This article is derived from issues 65 and 66 of the USIT Newsletter, which has a complete list of the USIT references. See http://www.u-sit.net. This is the second of a series on the interplay between intuition and logic.

The Intuition-Logic Struggle, part 2

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Since the last mini-lecture (TRIZ Journal, June, 2006) you have had a chance to try your hand at developing a new perspective within the plausible root-causes diagram for the unwanted effect of simultaneous two-key strikes on a keyboard. I trust that this has been an informative exercise for you. I'll begin this lecture showing you my attempt. We understand that this is not an exercise in deciding right from wrong. It is an exercise in discovery by seeding individual minds. Consequently, we should expect interesting differences, all of which are useful – the motivation for organizing "fresh-eyes" teams in industry.

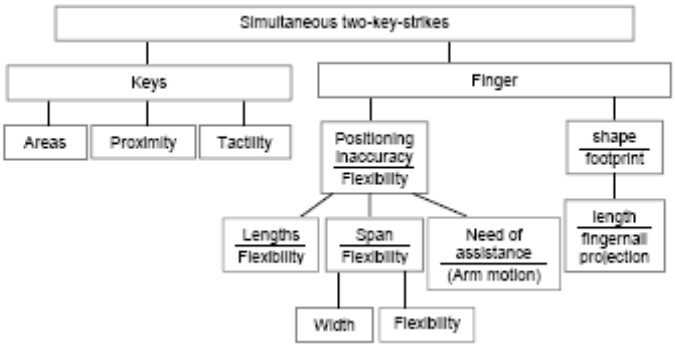
Analysis of simultaneous two-key strikes

My attempt at plausible root cause analysis of simultaneous two-key strikes is shown in the figure. This analysis brought to light the plausible cause of two, vertical-key strikes being a result of fingernail extension of a finger's footprint.

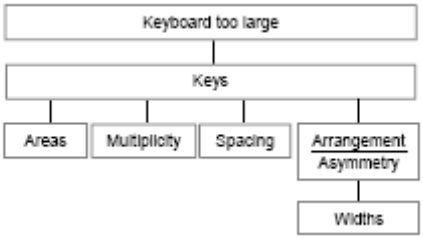
15. Decrease the chance of catching an upper key with a fingernail by increasing the trapezoidal slope of a key (reduce its top area).

16. Decrease the chance of catching an upper key with a fingernail by embossing a small, raised landing pad atop a key.

These ideas caused me to reflect on key shape, which recalled the original OAF diagram. On examining the diagram again I thought to look at key arrangement. The Keys-section of the diagram is repeated here (second figure.)



Modification of the keys-section of the OAF diagram for the keyboard too large unwanted effect.



Keys arrangement caused me to notice that ten keys in the QWERTY section are wider than the letter keys. Why? That question caused me to note that if they were all the same size and two redundant keys in the bottom row were eliminated, a smaller footprint trapezoidal shape would result. Could it be that the wider keys and redundant keys were added to fill out a rectangular shape?

17. Eliminate redundant keys and give the outside columns of keys widths that produce a smaller area trapezoidal footprint.

As I typed “outside columns” it caused me to look at the keyboard and note the frame again. The frame has an exposed boarder all the way around its perimeter. Why? My fingers don’t make contact with it. It serves no purpose that I can see, other than display the manufacturer’s logo.

18. Reduce keyboard-frame size to the footprint (perimeter) of the bordering rows and columns of keys.

My keyboard, if reduced to a borderless QWERTY section, would be only 61% of its present width. I like that idea. Probably, I could then find a number of things I have lost on my desk.

[☹ ➔ ☺]

The reality of structured problem solving is that intuition and logic play complimentary roles. We outline our effort and rationalize our ideas using logic. This entails graphic and verbal metaphors. Elements of these metaphors seed our subconscious, which is eager to pursue every thought provoking seed for intuitive fruit.

In the keyboard exercise, I got eleven intuitive solution concepts before exercising the logical plausible root-causes tool. Once the tool was brought into use, I got an additional 7 ideas. Did the tool do this? I doubt it, as explained earlier.

Developing the plausible root-causes diagram was an intense exercise. It involved searching for a phenomenological basis of rationale for each idea tested. For example, “position accuracy” was tested (in my mind) in several different wordings before being settled upon. Each test wording seeded the subconscious and raised further considerations for rationalization. Intuition offered test wordings. Logic made the final selection.

Logical problem-solving strategy with intuitive execution

On reviewing (logically) the keyboard problem exercise it appears that subtle intuitive strategies were at play. Once the artifact was selected for improvement, the computer keyboard, it intuitively became a single object with only two interactions: fingers-keyboard and keyboard-desk. I never even thought of keyboard-computer interaction, until writing this paragraph.

It never occurred to me either to consider object minimization, to which I am usually very sensitive. Also, I was well into the problem before thinking that the selected unwanted effect might be a convolution of others.

A major component of USIT's logical strategy is searching and analyzing two-object points of contact. It is assumed that there is a reason for every contact of two objects, i.e., to support one or more intended functions. We don't need to know *a priori* the reasoning of the designer for a given contact. On the contrary, we use this approach to spark our imagination along lines of logical relevance of a contact to enable us to apply our own understanding of the implied phenomenology. In this way, we encourage our subconscious (or hope to) to stay on track, so to speak. We identify the functions at a point of contact in images and words. These are the metaphorical seeds for our subconscious. We then delve deeper into our own understanding by polishing our interpretation through OAF diagramming.

Points of contact are themselves metaphors. For example, two flat surfaces in contact are treated as a point of contact. This may not be a good mathematical representation but it is an effective metaphor for sparking creative thinking. All we need to identify is what possible functions can exist at the interface of two surfaces in contact. Then select seemingly relevant ones. If you wish to think of the interface as an infinite set of points, okay; but you often find that each of these points performs the same function. Simplification encourages elimination of this redundancy and consideration of a single point as representative of the others.

Object⟶Function⟵ Object

As noted before, the unwanted effect of the keyboard being too large led naturally to two, two-object points-of-contact for consideration. Just out of curiosity, to see if we learn anything, let's consider the keys themselves. If they are taken as the problem situation, what unwanted effects could be invoked? (Yes, the question itself is a problem to be solved.)

This is a convenient place to pause. Can you think of other points of contact for analysis of the keyboard being too large?

Intuitive insights from function identification

The obvious way to answer this question is to begin identifying functions of the keys. These come to mind:

• Present information to the user
• Transduce position information into electrical information
• Detect position change
• Provide logical access to their information (speed typing via a rote pattern)
• Provide convenient access to their information (visual cues)

When I typed “present information” (a seed) it brought to mind (recall of experience) the overlays for keyboards (intuitive result of seeding). Overlays are often used to aid one’s learning of the features of a software system (logical expansion on intuition). Recall of overlays was an immediate suggestion that much more information could be made available on a keyboard than the QWERTY section provides (a new line of intuitive thought). This could be worded into an unwanted effect as, for example, too low information density. That is, given the size of a keyboard, it seems that potential information space goes unused. (I hope Madison Avenue ad writers don’t get wind of this!)

Unwanted effect: “Keyboard information density is too low.”

Writing this statement started a flow of ideas. Let me get my intuitive ideas out of the way:
19. Inlay key tops with miniature digital screens for displaying information – such as keyboard overlays for specific software.
20. Make screens visible according to ambient light conditions.
21. Offer software developers access for showing information on miniature key-screens (a new product opportunity).
22. Use mouse pointing to select monitor icons for activating software-specific information displays.
23. Enable automatic illumination of key sequences for software training – such as learning a software package, performing computer diagnostics, computer hardware and software installation, etc.
24. To reduce typos, lock keys from accidental striking that are not needed in a particular software package.
25. Electromechanically retract unneeded keys.
26. In periods of no finger-key contact, mechanically raise the F and J keys to enable quick QWERTY hand positioning for touch typists.
27. Put detectable vibrations in keys for tactile identification by blind typists and touch-typing students.

Now that those are recorded let’s begin USIT logic to seed more intuitive inspiration.

Intuitive insights from object identification
I’ll begin with object identification and selection. Keys are obviously relevant objects. However, information is the more important. In the above list two forms of information objects were mentioned, visible and tactile. Audible information could be useful but taste and smell are not likely candidates (or are they?).

Visible information can be in the form of single color illumination, varied colors, varied intensities, and various patterns of multiplexed illumination, intensity, and color.

28. Encode key information in forms of multiplexed illumination, intensity, and color.
29. Encode key information in forms of multiplexed sound intensity and frequency.
30. Encode key information in forms of multiplexed vibration intensity and frequency.

An important contact with information is a key and the information it displays. This immediately provides a point of focus. Digital screens imbedded in key tops have been mentioned.

31. LED patterns could be embedded in a key top to enable multi-functions for keys under software control.
32. Keys could have foggy windows with etched messages to be illuminated when needed.
33. Keys could have distinguishing grooves or bumps for tactile information.
Another important object that contacts information is the user. This makes me think of kinds of information the user might find useful on a keyboard.
34. A running tally of total word count when using word processors.
35. A running tally of file size when using image-processing software.
36. The directory path of the file being edited.
37. A memory-usage gauge.
Another point of contact already alluded to is sensor stimulation: by visual, tactile, and audible stimulation. This list could include thermal stimulation from hot or cold keys.
38. Encode keys using temperature modulation.
The idea of rote key pattern, mentioned above, brings to mind a subset of keys that are mechanically elevated while playing games.
39. An elevated pattern of keys for game software.

Intuitive leaps to creativity
“Leaps” come in various sizes. And size has various metrics. My big intuitive leap may be a piddling step in your mind. There is one distinguishing characteristic of any leap of intuition, namely, that it is not obvious. That is the implication of leap. Logic, by contrast, flows in incremental steps of accepted rational. These steps can be so small as to render their reading very dry. A good example is a mathematical proof.

The complimentary interaction of logic and intuition as we solve problems is composed mostly of small leaps of intuition. Ambiguity of a metaphor eludes logic and seeds the subconscious to proffer a not so obvious idea, for which the conscious immediately fills in the logical connections.

When I typed, “Keyboard information density is too low” (above #19), it immediately seeded the not so obvious idea, “#19 Inlay key tops with miniature digital screens for displaying information –such as keyboard overlays for specific software”. Looking back, maybe “information density” connected subconsciously to recorded experience with computer screens full of information. A month or so ago, I had given a lecture on digital

photography in which I discussed the information density of a computer screen. As I typed the first part of the sentence logic seems to have stepped in and offered simple expansion of the idea “such as keyboard overlays for specific software”.

In ordinary conversation a speaker’s words may somehow metaphorically inspire a response from a listener that seems to be a way off track. Somewhere there is a logical connection within the listener’s mind that is not obvious to others present. I can hear it now: “Why did you say that? It isn’t logical!” When the responder takes a moment to logically clarify the response it suddenly makes sense. Intuitive leaps have different sizes in different minds.

The kinds of intuitive leaps that are considered to be innovative or creative are those not obvious to one’s peers – people of similar training and background. This is a measure used by the US Patent Office. It requires a “non-obvious step” as a requisite for a patent. The big leaps of non-obviousness come from minds packed with relevant information and long periods of analyzing, trial-and-error seeding, testing, modifying, and persisting, interspersed with resting and digressing. Periods of rest and digression allow the subconscious to organize recent memory and play with unusual associations that logic of the conscious would not allow. Insatiable curiosity can carry anyone there.

Heuristic: Foster intuitive leaps to discover creativity.