U-SIT And Think News Letter - 44

Unified **S**tructured **I**nventive **T**hinking is a problem-solving methodology for creating unconventional perspectives of a problem, and discovering innovative solution concepts, when conventional methodology has waned.

Updates and Commentary

Dear Readers:

I could offer a variety of excuses for this long delay between newsletters, but I won't. I will note, however, that the automailing system used to send free ebooks and newsletters in English, Japanese, and Spanish has had its last known bug killed! (visit www.u-sit.net)

3. Mini USIT Lecture – 44

USIT – a Method for Solving Engineering-Design Type Problems

I. Continuation of Plastic Heuristics

Plastic heuristics are heuristics that are not limited to a specific type of problem but are generic in being applicable to multiple types of problems. The value of a generic heuristic is its potential for being adapted to diverse specific problems. Instead of memorizing multiple specific heuristics we can start with a representative generic version.

Name recall from first-letter cues is such a popular heuristic it is a tempting selection for demonstration of heuristic generification. The discussion in Mini USIT Lecture – 43 (See NL_43 §I) shows that first-letter attribute of a name is just one of multiple attributes that, taken together; resolve the unwanted effect – name recall.

It was also shown in that lecture that name can be joined with another attribute to produce the function recall-of-mental-image, where mental image is an attribute of a physical object (a person). This comes about from the chaining of A – (F or U) – A links, as illustrated. The common denominator, so to speak, in this linkage is that the three attributes being joined all pertain to the same object. A complete graphic is shown below having O_j as the common object.

$$\begin{array}{l} O_j - \{A_i, \ldots\} \\ \qquad\qquad\quad \backslash \\ \qquad\qquad\quad U - A_j - O_j \\ \qquad\qquad\quad / \\ O_j - \{A_k, \ldots\} \end{array}$$

In this graphic, A_j is one specific attribute of the object O_j while A_i and A_k are two other attributes of the set $\{Ai, \ldots\}$ characterizing the same object, O_j. In words, this graphic is a generic heuristic used to remember that *two attributes of a given object can be used to recall a third attribute*. Note that in the case of recalling a person's name the set of attributes, $\{ A_i, \ldots\}$, refers to the set stored in the recaller's mind, whether or not they are immediately accessible.

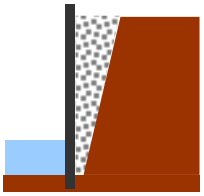
An even more generic rendering of this heuristic is achieved by dropping "to recall" as a specific function and simply remembering this heuristic as "*an object may have a three-attribute function*".

At this point, these ideas are unproven theory. Do they work? If one can use them to solve a problem, they do. Otherwise, they don't.

An obvious first check on this generification is to search for an example of a single-object, three-attribute function that does not refer to the function to recall. The first to come to my mind is the function "to render the color white", which can be supported with three attributes of color (an information object), red, green, and blue, or yellow, magenta, and cyan, or any other complimentary triplet (see a color wheel). There are better examples of a single-object, three-attribute function.

It seems to me that in name recall, having an occupation, the first letter of a name, and then recalling the person's name is a more powerful triplet of attributes than three complimentary colors. The former are rather generic while the latter are more like being of the same species.

A better example may be a seawall problem I solved. A fifteen-foot section of an eighteen-year-old seawall bulged at its bottom allowing leakage between the steel panels (mud flowed into the river). Plausible cause was deemed to be flow of wet earth against the seawall allowing build up of earth and increased stress on the seawall. A uniqueness of this problem was that the unwanted effect probably existed during days of heavy rain and afterwards disappeared when the earth dried and hardened in place.



I began to think of this as an effect, to flow, and three attributes of the object mud: particle size, water content, and viscosity. From that basis came the idea to increase particle size. And that led to the idea of replacing some of the backfill dirt with large gravel.

Notice that in this thought process that the three-attribute function heuristic simply produced a different perspective of the unwanted effect. At the moment, it was an effective perspective.

Perhaps you can cite other examples of plastic heuristics.

********** to be continued **********

II. Continuation of Left-brain Right-brain Participation in Solving Technical Problems Using Plastic Heuristics

Correction: The second sentence of the first paragraph in the last mini-lecture (NL_43 §II) should have read as follows – "In these lectures I am examining an alternative approach using (not "to") an attribute-centered focus."

Flying off of the handle. The last exercise, in NL_43 §II, asked for pairs of causal attributes that support the unwanted effect of an axe head flying off of its handle during use. A common solution is to cut a slot in the handle, insert it into the axe head, and drive a wedge into the slot of the handle to expand it into the hole in the axe head thus securing it in a lock-and-key fashion. Sometimes the assembly is soaked in water to cause the handle to swell. Another known solution is to make the handle and head from a single piece of metal. And another is to taper the hole and handle so the head cannot be removed from the outer end of the handle.

These two objects make contact on the inside surface of the axe-head hole and the immediately opposing surface of the handle. I thought of

- axe-head *surface roughness* and handle's *compliance* (a lock-and-key model),
- *friction* at the interface and *angular momentum* of axe head, and
- *size* of handle and its *moisture content*

. As I pondered the lock-and-key idea I thought of various pins and bolts joining the handle to the head.
. Surface roughness and compliance brought to mind a fish-scale surface, smooth in one direction and rough in the opposite direction.
. Friction and angular momentum brought to mind a hollow handle having its sides slotted and containing a movable ball. Two slots are cut in a "U" shape to form two springboard-like structures. The ball rests in contact with two such springboards. Angular momentum then drives the ball harder into the springboards spreading them more tightly into the axe-head hole and into indentations in the axe head.

"Agramatic but Numerate"*

We've been considering the idea of subduing the "talkative" LB to let the "silent" RB have more freedom in problem solving and wondering if this is relevant to problem solving. The following paragraph summarizes an article I read that, in a curious way, is relevant to this discussion.

Work at the University of Sheffield[1, 2], discussed in Scientific American[3], describes very interesting observations of mathematics performed by three, profoundly aphasic middle-age men. Each suffered from large left-hemisphere perisylvian lesions. Yet all three were able to solve mathematical problems involving recursiveness and structure-dependent operations (expressions containing brackets). They did this in spite of severe loss of ability to speak or understand spoken or written language. These observations challenge conventional wisdom concerning the extent to which language enables other higher cognitive functions. "To our knowledge, these results demonstrate for the first time the remarkable independence of mathematical calculations from language grammar in the mature cognitive system."[1]

This work raises interesting questions about how we use USIT to invent new ideas in problem solving. It is especially relevant to our ongoing discussion of left-brain and right-brain roles in problem solving.

My approach to understanding and applying USIT, in my mind, is both verbal and graphic. I spend considerable effort in "talking through" problem definition and analysis. Much of this effort is supported with simple sketches. Carrying an analysis to the depths of root cause requires, for me, constant use of language. As I shift into concept generation graphic images play a stronger role and language plays a lesser one.

Looking at this mental activity from a higher level, it seems to me that both language and image activities in problem solving are effective for creating metaphors having pregnant ambiguity – ambiguity ripe for sparking unusual concepts. Such sparking occurs in the subconscious as the recently surfaced (problem-relevant) objects, attributes, and functions seed the non-verbal depths of our minds.

I think this study encourages our continuing pursuit of means to engage right-brain participation in our problem-solving efforts.

_____

1. "Agrammatic but numerate", Rosemary A. Varley, Nicolai J. C. Klessinger, Charles A. J. Romanowski, and Michael Siegal, PNAS March 1, 2005, **102**, 3519-3524. (See www.pnas.org/cgi/content/abstract/102/9/3519.)
2. "Structures of Words vs. Structures of Numbers", http://itre.cis.upenn.edu/~myl/languagelog/archives/001944.html.
3. "Math without Words", Philip E. Ross, Scientific American June 2005, pp 27-30.

* The translators of the newsletter will have fun with this title. ☺ (I suggest leaving it as is.)

---------- LB/RB Participation in Solving Technical Problems Using Plastic Heuristics will be continued. ----------

8. Other Interests

1. Have a look at the USIT textbook, "Unified Structured Inventive Thinking – How to Invent", details may be found at the Ntelleck website: www.u-sit.net (*Note*; not www.ic.net)
2. USIT Resources

Publications	Language	Translators	Available at …
1. Textbook: Unified Structured Inventive Thinking – How to Invent	English	Ed Sickafus (author)	www.u-sit.net
2. eBook: Unified Structured Inventive Thinking – an Overview	English	Ed Sickafus (author)	www.u-sit.net
	Japanese	Keishi Kawamo, Shigeomi Koshimizu and Toru Nakagawa	www.osaka-gu.ac.jp/php/nakagawa/TRIZ/
"Pensamiento Inventivo Estructurado Unificado – Una Apreciación Global"	Spanish	Juan Carlos Nishiyama y Carlos Eduardo Requena	www.u-sit.net
3. eBook "Heuristics for Solving Techncial Problems – Theory, Derivation, Application" -- **HSTP**	English	Ed Sickafus (author)	www.u-sit.net
"Heurísticas para Resolver Problemas técnicos – Teoría Deducción Aplicación"	Spanish	Juan Carlos Nishiyama y Carlos Eduardo Requena	www.u-sit.net
4. U-SIT and Think Newsletter	English	Ed Sickafus (Editor)	www.u-sit.net
	Japanese	Toru Nakagawa and Hideaki Kosha	www.osaka-gu.ac.jp/php/nakagawa/TRIZ/
	Korean	Yong-Taek Park	www.ktriza.com.

Please send your feedback and suggestions to Ntelleck@u-sit.net and visit www.u-sit.net

To be creative, U-SIT and think.