U-SIT And Think News Letter - 26

Updates and Commentary

1 USIT – How to Invent
2 USIT – an Overview
3 Mini Lecture
4 Classroom Commentary
5 Problem-Solving Tricks and Related Miscellany
6 Feedback
7 Q&A
8 Other Interests

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 25 digressed from the ongoing topic of a USIT strategy for invention. Here we continue the discussion and begin a few requested sessions of classroom commentary.

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

3. Mini USIT Lecture – 26

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

Continuation of **How to Invent** …

Recap of Mini USIT Lecture 24
In mini-lecture 24 we were systematically working our way though the CAF table generating new concepts for a drinking vessel. We reached [SC09]. This lecture continues from that point.

CAF table update

Claude Meylan, Switzerland, has an excellent suggestion for another characteristic type of attribute, ecology. *"We could consider the whole life cycle of this drinking vessel and especially its life after use. In that sense, the attribute could be the durability … The associated unwanted effect is obvious: it's pollution. We could consider its energy input as an attribute or other ecological parameters."*

The CAF table has been appropriately appended to include Claude's recommendations.

#	Characteristics	Attributes	Functions (and associated unwanted effects, •/▪)
20	ecology	• durability (*recyclability)	▪ pollution
21		• energy input	▪ reduction of natural resources

I remember examining the bottom of the drinking vessels in the classroom in Sicily, looking for advertising information. But I don't recall seeing a recycling icon. I don't think the idea crossed my mind. The addition of ecology broadens our search for functions and unwanted effects.

* After making the above additions to the CAF table and then mulling on recyclability of a drinking vessel I wondered if "durability" could be elaborated in some useful sense? For example, durability is needed from the point of blow-molding fabrication to the end of user's need for the drinking vessel. After that it needs to be non-durable for recycling. Nothing better comes to mind so I'll insert it as the parenthetical note in the CAF table and move on.

Methods for inventing
… Continuation of inventing new drinking-vessel concepts

[CAF3F1]: "thin wall – to reduce material cost". Reducing material cost by using less material begs the question of what drives material cost (charged by a supplier)? Obvious answers from the supplier's perspective are raw material costs, material formulation, processing, packaging, shipping, and warranty costs, as well as volume-of-sales cost discounts, and desired profit. Each broadens the opportunity for invention. But we are not consulting with our company's suppliers. At the moment we are still in the closed world of our company's environment.

Thin wall has implications relevant to several material and fabrication attributes related to thickness:

1. material continuity during blow molding (too thin may produce holes and separations),
2. stiffness for reacting applied force of grasping (too thin would allow deformation tending to displace vessel contents to overflowing),
3. decreased resistivity to transverse heat flow (across the thin wall),
4. increased resistivity to longitudinal heat flow (along the thin wall),
5. decreased transverse electrical resistance,
6. increased longitudinal electrical resistance,
7. decreased buckling strength, and
8. less (destructive) impulse when a lighter vessel is dropped to the floor.

Notice that each of these implications, except the first two (continuity [CAF3F2] and stiffness [implied in CAF4F2]), contains an attribute not introduced in the CAF table. How did this happen?

It happens because we begin constructing the CAF table by listing obvious attributes of a drinking vessel ***and*** their inferred functions or unwanted effects they support. During the subsequent process of examining each tabulated attribute for new ideas we begin to discover unused attributes. These are "unused" in the sense that we did not recognize a potential use or related unwanted effect during construction of the table. In this way, the CAF table becomes a tool for discovery.

SC10 [CAF3F1]: "thin wall – to reduce material cost". Thinness can be optimized and artistic value increased by introducing imaginative patterns of vertical and circumferential convolutions in wall contour.

SC11 [CAF3F2] Thinness leading to holes brings to mind to blow mold in two steps. The first step intentionally creates a thin wall and resultant holes. The second step applies a second, inner layer of different color to produce a two-tone artistic product having adequate continuity and stiffness.

SC12 [CAF4F4] "Equally spaced parallel bands in mid section – produce too narrow bands allowing interlocking of nested containers and interfering with single-container removal." First, design slope of

vessel and radial width of narrow bands to produce slight positive interference with a neighboring vessel on stacking. Thus a small, applied axial pressure will engage the bands and provide vessel-to-vessel stiffness for stacking. Second, design each circumferential band with periodically spaced gaps having no protruding band structure. Successive bands on the same vessel are staggered in angular positions. Stacking is done (by machine for packing) with bands stacked having their gaps out of phase with each other. Then on applying a small angular twist, that aligns a band section with a gap on the next vessel, an end-most vessel can be removed easily from a stack without toppling the stack.

SC13 [CAF5] "Rolled-down lip – increases surface-to-lip contact area lessening dribble. Divide the lip into narrow circumferential sections separated by very thin material, or even parted, to reduce dribble and produce a very flexible rim for comfortable compliance to lip shape.

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

4. Classroom Commentary

Professor Toru Nakagawa has requested discussion on several questions relevant to the practice of USIT. They strike me as being of general interest to this newsletter readership. I would like to address these questions but do so individually in separate USIT newsletters. The first one follows.

Nakagawa Query #1 (In reference to the "messy newspaper ink" problem discussed in USIT NL_01 to NL_18.)

> *"So far you have developed a large number of conceptual solutions. Could you please show us some way to make a system of such solutions? Can we review them quickly in some systematic way?"*

Now that we are well into the drinking vessel problem, I'll use it as an example. This way the discussion will fit into the current topic.

I recognize the utility of the tool being requested. It would be especially useful for individuals and problem solving teams to track their progress and for reporting to their management.

Such a summary is a straightforward extension of the CAF table, as shown here.

CAFS – Summary of Solution Concepts

#	Class	Attributes	Functions, •/, and associated unwanted effects, /▪)	Solution Concepts

I have changed the name of the second column from "Characteristics" to simply "Class", as suggested by Matt Smith, where class refers to a superior level of attributes. Classes are selected for convenience of organization for each particular problem being summarized. Our current state of progress on the drinking vessel is illustrated below. To correlate columns for ease of reading, bullets have been changed to letters. Thus CAFS1F2 becomes CAFS1Fb. But this notation is becoming cumbersome, so I'll drop the CAFS part. Then 1F2 becomes 1Fb. It may be convenient to use succinct notes in the Solution Concepts column (as in illustration) and include backup explanatory material for details.

CAFS – Summary of Solution Concepts for a Drinking Vessel

#	Class	Attributes	Functions •/, and associated unwanted effects, •/▪	Solution Concepts
1	shape	• a) circular cross-sections in plan view (D_1 to D_2) • b) circles are concentric	• a) to minimize depth of liquid at sides of mouth preventing dribble while drinking, • b) to simplify blow-molding tools minimizing cost.	a) SC03: extruded mouthpiece; collapsible when not in use b) SC04: capability of blow molding not yet exceeded (don't count as 4th concept)
2		• A) truncated-cone cross-section in elevation view (shown above; $D_1 > D_2$) • b) axis of symmetry is a straight, vertical line • c) conical shape is a surface of revolution about the symmetry axis	• A) to ease removal from molding tools reducing defective parts, • b) to aid stacking, thus, minimizing storage space, • c) to reduce slippage when grasping (imagine grasping an inverted trapezoidal-shape container ($D_1 < D_2$).	b) SC05 Contrarian solution – tilted axis: shape forms a serving scoop. b) SC06 Contrarian solution – tilted axis: scoop for measuring desired volumes. b) SC07 Contrarian solution – tilted axis: low aspect ratio for serving hospital patients b) SC08: blow mold in groups with joined tops for more stable stacking c) SC09: pores (bubbles) in wall to roughen surface for grasping; reaction of additives may produce bubbles
3		thin wall	• a) to reduce material cost ▪ b) if too thin (tooling design and quality control issues) it causes non-uniformity of polymer thickness during blow molding and subsequent weak regions for later failure. ▪ c) too thin makes vessel too hot for grasping	a) SC10: patterned convolutions to strengthen thinner walls and add artistic value b) SC11: two-layer thin walls using 2nd layer to close holes in 1st and add artistic value c) SC01: roughen surface with dimples to reduce path for thermal conduction c) SC02: spiral dimples to guarantee alignment of dimples
4		equally spaced parallel bands in mid section	• a) to roughen surface increasing resistance to slippage from grasp, • b) to strengthen shape against distortion while handling, • c) to produce an attractive pattern (information) improving an uninteresting appearance, ▪ d) too narrow bands may allow interlocking of nested containers interfering with single-container removal.	d) SC12: broken circumferential bands with positive interference for stacking and twist release for removal

5.	Problem-Solving Tricks and Related Miscellany	
6.	Feedback	Suggestions / corrections / etc.
7.	Q&A	Questions you would like to have discussed are welcome.

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

APOLOGIES
APOLOGIES
APOLOGIES to my readers.

While attempting to send requested back issues of all USIT Newsletters, I inadvertently resent the last newsletter. … sorry about that, ED

(A request has been made to translate these newsletters into Korean. I'll let you know when it happens.)

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

To be creative, U-SIT and think.