The Innovation Turing Machine

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Guided Creativity

- Innovation is rooted in creativity
- Unguided Creativity Solves Irrelevant Problems
- Guided – Creativity advances solution to the challenge at hand
- Can Creativity be Guided? Yes: The Innovation Turing Machine.

The Environment

- **Innovators**

  An individual or a team committed to innovation productivity

- **Innovation Challenge**

  An innovation challenge, IC, is a challenge that can not be met with an "idiot procedure". An "idiot procedure" is a set of instructions that if followed by a simpleton would guarantee a given result

- **Innovation Resources**

  Money, time, talent, supplies, instruments, facilities, and equipment.

Meeting an Innovation Challenge

- The effort to meet an innovation challenge straight on is an intimate mental effort, akin to rubbing Flintstones for the purpose of the emergence of a spark.
- Sometimes a spark flashes on, sometimes not.
- *The procedures herein are set forth for the "sometimes not" case*.

Core Principle

- When a innovation challenge IC resists direct solution then attention should be shifted to searching for a related innovation challenge, RIC, which is
- 1 – easier to solve

and

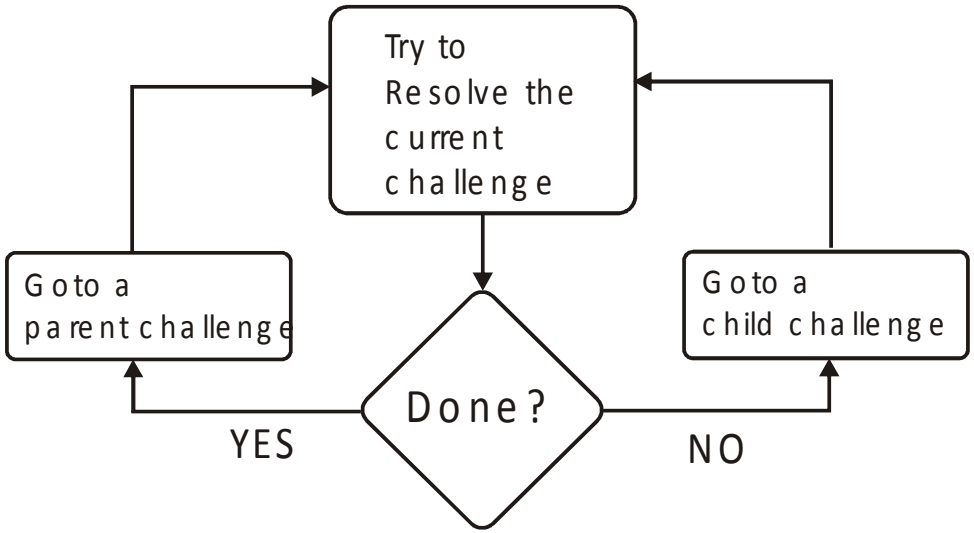
- 2 – solving it, makes solving IC easier.

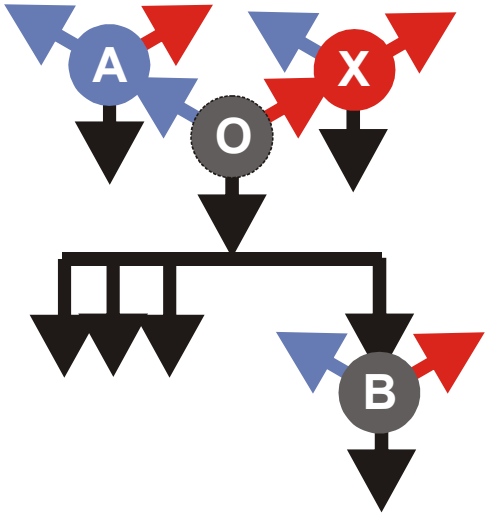
$$P' + P|P' \leq P$$

P – effort to IC, P' – effort for RIC

The Innovation Turing Machine

The ITM challenge-shift mechanism



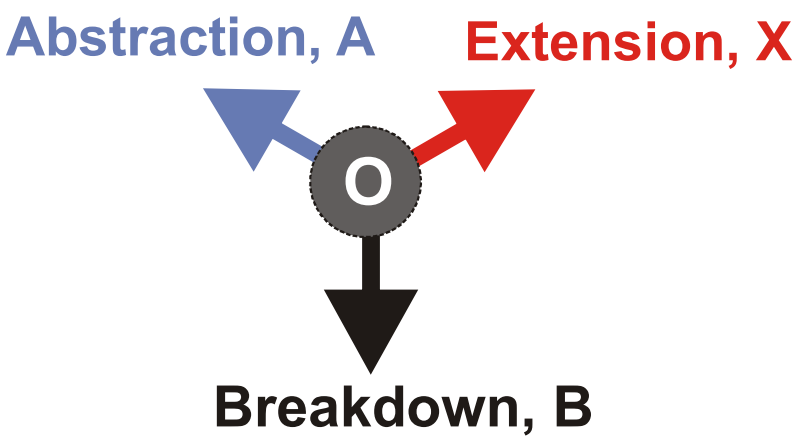


Iterative Application of the Core Principle

Searching for RIC

- The ITM procedure calls for three parallel search avenues for the Related Innovation Challenge

The Original IC, O is replaced by breakdown components, B by Abstraction challenge, A, or by an extention challenge, X



Breakdown

- **Serial**

  Identifying components of the IC such that solving them will build up to solving the reference IC

- **Parallel**

  Identifying parallel scenarios, each of which will solve the reference IC

- **Concentric**

  Alleviating the IC challenge by mitigating assumptions that are removed gradually

Serial Breakdown

- **Ordered**

  Fixed order. Breakdown component i will be solved only after component (i-1) has been solved for i=2,3,..

- **Unordered**

  Components can be solved in any order

- **Partially Ordered**

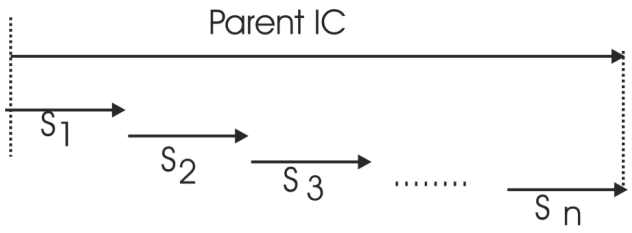
  Some components require a fixed sequence, others not.

Serial Breakdown Strategy -- Unordered

- Appraise the innovation load of each component
- Decide whether that hardest component represents an attractive next step. If so, make it the IC-in-Focus (ICIF). If not – reverse course.
- Focus on remaining components from the harder to the softer.
- Beware of rushing to solve the “easy” ICs while another component IC is overly hard.

Serial Breakdown Strategy -- Ordered

- Appraise the Innovation Load of each Component.
- Decide whether the hardest component represents an attractive next step. If so, make the component the IC-in-Focus according to the given order. If not, then either reverse course, or:
- If the components are sufficiently related so that solving one will develop insight into others, then opt to focus on the series in order.



IC Serial Breakdown

All components must be accomplished for the parent IC to be done.

Serial Breakdown Strategy – Partially Ordered

- Appraise the innovation load of each component
- If the hardest component is in the unordered set then apply the unordered strategy.
- If the hardest component is in the ordered set then apply the ordered strategy
- Repeat by reverse order of Innovation Load.

Parallel Breakdown Strategy

- "There is always another way to solve a challenge" – Keep Looking!
- List n identified solution scenarios, then add 'not yet identified' scenario (n+1).
- Appraise the Innovation Load (IL) of each component.
- Decide whether the component IC (CIC) with the lowest Innovation Load is attractive enough to be designated IC-in-Focus. Do so, if yes.
- If not, then either reverse course, or:
- Try to specify scenario (n+1), and if successful, reapply strategy.

Concentric Breakdown Strategy

- Simplify the IC-in-Focus by re-specifying it under alleviating assumptions.
- Appraise the Innovation Load of the residual IC. Proceed only if negotiable (‘the monkey and the moon’)
- Appraise the Innovation Load of the simplified IC (SIC). If attractive to become IC-in-Focus then do so. If not then either reverse course, or:
- Add more assumptions to further simplify the IC.
- Repeat simplifying until productive, then gradually remove assumptions to solve the pre-breakdown IC

Simplified IC Strategy

- Physical Alleviation

  Define an easier situation. Limit things like size, accuracy of performance, and measurements, levels of impurities, time to solve, etc.

- Modeling

  Build a mathematical model of the IC solve (i) analytically, (ii) numerically, (iii) stochastically.

Complex Breakdown

- Repeat breakdown operations on a given IC construct a breakdown innovation tree, or innovation map.

- The innovation map offers a useful insight into the innovation load ahead.

Extension

- Assemble ICs with similarities to the IC-in-Focus, to define an inclusive IC where solutions from any assembled IC will be used to develop a solution for the ICiF.
- **Similarity Categories:** detailed, technology, science, allegory.
- **Search Strategy:** self, adjacent, public, purchased.

Extension Deduction

- Translate the solution of a solved similar IC to the ICiF.
- Translate the partial solution of partially solved similar IC to the ICiF.
- Use record of resources (e.g. cost, time), and expertise used to solve similar ICs to appraise the same for the ICiF.
- Use failure data for efforts to solve similar ICs to appraise the innovation load of the ICiF.

Extension Similarity Categories

- **Detailed**

  An IC that is similar in its details to the ICiF.

- **Technology**

  An IC that is based on similar technology to the ICiF

- **Science**

  An IC that engages similar scientific principles to the ICiF

- **Allegory**

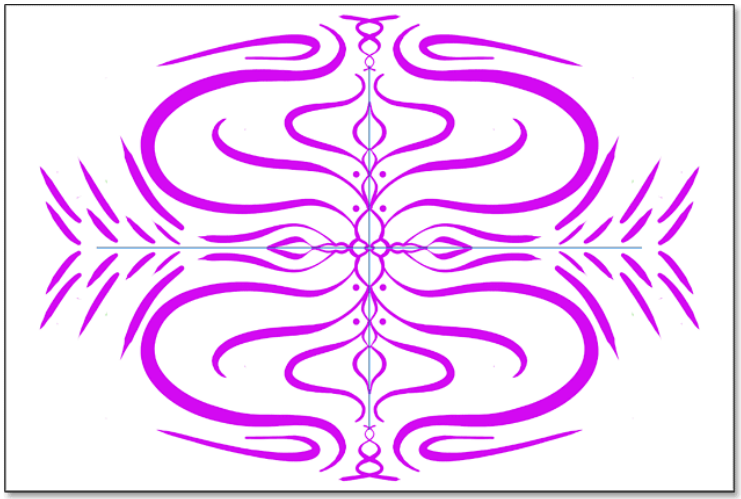
  An IC that has configuration and/or dynamic similarity to the ICiF

Extension Search Categories

- **Self** Team own history of similar cases. From memory or from records.
- **Adjacent** 'next door R&D teams' may have encountered similar challenges – worth asking
- **Public** Books, publications, public reports, record of patents
- **Purchased** Experts, private databases, data acquisition services

Symmetry

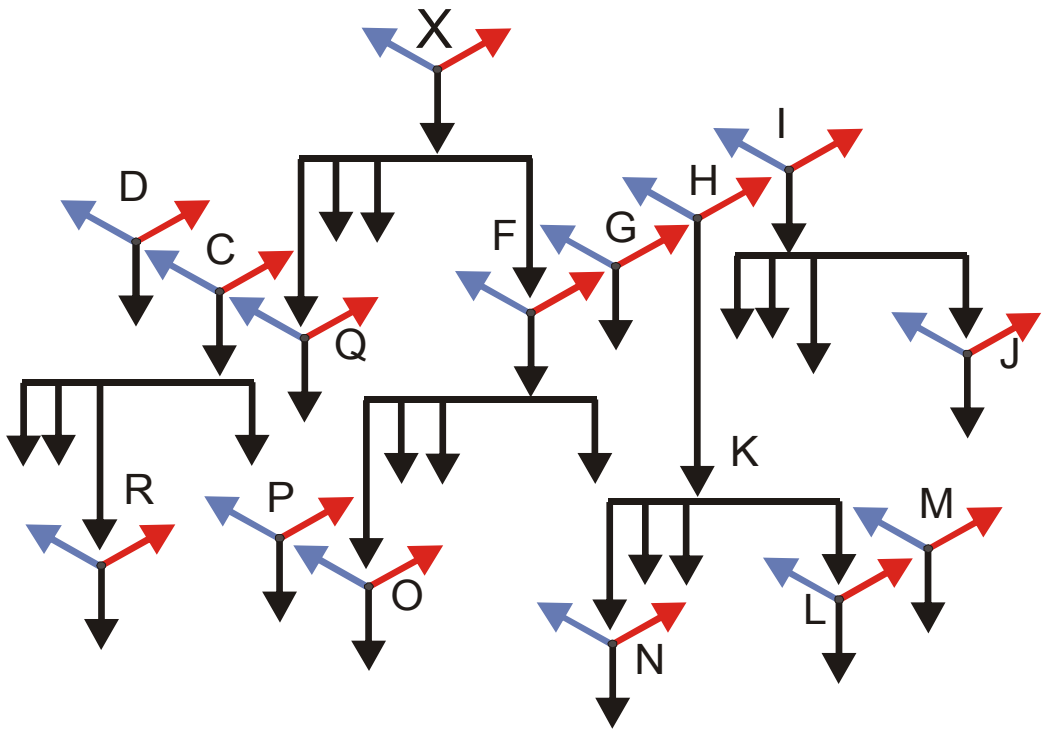
- Symmetry has proven itself as a powerful scientific tool.
- Symmetry can be used to discover a hidden facet of the ICiF, through its existence in a symmetrical challenge.
- Anti-Symmetry is as Useful as Symmetry
- Symmetry varies from randomness to perfection.



Abstraction

- Recasting the ICiF without non-essential details.
- Achieving simplicity conducive to creativity
- Extending the circle of experts to be consulted for a solution
- Enriching the Extension set.

Innovation Trajectory



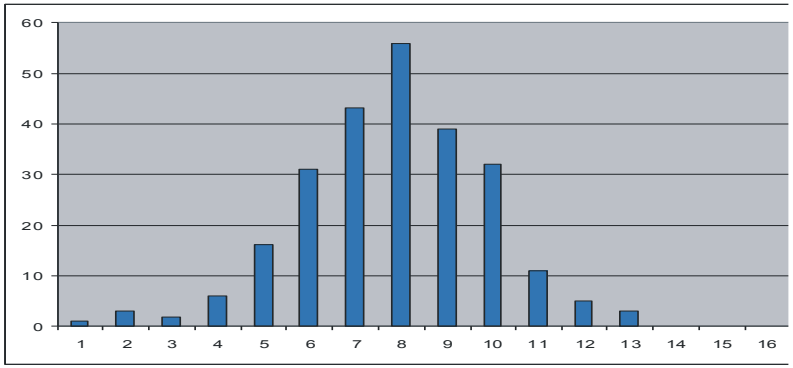
b(X) = {Q,...F}
a(Q) = C
a(C) = D
b(C) = {R,...}
e(F) = G
e(G) = H
e(H) = I
b(H)=K
b(K) = {N,...L}
e(L) = M
b(I) = {J,...}
b(F) = {O,...}
a(O) = P

Trajectory Modeling

- Modeling the expected steps from the original IC through RICs and back to the original IC

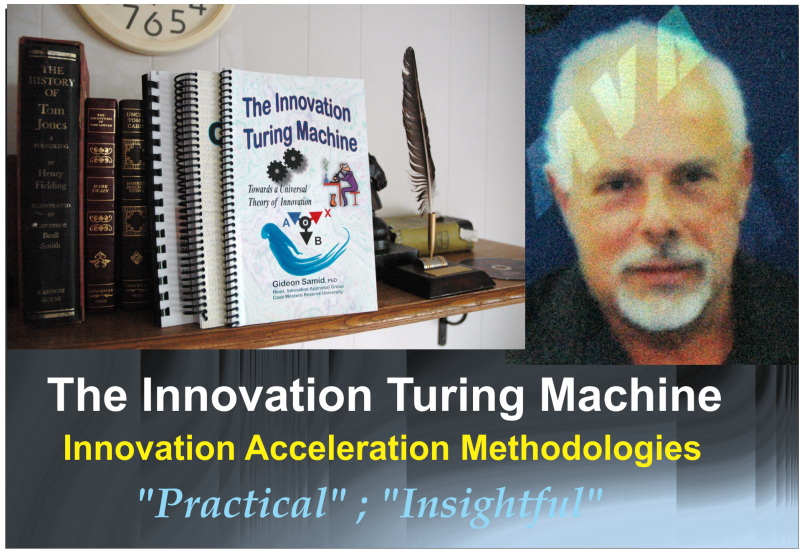
ITM modeling

$$P_i = (0.03 + 0.075i)(1 + 25V_{i+1}/4^{i+1})$$



Using the above formula for the chance for innovation set i to increment its value, a Monte-Carlo analysis produces the depicted results: the ITM procedure extends to set #13, while most of the innovation happens in set #8. 248 ICs had to be resolved before the original challenge was figured out. The model shows 495 isteps

@your service



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