



U-SIT And Think News Letter - 02

Updates and Commentary

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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.

Dear Readers:

- Thank you all who confirmed your successful receipt of NL01.
- Thanks, too, for your kind remarks (see Feedback).
- In NL01 an exercise was offered, and object minimization alluded to. An opportunity arose this week to solve a deck of cards problem– actually, a mathematics problem – using this USIT heuristic. It is discussed in Problem-Solving Tricks and Related Miscellany.
- Mini Lecture – 02 continues the ink-smearing problem.

1. USIT – How to Invent: the USIT textbook.

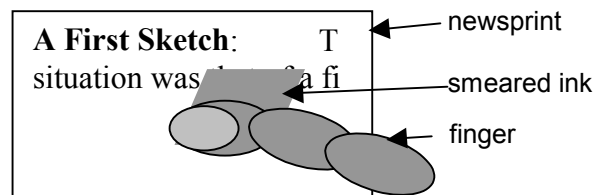
2. USIT – an Overview

3. Mini Lecture – 02

Well-Defined Problems Have a Minimum Set of Objects

Mini-lecture-01 started out heading toward creation of a well-defined problem. It gave an example of an ill-defined problem and challenged us to unravel it into as many un-wanted effects as we can find. Then it posed an unintuitive attack – minimize the number of objects. But, is that sensible? If you want to find as many unwanted effects as possible, wouldn't you want as many objects as possible? Of course, the answers are yes and no. Emphatically, NO! The most important underlying, basic, fundamental, essential, attack on a problem is to **simplify** it. Minimization of objects instantaneously simplifies a problem. (See example in Problem-Solving Tricks and Related Miscellany.)

My last mini-lecture posed the following problem situation: A publisher speaking: “*The ink on our newsprint is messy. Fix it!*” The first image that came to my mind when I composed this problem situation is that of a finger smearing ink on newsprint. (Those darker ovals in the figure represent phalanxes of a finger.)



The exercise given was to unravel this situation into as many unwanted effects as you can.

Part of forming a well-defined problem from an ill-defined one is clarification of terminology. The word “messy” is not specific in this problem situation. It includes ink smearing on the paper and a number of effects of ink transferring off of the paper. This is an ill-defined problem in need of better focus. By identifying underlying unwanted effects we will be better able to direct our efforts efficiently, identify plausible root causes (next mini-lecture), and get to the heart of a well-defined problem.

Unwanted Effects: Some possible unwanted effects include:

- ink smudges on a reader's hands,
- ink marks on a reader's clothing,
- ink smears on the paper,
- ink accumulation on handling equipment, and
- unpleasant ink odor.

Note the objects these unwanted effects imply: ink, paper, hands, clothes, equipment, and nose. Allowing more objects allows more unwanted effects. For example, cost of cleaning the seats of a delivery person's car. Cleaning issues introduce additional objects. To keep the identification of unwanted effects relevant and manageable, and to sustain an efficient process, minimize the number of objects.

Object Minimization: There are four obvious objects in this problem situation: ink, paper, finger (or other objects marked by ink), and the surrounding air – they are all in contact. To form a minimal set we need to find a way to think about the situation that enables omission of objects without losing the problem. One way of looking at this situation is to omit finger and see if the problem still exists. Granted finger does the smearing but the printed ink has the capability for being smeared before finger makes contact with the ink. The first four unwanted effects have a real or analogous finger; i.e., something making contact with ink becomes marked by the ink. So I'll eliminate the "something making contact with ink" leaving ink, paper, and air. It seems to me that I can eliminate air also and still have printed ink capable of being smeared. This leaves ink and paper as a minimal set of objects containing the problem.

If you are concerned that I have thrown out possible solutions in this process of object elimination, don't be. Our minds have now processed these objects and thereby engrained them into our subconscious. Solution concepts will probably involve these objects as well as those consciously retained. We simply can't keep our minds from re-visiting all of the ideas we entertain during problem analysis. (Try forgetting a melody that you heard, even years ago. Once it starts replaying in your mind it is very difficult, if not impossible, to consciously force your subconscious to stop bringing it up.)

This leaves us with two unwanted effects: ink smudges on a contacting object and an unpleasant odor. My experience with newspapers leads me to rank ink smudging higher than odor as the more important unwanted effect to address. Karl (the other son; who happens to be in the newspaper business) assures me that it is the more important problem. Our unwanted effect can be stated as: "Ink on newspaper makes marks on objects that come into contact with it." However, we wish to eliminate any causal contacting objects in order to focus on the basic problem. So a more definitive statement for a smaller set of objects would be, "ink on newsprint is capable of being smeared", which only implies a causal object.

Finally, we have identified, worded, ranked, and selected a single unwanted effect to focus on as a problem.

Unwanted effect: "Ink on newsprint is capable of being smeared."

For our next session on this problem, list the objects, make a sketch, and try your hand at identifying plausible root causes of the unwanted effect. This exercise will bring you quickly to the depth of your capability in defining the underlying phenomenology of the unwanted effect. You can't ask for more.

[See the discussion of the Plausible Root Causes Tool in USIT – an Overview, pp. (15-16).]

4. Classroom Commentary **OBJECT MINIMIZATION**

No, reducing the number of objects by eliminating those not containing the problem does not throw out solution concepts. Remember, we are not doing rigorous, thorough, conventional engineering analysis. We are trying quick, unconventional analysis to see things differently and stir our problem-solving subconscious into action. The process of object elimination is one of careful reasoning about the role of each object; those kept and those eliminated. Both are ingrained in our minds by this process. Yet our conscious efforts are focused on smaller numbers of objects, which therefore, are more consciously manageable. This is conducive to speed and effective focus.

5. Problem-Solving Tricks and Related Miscellany

Equalizing the Odd Cards in a Shuffled Deck of Cards

Kurt (the other son) phoned me last Sunday to describe an interesting problem he heard on National Public Radio's "Car Talk" program:

"Given a deck of 52 cards with 13 facing up and 39 facing down, separate them into two groups having the same number of face up cards – do it blindfolded or in a dark room."

(Solve it yourself before continuing; you may appreciate more the following discussion.)

----- A Solution -----

My USIT reaction was to simplify the problem by minimizing the number of objects. Minimization requires reducing the number of objects in a problem to just those needed to contain the problem. It is evident that this problem consists of three times as many facedown cards as face-up cards. A minimum set having these characteristics is four cards. So I'll solve the smaller problem and see if the result scales to the larger one.

A deck of four cards can be arranged in two groups in only three ways: two cards and two cards, one and three, or zero and four cards. Of course, the face-up card can be in any group containing cards. An even number of face-up cards (0, 2, or 4) is needed to make two equal groups. Obviously, we need to turn over one or three facedown cards, or one face-up card, to create an even number of face-up cards. But we need to create a unique pair of two groups in which turning (unseen) cards guarantees the desired result. Again, simplify – turn over a whole group. This smaller problem allows solution by trial.

Make two groups, one having three cards and one the remaining card. The face up card is in one group or the other. Simply turn over the single card and both groups will have the same number of face-up cards: either 0 or 1 in each group. On scaling this solution to larger decks of cards, say $4n$ cards, with n facing up, make one group of $3n$ cards and one of n cards and turn over the smaller group. This solution works because: if the larger group has $n-x$ face-up cards, then the smaller one has x face-up cards. Turn over the smaller group and you have $n-x$ face-up cards in both groups.

6. Feedback

"Received the newsletter, and opened it OK. Nice, concise, structured format. I like the first mini-lecture. Looking forward to future issues. I am still generating subtle, gradual awareness of the need for USIT within our technology organization, potentially moving toward a training session. I'll forward the newsletter to help build awareness. Thanks, Gary Allen"

and

"Enjoyed your first newsletter. No problems at this end. Got it open and devoured it immediately. Thanks, Saulius Jameikis"

and

"Thank you for your nice message. We are very glad to learn that you are starting to write and distribute 'U-SIT and Think News Letter'. Your Mini Lecture is quite instructive. Could you permit me to translate it into Japanese and post it in my Web site on a regular basis? (Though I will not be able to translate all the News Letter articles, I wish to introduce most instructive articles to Japanese readers.) By the way, is your News Letter to be posted in your Web site? I think sending by email and also posting it on the Web is compatible and worth doing. Toru Nakagawa" [Ed: Permission granted.]

and

"One suggestion--name the file something with USIT in it (newsletter01 isn't enough to remind me why I have this file, if it is several days between receipt and actually reading it) Ellen Domb" [Ed: Done.]

7. Q&A

8. Other Interests

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

To be creative, U-SIT and think.