone, and *false positives* that tie up resources that are better used elsewhere.
- It enables corporations to manage multiple options in a portfolio setting, incorporate learning and knowledge dissemination, as well as evaluate exit possibilities in real-time.

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# Flexibility Theory™ – Typology

- Time Flexibility
  - Understand and model the value of waiting
- Scope Flexibility
  - Plan for a range of possibilities
- Goal Flexibility
  - Pursue a moving target
- Spatial Flexibility
  - Exploit uncertainties in the Mobile Equilibrium
- Process Flexibility
  - Proactively capitalize on relevant and value-added synergies

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# Flexibility Theory™ – Rationale

- The discrete logical framework of real options breaks down when:
- Target markets and technical agendas are flexible;
  - demarcation between investment stages is blurry
  - the scope for possible modifications in the initial stages is vast
  - opportunities are linked to the actions of the corporation; i.e., endogenous
- Actors at different levels of the corporation have different perspectives on the attractiveness of a given opportunity due to psychological biases, cognitive issues, and different incentive structures.

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# Flexibility Theory™ – Rationale

- Hence, there is a need for more generic path-dependent processes, along the lines of:
  - Probe and learn (Lynn et al., 1996)
  - Incremental search (March & Simon, 1958)
  - Innovation journeys (Van de Ven et al., 1999)

# Path Dependency

- A firm's decisions to adopt the future innovation are contingent upon its earlier decisions regarding adopting the current innovation.
- History matters → Sunk costs are not completely sunk if you keep your options open from the beginning.
- The importance of path dependency is amplified where conditions of increasing returns to adoption exist.

# Logic of Control

- To the extent we can control the future, we do not need to predict it.
- Most corporations, on the other hand, rely on a predictive logic using causal models.
  - They implicitly assume that to the extent they can predict the future, they can control it.
- The logic of control overcomes the difficulty of prediction/forecasting by
  - Initially keeping investments to the utmost minimum
  - Continually negotiating with key stakeholders
  - Learning to use contingencies to create new ends

# Real Options Analysis – Problems

- ROA, by definition, cannot endogenously discover opportunity structures.
- ROA suffers from "economic hysteresis," which is defined by Avinash Dixit as the failure of investment decisions to reverse themselves when the underlying causes are fully reversed.
- ROA can only be used to incorporate risk, which is an uncertain realization from a well-specified probability distribution. However, the strategic environment operates under the Knightian uncertainty, which implies that the future has no distribution.

# Real Options Analysis – Problems

- ROA requires that expected payoffs be exogenously determined. This excludes the game-theoretic nature of strategic decision making that includes the possible actions of competitors resulting in so-called "strategic interactions."
- The discrete logical framework of ROA breaks down when target markets and technical agendas are constantly in flux in the sense of Heraclitus.
- While ROA may justify investments that would be rejected under the DCF methodology, these justified investments may well destroy value when implicit assumptions about abandonment flexibility are wrong.

# Real Options Analysis – Problems

- ROA is, by its very nature, designed to value optionality of investments. The belief that ROA provides an accurate and robust value of flexibility results in a false sense of confidence, as optionality is, at best, a subset of flexibility.
- ROA relies too much on judgment; given enough volatility and time, an option could turn out to be a very big number. Hence without solid, accurate measures of volatility real options can lead companies astray.
- More importantly, ROA does not differentiate between exogenous and endogenous volatility.

# Real Options Analysis – Problems

- There needs to be a value put on the real option value.
- A real asset is not typically associated with a single real option but with many – the respective values of those different options are linked to one another via a spider's web of interdependencies.
- ROA overestimates windows of opportunity; the time you let uncertainty work for you is shorter than you plan for.

# Real Options Analysis – The Role

- Stephen Ross of MIT correctly states that ROA should enable corporations get more adept at "slicing and dicing" a transaction into various risk components, each of which can be retained, hedged or transferred according to an institution's needs and abilities.
- There is no mentioning of valuation in his description of the role of ROA.
- ROA gives substance to management intuition.

# Flexibility Theory™ – Completeness

- Learning in a Bayesian framework
- Game-theoretic issues
- Competitive forces
- Intelligent Information Processing
  - Knowledge is currency for uncertainty, whereas information is currency for risk
- Mobile equilibrium sphere → Piaget
- Dynamic capabilities → Teece
- Effectuation and Near-Decomposability → Sarasvathy and Simon
- Network-Centric Systems → Paul West

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# Risk Budgeting – Strategic vs. Tactical

- Strategic Risk Budget
  - Capturing available opportunities
  - Involving "core" issues
  - Exploiting exogenous uncertainty

- Tactical Risk Budget
  - Developing new opportunities
  - Involving "latent" issues
  - Exploiting endogenous uncertainty

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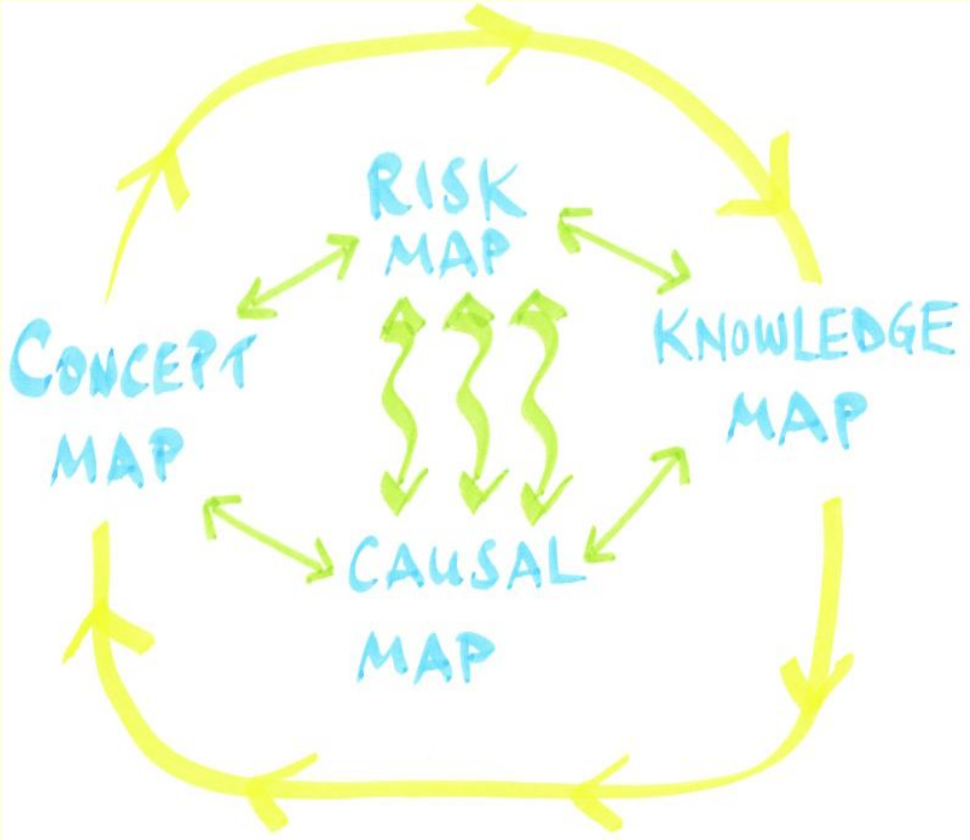
# Social and Cultural Implications

- Flexible Human Beings
- Flexible Educational System
- Flexible Communities
- A Flexible Generation (*FlexGen*)
- A Sustainable Future for the Human Race

# Transformational Map™

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