Today's Topics on Creativity

- Introduction
- Creativity
  - Nature
  - Design Rules and Combinatorics
  - Work of Vance and de Bono
- TRIZ theory
  - TRIZ, Value Engineering and the Semantic Web tool
- Radiant Thinking, Mind Mapping tool
- Appendix: Technological change: from its creation to economic growth and societal welfare

Mind Map Philosophy:

"The chisel was unleashing the beauty and image/figure within the marble bursting to be revealed."
Michael Angelo

- – Let your creative energy radiate from both sides of your brain, from the kernel of your Mind Map
- – Applied Radiant Thinking

What is a Mind Map (1 of 2)?

- A Mind Map is a powerful graphic technique which harnesses the full range of cortical skills in a single, powerful manner
  - word,
  - image,
  - number,
  - logic,
  - rhythm,
  - color
  - spatial awareness

Mind Map Brings it all together!

It gives you the freedom to roam the expanses of your brain. The Mind Map can be applied to every aspect of life where improved learning and clearer thinking enhances human performance.

What is a Mind Map (2 of 2)?

- Originated in the late 1960s by <u>Tony Buzan</u>
- Similarly to a road map, a Mind Map:
  - Provides an overview of a large subject/area.
  - Enables you to plan routes/make choices and lets you know where you are going and where you have been.
  - Allows you to Gather and Represent large amounts of data.
  - Encourages problem solving by showing you new pathways.
  - Is Attractive, easy to read, muse over and remember.

  <u>Bottom Line:</u>
  - Let you see the whole picture *and* the details at the same time.
  - It is a tool, not a solution!

Creative Thinking and MindMaps

A Mind Map Enables One:

- To clear the mind of paradigms, thus providing space for new creative thought
- To capture and develop "flashes" of insight when they occur
- To explore all the creative possibilities of a given subject
- To encourage more consistent creative thinking
- To create new conceptual frameworks within which previous ideas can be <u>reorganized</u>
- To plan creatively

Why Mind Map?

- **Disadvantages of traditional linear notes:**
- Energy and time wasted writing down superfluous words.

- Other information may be missed while noting down one idea.

- Take longer to read and review.

- Associations and connections between key words and ideas not readily apparent.
  - Attention wanders easily.
  - Lack of color and other visual qualities handicap memory.

Mind Map - Basics

- **Mind maps work the way the brain works**
  - Not in nice neat lines.
- **Memory is naturally associative, not linear.**
  - Any idea probably has thousands of links in your mind. Mind maps allow associations and links to be recorded and reinforced.
- **The mind remembers key words and images, not sentences**
  - Try recalling just one sentence from memory! Mind maps use just key words and key images, allowing more information to be put on a page.
- **Mind maps are more visual and depict associations between key words, they are much easier to recall than linear notes.**

How To Do it……

- Starting from the center of the page (rather than top-left corner) your thoughts radiate "out" from a central theme in all directions.
- "Main Points" flow out from central theme
  - Restrict words to few, key phrases
  - Each new idea should have a unique color or symbol
- Subordinate ideas "branch out" from main branches
  - Change of fonts to key brain
  - Same color as main branch
- Use images wherever practical
  - Mental triggers
- Link and associate ideas
  - Draw arrow, comments, etc to show linkages

How To Do it……

Image removed due to copyright restrictions.
Diagram of the mind mapping process.

The Mind Map Creative Thinking Mechanism

- Associate new and unique ideas with pre-existing ones
- Use different colors in creative thinking
- Use different shapes in creative thinking
- Combine unusual elements
- Magnify and use dimension
- Adjust conceptual position
- Rearrange and link pre-existing concepts
- Respond to an aesthetically pleasing object
- Respond to and emotionally pleasing object
- Respond to an object which appeals to the senses of sight, touch, hearing, smell and taste
- Uses interchangeable shapes and codes[1]

The Mind Map Book, T. Buzan, Penguin, 1996.

Examples of Mind Mapping

Counter Littoral Threat Weapon
Functional Decomposition

Destroying Threat

Deactivating
Threat

Propulsing Guiding System
Controlling Energizing Detonating

Counter Littoral Threat Weapon Functional Decomposition

Destroying Threat

Deactivate Threat

Propulsing

Guiding

System Controlling

Energizing

Explosive

Propulsion System

Generator of Thrust

Guidance System

Hardware

Software

Fuel

Detonating

Active target feedback system

Depth sensor

Weapon steering system

Control
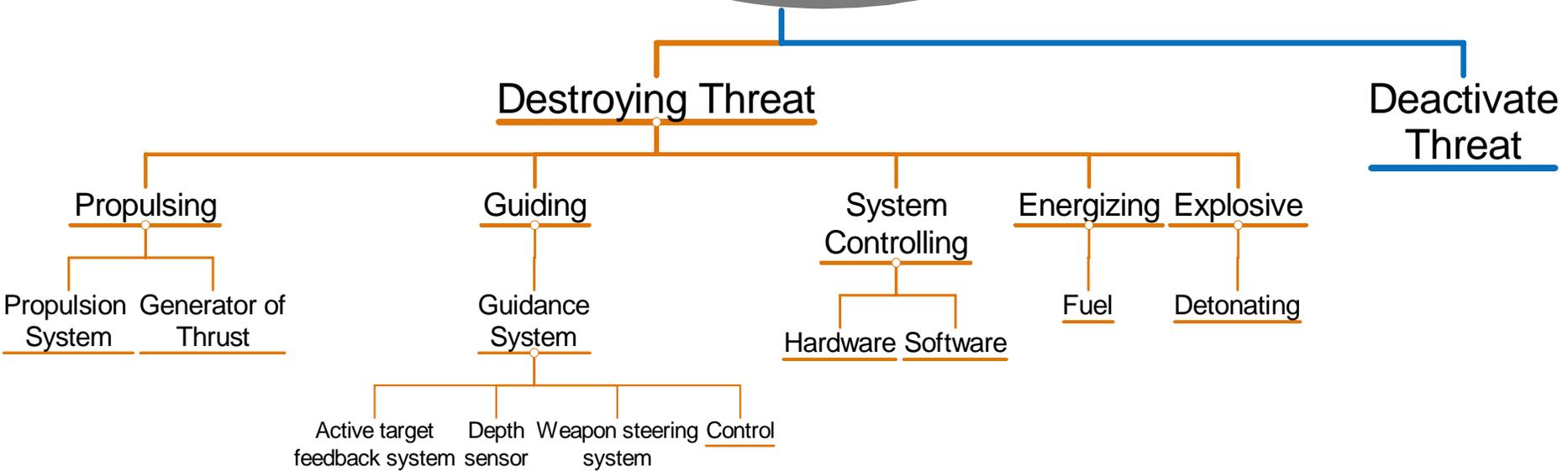
System Architecting of a Counter Littoral Threat Weapon
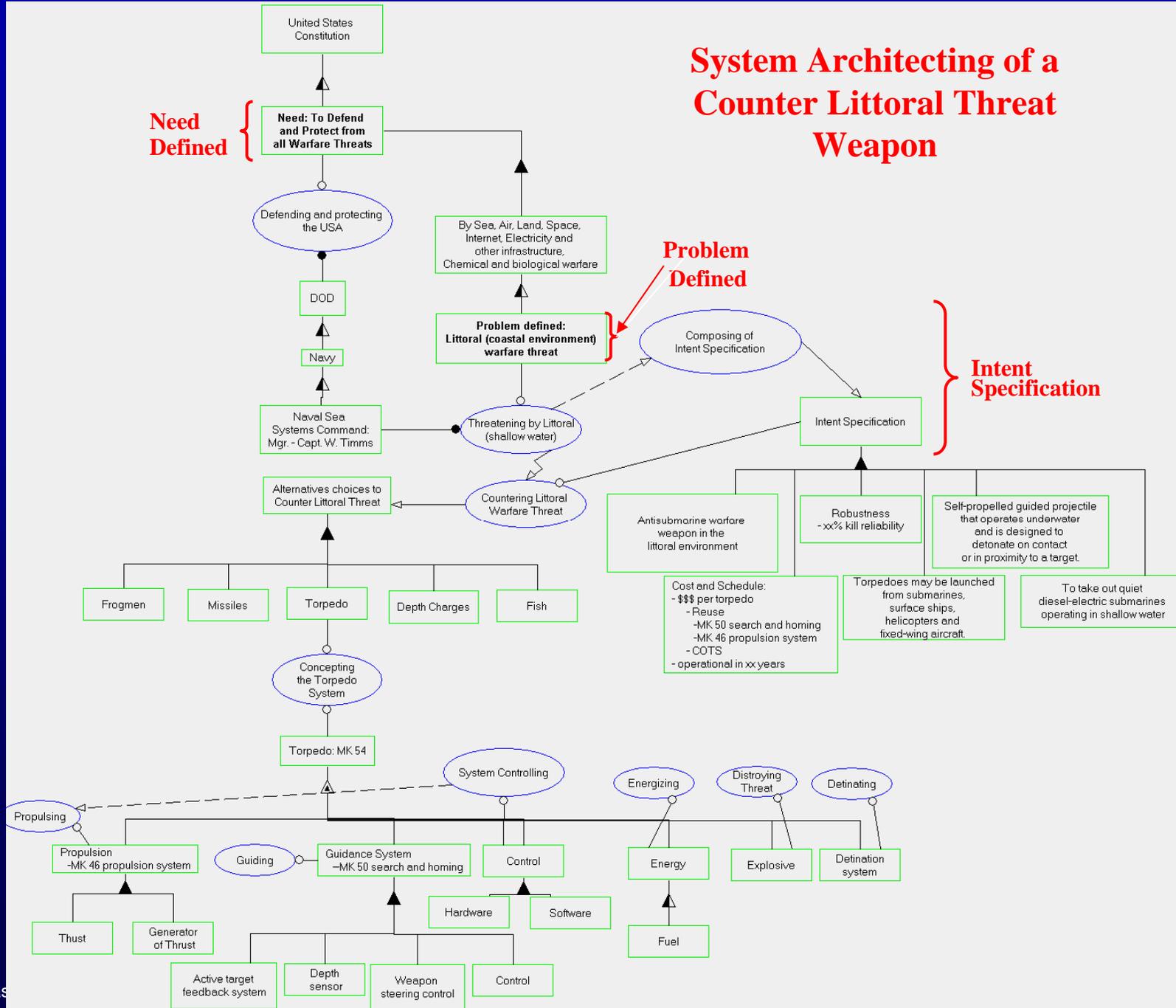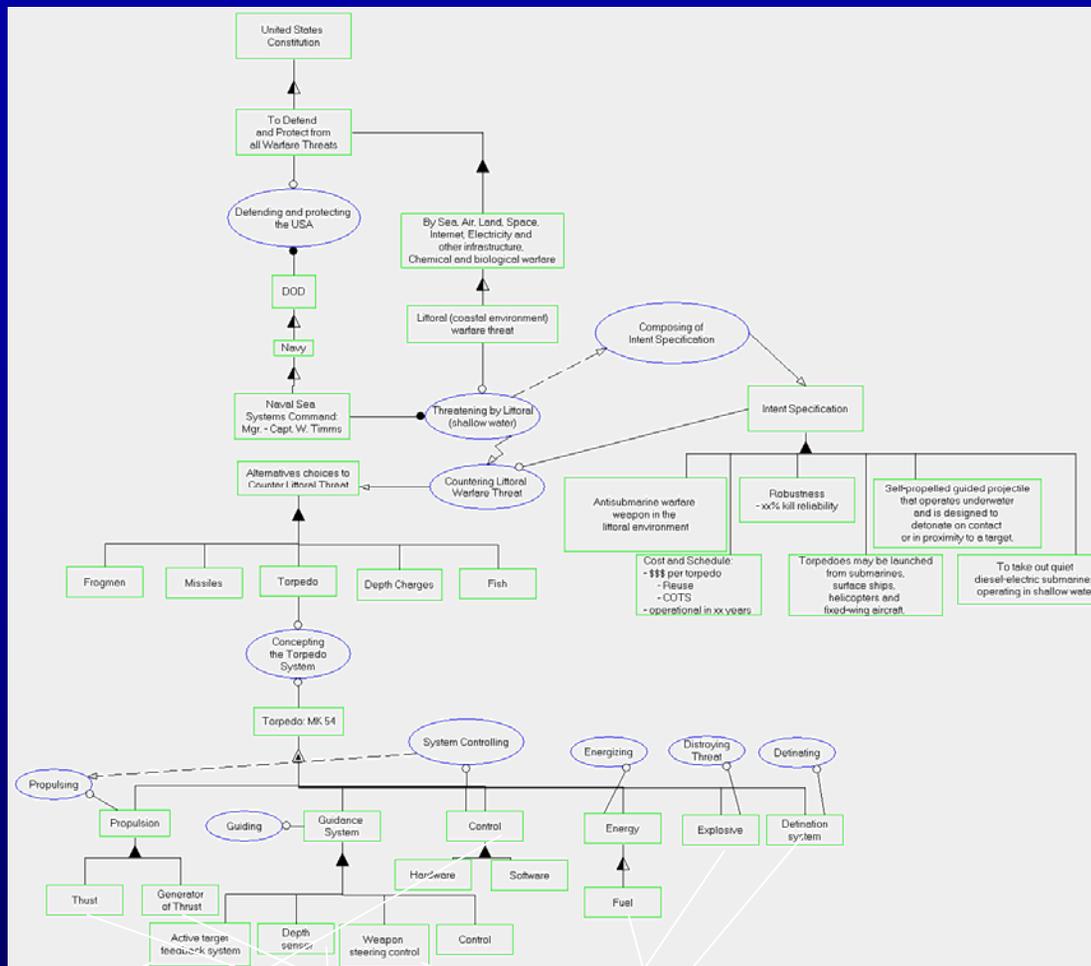
Schematic of torpedo, highlighting different subsystems, removed due to copyright restrictions.

Concepting the Torpedo System

Torpedo: MK 54

System Controlling

Energizing

Distroying Threat

Detinating

Propulsing

Propulsion
-MK 46 propulsion system

Guiding

Guidance System
—MK 50 search and homing

Control

Energy

Explosive

Detination system

Thust

Generator of Thrust

Active target feedback system

Depth sensor

Weapon steering control

Control

Hardware

Software

Fuel
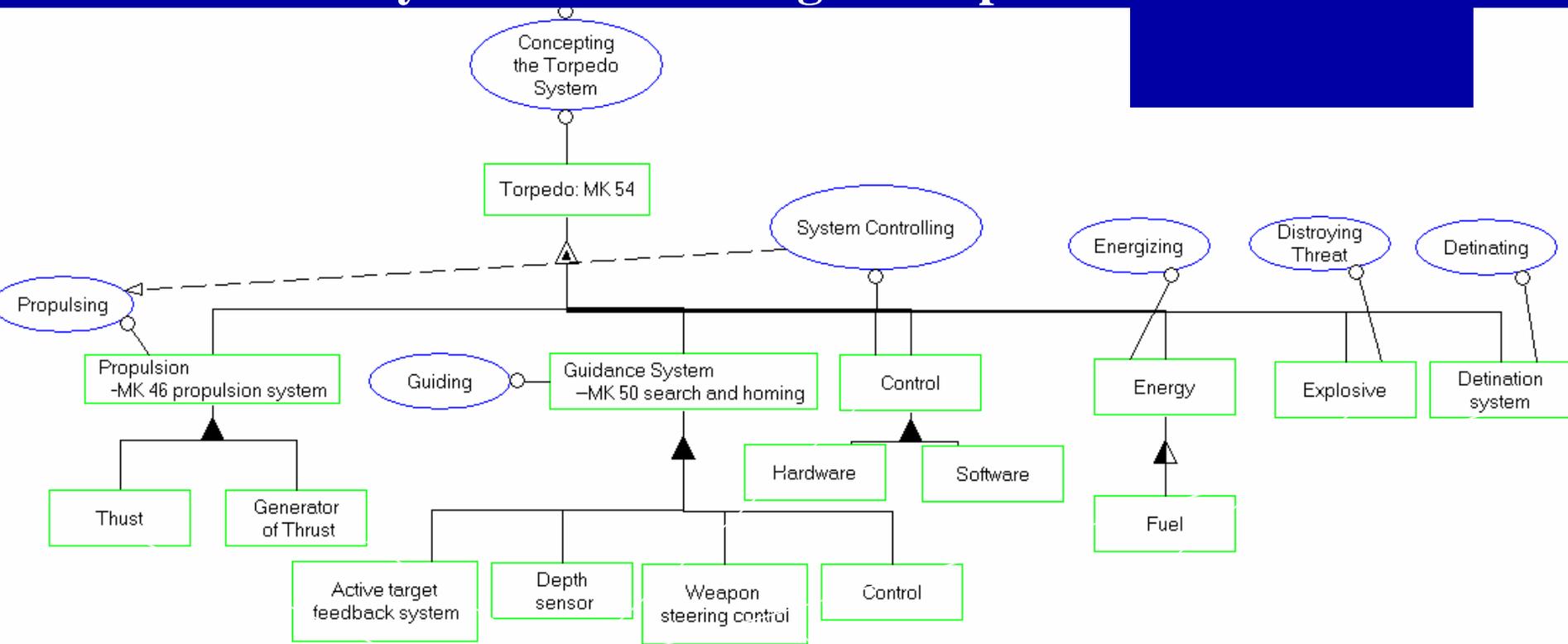
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Progression of Principles Development as Applied Radiant Thinking

1. Collect data

2. Make observation(s) from the data based on analysis

3. Empirically verify observations

4. Describe observation(s)

5. Develop Descriptive principle

6. Develop Prescriptive principle

7. Develop Normative principle

8. If universally true, then make a Law
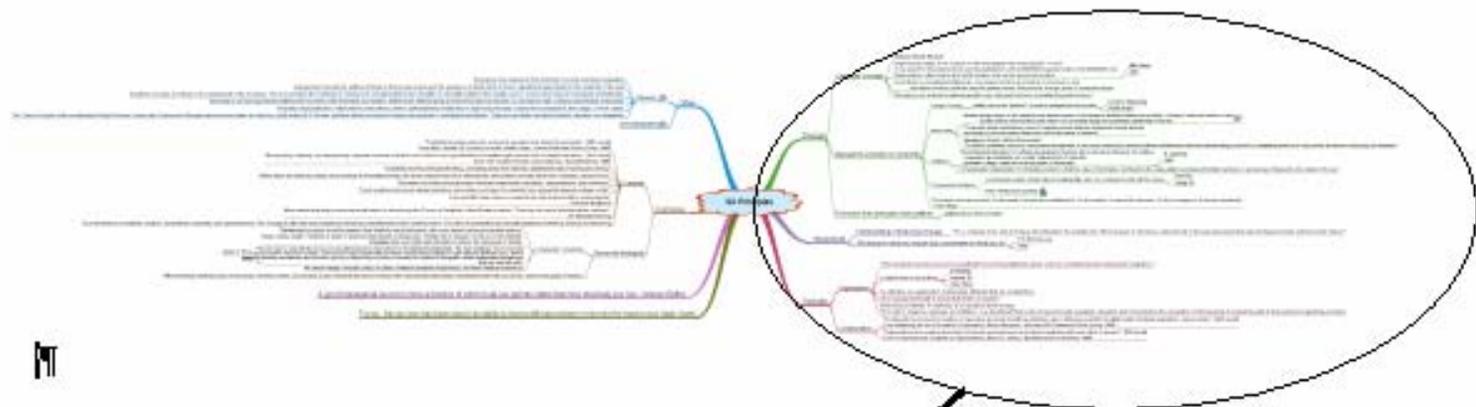
Literature Search Map

Thomas H. Speller
September 20, 2004
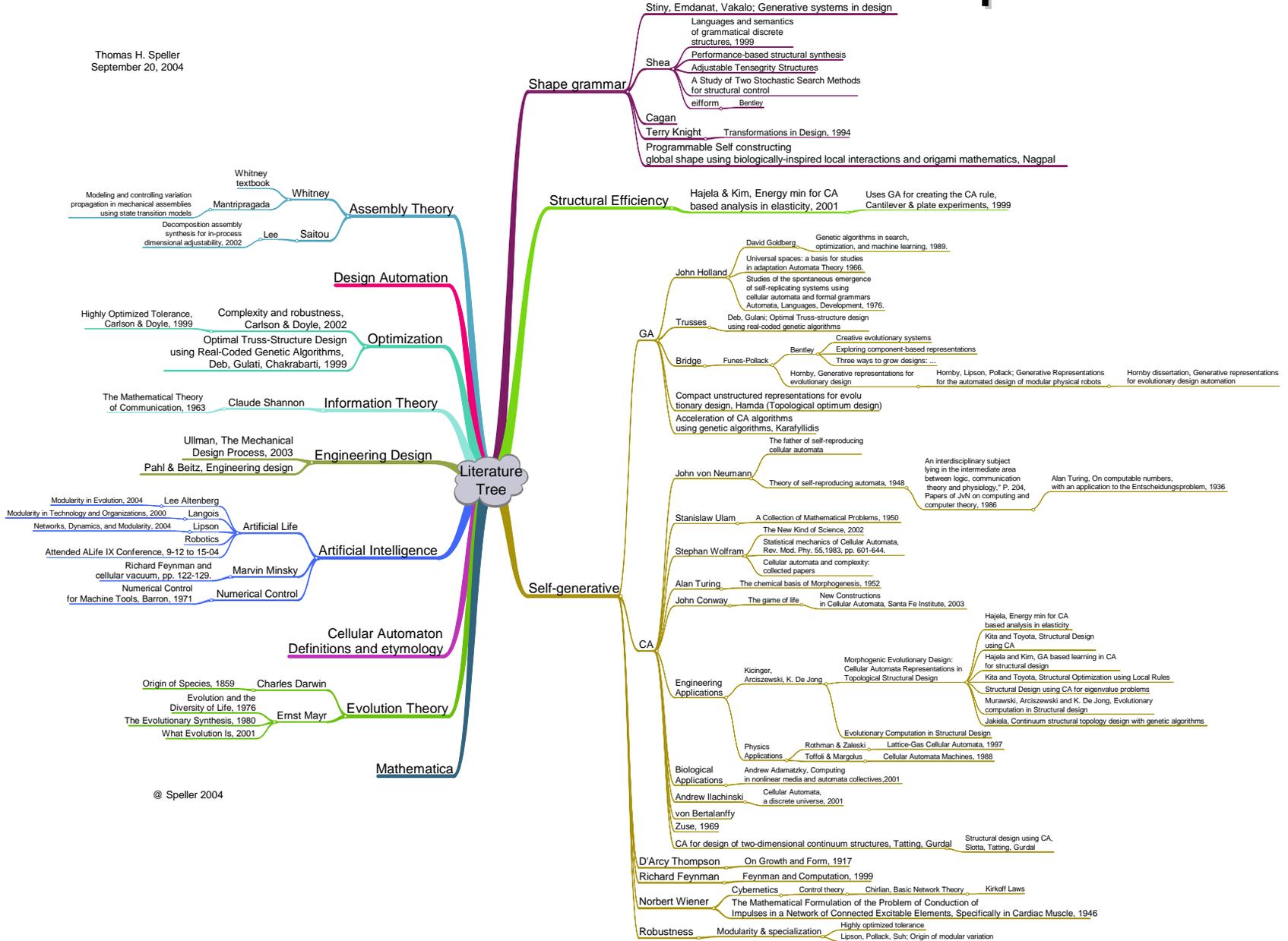
@ Speller 2004

Application #1 – Reading Notes

- Recording Short Statements while reading an article or book is relatively Quick, and provides a platform for memory retention, as well as future output.

- Example:
  - Product Design and Development – Customer Needs Identification
    - Use Mindmap to summarize key points of chapter.
    - Use Mindmap to display key points in Document Outline Form (conversion to Word)

Chapter Sections

Examples/ Points

Gather Raw Data from Consumers

Steps
- Interview
- focus group
- observe the product in use
- survey (written)

Choosing customers
- lead users
  - capable of articulating needs
  - may have already invented solutions
- Customer selection matrix
- for industrial/commercial
  - phone book
  - sales group
- for consumer products
  - more difficult
  - what's in it for them?

Documenting
- audio recording
- notes
- video
- still photography

Interpret raw data in terms of customer needs
- Needs are expressed as written Statements
- the result of interpretation of the underlying need
  - based on raw information
  - supplied by customer
- Express what the product has to do
  - not "might" do
  - not "Should" do
- Express need at same level as raw data
- use positive, not negative phrasing
- express need as product attribute
- avoid "must" and "should"
  - do not imply levels of importance
  - avoid value judgement

Eppinger Model: Identify and Characterize Customer Needs

Organize needs into a hierarchy of primary, secondary, ... needs
- list of 50 to 300 needs statements
- print or write each on a separate card or Postit
- eliminate redundant statements
- group according to needs expressed
- for each group, choose a label
- consider supergroups
  - two to five groups
  - no more than 20
- review and edit the organized needs statements

Establish the relative importance of the needs
- Use hierarchy
- rely on consensus of team
  - based on experience with customers
  - educated "guess"
  - rapid, but less accurate
- based on further customer survey
  - minimum of 2 weeks
  - more accurate
  - is important, and probably worth the time

Reflect on the results and the process
- team challenge its results
- verify that it is consistent
  - with logic
  - knowledge
  - intuition
- Ask pointed questions
  - merit
    - is this worthwhile?
    - Did we satisfy our objective?
  - scope
    - Did we capture all the modes?
    - Did we do enough?
  - breadth
    - was it broad enough?
    - Was it specific enough?
  - need for follow-up?
  - were the customer's "valid Cross-sections"?
    - representative?
    - consistent?
    - sufficient?
  - what have we learned along the way?
    - Does it change anything?
    - do we need to do more?
  - How can we improve?
    - now
    - future

The Mind Map is very Concise:
If we convert the map to MSWord,
PowerPoint or MS Project Format,
we automatically get a "pretty good"
outline of our thought process …..

Slides and Notes are Automatic

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Example 2 – Summarize Concepts

Image removed due to copyright restrictions.

Taking "Live" Notes

- Mind Map is both quicker, and more efficient than hand notes for most lectures

- Mind Map is NOT necessarily good for Technical Lectures??????

Mind Map References

- Software
  - http://www.mindmapper.com
  - http://www.conceptdraw.com
  - http://www.mindmanager.com
  - http://www.mindjet.com/us/
  - http://www.torcomp.com/mindmapper/
  - http://freemind.sourceforge.net/wiki/index.php/Main_Page Freeware

  - Books

    The Mind Map Book, T. Buzan, Penguin, 1996.