U-SIT And Think News Letter - 40

Unified Structured Inventive Thinking 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:

- This newsletter begins with some concluding remarks on inventing a new drinking vessel. At some point (when I can find some free time) I'll summarize those lectures.
- The discussion of left-brain and right-brain participation in problem solving is continued. However, a new aspect is being added, namely "plastic heuristics". Can you guess what they are?

3. Mini USIT Lecture – 40

USIT – a Method for Solving Engineering-Design Type Problems

1. Conclusion of "**How to Invent a Better Drinking Vessel**"

Many heuristics have been published over the years for use in inventing. Of course, the most popular, and most used, is brainstorming. For speed, brainstorming is hard to beat. It gets things done quickly. But it is more like flushing the mind of the obvious. Too often this is where problem solving ends for many technologists. Yet this is where one should now turn to structured problem solving; it's the ideal place to begin USIT.

One heuristic of USIT has been demonstrated in the foregoing mini-lectures on inventing a new drinking vessel. I refer to this type of problem as invention based on a prototype. It is a common situation that industrial problem solvers often face when their company decides that it is time to reinvent a product. As demonstrated, the key to this heuristic is to tie attributes into new functions without immediate concern for objects – a fresh perspective.

Heuristics are the heart of problem solving methodologies. Heuristics used by engineers and scientists in solving design-type problems are the non-algorithmic, empirical tricks, tools, and techniques learned academically and from experience. They do not solve problems. Instead they give pause to look at problems in different ways for new insights.

In this newsletter I will begin discussing the nature of heuristics as presented in the free ebook, "Heuristics for Solving Technical Problems – Theory, Derivation, Application" (see USIT Resources at the end of this newsletter).

--------------------------- ---------------------------------

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

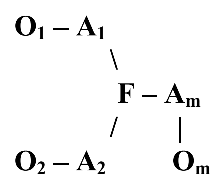
Isn't this where we ended the last mini-lecture? Yes, it is, but notice the added reference to "plastic heuristics". So, where is this going? Current motivation goes something like this:

When I wrote "Heuristics for Solving Technical Problems" (HSTP) I used a very simple model for generating creative thoughts in problem solving. The model was, put simply, "seeding the subconscious and waiting for something to grow", i.e., for a fresh idea to come to the conscious. Upon finishing the manuscript I was disappointed with this model. I thought about rewriting the manuscript to incorporate a better model. Then I discovered that I didn't have a better model to propose. So, I decided that I would begin working one. This led to studying left-brain, right-brain thinking – a topic that quickly caught my imagination. Hence, my goal in the coming lectures is to discuss the nature of heuristics in problem solving, *a la* HSTP, and to look for obvious or reasonable implications of left-brain, right-brain participation in problem solving. My expectation is that a more useful model of creative thinking in problem solving will surface. For your sake, it may make the reading easier if I can separate specific HSTP discussion from specific LB/RB discussion – I'll try.

II.a HSTP:

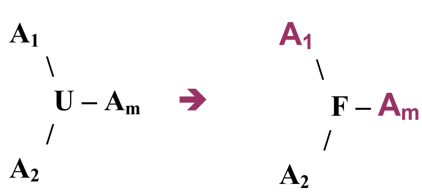
Plastic heuristics, what are they?

I am always impressed when stepping through the alphabet succeeds in bringing to conscious a name I desperately need. But I am far more impressed when reviewing the attributes of a drinking vessel an invention springs forth. It seems to me that stepping through the alphabet looking for a name and stepping through attributes to recall relevant functions are the same heuristic. This is what I mean by plasticity in heuristics. One heuristic, couched in proper terms, can be effectively used for disparate problems; e.g., "step through attributes". And the key here is another heuristic, namely, ambiguity. But what constitutes "proper terms". For one, ambiguity supports plasticity.



This idea is contained in the graphic heuristic used in HSTP. As shown in the figure (from HSTP, p34, Fig. 22), two objects, O_1 and O_2, each have an attribute, A_1, and A_2 respectively, supporting a function, F, that affects an attribute, A_m, of one of these two objects or of another object, O_m. Notice how a function can be thought of as being associated with three attributes (two in and one out, so to speak). Practicing this type of mental modeling begins to catalog functions in one's mind with multiple attributes. Notice, also that the model is ambiguous; i.e., no specifics are given.

When F in the figure is replaced by U we have a graphic model of an unwanted effect. Following the discussion in USTP, a graphic representation of solving a model using focus on attributes is illustrated in this figure:



The intent of this figure is to suggest that an unwanted effect can be modified or replaced to produce a desirable function by "activating" a new attribute (A_1).

The last figure and the last sentence state symbolically what is happening without using specifics. In the above examples specific attributes were implied:

Recalling a name …

person's features \
"can't recall" – name? ➔
/ **memory**

person's features \
"to recall" – name!
/ **A, B, …**

Inventing a drinking vessel …

thermal conductivity \
cause discomfort – pain ➔
/ **area of contact**

spine-like conduction path \
to protect – no pain!
/ **area of contact**

This demonstrates the plasticity of the graphic heuristic.

II.b LB/RB Participation

In the last lecture I was searching for plausible examples of RB's *spatial* thinking – "*Seeing where things are in relation to other things.*" (See table of LB/RB characteristics in NL_38.) Let's look for examples of other characteristics.

RB is *nonverbal*, as contrasted with LB's *verbal* thinking. LB verbalizes detailed steps of the cognition process in problem solving, but RB is not equipped with language for this purpose. Writing these sentences attests my LB's verbalization during solving a communication problem.

RB's forte is *synthesis* (*putting things together*), which complements LB's bent toward *analysis* (*breaking things down into parts*). This is evident in problem solving like assembling jigsaw puzzles. I sometimes pick up a jigsaw piece, examine its contours, and mentally verbalize its shape in terms of size and placement of convex and concave lobes around its periphery, its color, and its pattern. Then while holding it in view I look for vacancies in the partially assembled puzzle having these characteristics. The verbalization is LB activity. The recognition of a potential spatial vacancy is RB activity. On occasion, a piece is picked up and a vacancy noted before LB verbal characterization of its shape. This must be pure RB action.

Spatial synthesis in problem solving is one form of creative thinking that leads to discovery. Once I studied growth morphology of layered structured crystals; in particular, $NiBr_2$ platelets grown from the vapor phase. An unexpected form of two-dimensional accelerated growth spikes was discovered radiating from the steps of growth spirals. The root cause was a mystery until a three-dimensional model was constructed. Molecules were made from spheres of plastic having proper dimensions for Ni and Br. The assembled model revealed a high density of dangling bonds in the same crystallographic orientations as the 2D spikes.

RB is also characterized as engaging *actual* cognition – "*relating to things as they are*" – in contrast to LB's *symbolic* cognition – "*using a symbol to stand for something.*" As educated technologists, symbols are fundamental to our LB verbalization. Symbols like Θ, Ψ, π, e, i, ρ, σ, ω, λ, μ, Σ, and many more, are instantly understood without conscious interpretation (e.g., "absolute temperature", "wave function", "3.1415926535…" etc.). RB looks at these symbols and sees their artistic or curious shapes. LB looks at a cloud in the sky and instantly visualizes water droplets in turbulent circulation. RB sees the actual shape of a horse's head. LB sees a cairn next to a mountain trail and looks ahead to the mountain pass. RB notes the beautiful lichens covering the stones.

LB is also *abstract*, "*taking out a small bit of information and using it to represent the whole thing*". By contrast, RB is *analogical*, "*seeing likenesses among things; understanding metaphoric relationships*". LB can conduct detailed reasoning, manipulate concepts, and draw conclusions using abstract symbols to simplify concept representation; e.g., algegra. RB, pondering relationships, creates and recognizes metaphors. RB can paint a picture of a broken pencil to express pain.

LB can combine specific heat, density, and thermal conductivity into one abstract symbol and use it to scale time in heat flow analysis. RB can visualize the glowing end of a red-hot branding iron and see the exploding destruction of dermal cells at the instant of contact of the iron and animal hide.

LB's thinking is also *temporally oriented* in that "*it keeps track of time, sequencing one thing after another*." RB's thinking is *nontemporal* having *no sense of time*. LB neatly plots a process flow chart with detailed sequential steps accounting all resource inputs and product outputs at their appointed times and locations. RB can see the distorted body of a wrecked car and visualize what it will look like when repaired. It can reverse the process from the repaired body to the crumpled one and recognize all needed steps in reconstruction without concern for their sequence. In fact, RB can entertain the thought of all steps occurring simultaneously.

Is the lack of temporal thinking a source of whimsy? As I thought of this question it occurred to me that perhaps "whimsy" is LB's pejorative derision of RB.

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

8. Other Interests

1. Have a look at the 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

Publication	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"	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.