U-SIT And Think News Letter - 22

Updates and Commentary

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.

Dear Readers:

- Mini-Lecture 21 saw the completion of the barhopping problem and began discussion of how to invent *a la* USIT. This topic will be continued, but only briefly in this edition in order to accommodate a Q&A issue.

1. USIT – How to Invent: the USIT textbook.	$44.50
2. USIT – an Overview	FREE

3. Mini USIT Lecture – 22

"USIT – an Alternative Method for Solving Engineering-Design Problems"

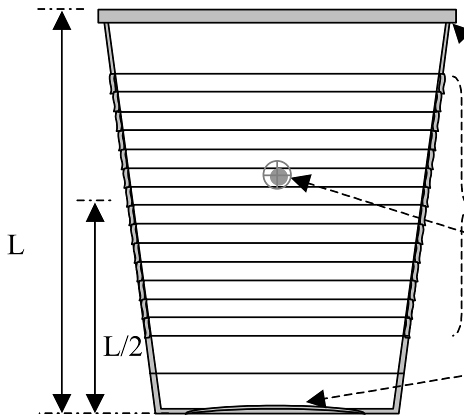
Continuation of **How to Invent** …

In the last USIT Newsletter, I began discussion of inventing using as an example the need to improve our company's market share for an existing product. Our strategy is to identify and incorporate a new function into the selected product. We need first a model product and then ideas.

Ideas spark ideas and so does analysis, so analyze to generate ideas
I would like now to demonstrate how analysis of an existing artifact generates ideas, which immediately spark new ideas. As ideas are uncovered you will find yourself generating new ideas (Axiom 3).

Looking for a common artifact in the classroom in Sicily, I noted a supply of bottled water and stacks of plastic drinking vessels (I'm tempted to call them "plastic glasses". I can see the email now!) I suggested that we analyze a plastic drinking vessel, and passed out one to each person present. (*) My approach to its analysis follows.

Determine visual characteristics
As the students began to toss out descriptive characteristics I made a sketch on the viewgraph. A better one is shown below. Note the pains taken to point out the obvious. A very important procedure in problem analysis is verbal and graphic description. The more detail the better. (**) That comment can get out of hand, however, when analyzing a large system in which object minimization has not yet been applied. I avoided the problem in this demonstration by selecting a simple object.



Drinking vessel

Attributes

- Shape
  - circular cross-section in plan view
  - trapezoidal cross-section in elevation view
  - thin wall
  - equally spaced parallel bands in the mid section
  - rolled-down lip
  - center of gravity above half-height
  - "oil-can" bottom
  - edges of bands have raised ridges
  - embossed lettering on the bottom

- Material
  - polymer
  - transparent
  - flexible
  - large elastic range
  - brittle (no plasticity)
  - light weight (relative to other vessels of comparable volume)
  - thermally conductive

- Technology
  - blow molded

At this point we have four goals: determine visual characteristics, other characteristics, functions (including unwanted effects) for the characteristics, plus supporting attributes. These can be approached sequentially, in parallel, or randomly. I find the ramdom approach with iterations to be the more natural. It is also probably the more efficient. For example, as a visual characteristic is recognized, it may spark ideas for fuctions or unwanted effects. So record them and continue. I show a serial start above, but will move to a more random process in the next mini-lecture.

It would be useful if you procede to fill in your own ideas before the next lecture.

(*) Those of you who teach problem solving may wonder if this choice of artifact is a wise choice. (I do sometimes.) My strategy in selecting something to invent is based on classroom experience and the need to make the exercise efficient and interesting. By choosing a common object no time is lost in making sure everyone present understands the object. Sketches can be very simple. Students are more apt to see the common object as so common as to offer little opportunity for improvement. Thus, they are less apt to waste time using their intuition to come up with a quick solution. Hence, it is easier to establish and maintain focus on understanding the process of invention. It also adds some suspence.

Of course, the choice of a common object still begs the question of any significant outcome. Here I would argue that it is more important to teach the process than worry about the results. But I also know from experience that spontenity of this process captures everyone's imagination and has always produced new ideas. I enjoy this spontenity and the excitement it produces. Consequently, I want to participate in discovery with the class and do not work out the process ahead of the class. But this is not for everyone. Some students prefer to have class presentations "cut and dried", so to speak, with all details preworked and contained in handout lecture material.

Another reason for this procedure is it simulates very nicely the atmosphere of a team charged to improve a product. I think most students recognize this by the end of the exercise.

(**) Written and sketched observations are commitments to a current state of thinking. They immediately start the brain challenging the commitments and making improvements through clarification. Uncommited thoughts lead to slow progress amid foggy thinking.

****** To Be Continued in the next USIT Newsletter ******

5. Problem-Solving Tricks and Related Miscellany

6. Feedback

Questions you would like to have discussed are welcome.

7. Q&A

Exploring Transduction

From Switzerland …

"Dear Ed,
As one of your attentive readers, once again I would like to thank you very much for your generous contribution to the inventive methodology.

Even if my questions don't follow your well thought path through USIT, I would be very interested to know what kind of tools (DB's, software, ...) you prefer -if any- to explore transduction opportunities?

Kind regards,
Claude Meylan"

Dear Claude, thanks for your nice comments and your excellent query. I'm sure other sagacious readers may have wondered the same thing.

I think this is a natural question for readers because we have come to recognize and use so many computer aids in our technical work. It may also be prompted by the fact that some commercial problem-solving methodologies sell software aids. An even more direct association is the technical use of the word transduction, which brings to our minds learned examples such as piezoelectricity, elasticity, and other <u>named</u> tensor properties of solids. The latter may cause wonder about the existence of cataloged transduction phenomena.

Firstly, when I learned systematic inventive thinking from Roni Horowitz and associates (1955) I was impressed with its aim. It was noted that SIT is simpler than other problem-solving methodologies and does not require computer aids. The idea of no computer aids caught my imagination. I liked the idea of a mental methodology that required no crutches, one that could be a part of my fundamental way of thinking. So I have intentionally avoided the urge to produce software. (I also encourage students to wean themselves from flowcharts as early as possible.) This is not a putdown of software aids. It is simply my preference.

Secondly, in my mind I visualize transduction qualitatively in the tensor sense; namely, the association of two attributes within the same object. I argue that in the pre-engineering stage of problem solving we need only identify the associated attributes. Consequently, we can make them up (subject to their plausibility) and then evaluate their role in solving a problem. Later, in the engineering stage we can inquire of their existence. If they don't exist as recognized phenomena, it does not mean that they are impossible. There must be many transduction phenomena yet to be identified. Since my background is in solid-state physics research, I have always been on the lookout for new transduction phenomena. And I am impressed when I read of a new one, which happens frequently in the literature.

Also if a particular pair of attributes has not been recognized as being coupled in transduction, it suggests continuing the search for other intermediate attribute pairs to complete the needed A-F-A chain.

A final note on transduction is that the pursuit of transduction phenomena forces us to focus on the association of pairs of attributes. I find that this exercise, during the solving of an engineering design problem, can spark unusual ideas. These ideas are sometimes not even transduction but simply associations not previously recognized. Transduction is used as a metaphor.

I hope my answer is not too disappointing to you. If this is published in the USIT Newsletter perhaps some readers will respond with other, more useful ideas.

Thanks again for the thoughtful inquiry.

All the best, Ed

(I thank Claude for permission to publish this Q&A.)

<u>By the way, does anyone have sources of cataloged transduction phenomena to recommend?</u>

8. Other Interests

- Regarding inquiries about ordering the book, "Unified Structured Inventive Thinking – How to Invent", details may be found at the Ntelleck website: www.u-sit.net. The cost of the book is US$44.50 plus shipping and handling. See the website for S/H charges. Send a check made out to **Ntelleck, LLC** for the proper amount, drawn on a US bank, to

Ntelleck, LLC, P.O. Box 193, Grosse Ile, MI 48138 USA

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

To be creative, U-SIT and think.