



# U-SIT And Think News Letter - 19

## 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:

- Mini-Lecture\_18 completed the demonstration of USIT applied to the problem of messy ink on newsprint. In this lecture we consider confusion raised by the use of causes and effects.

1. USIT – How to Invent: the USIT textbook.	\$44.50
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2. USIT – an Overview	FREE
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## 3. Mini USIT Lecture – 19

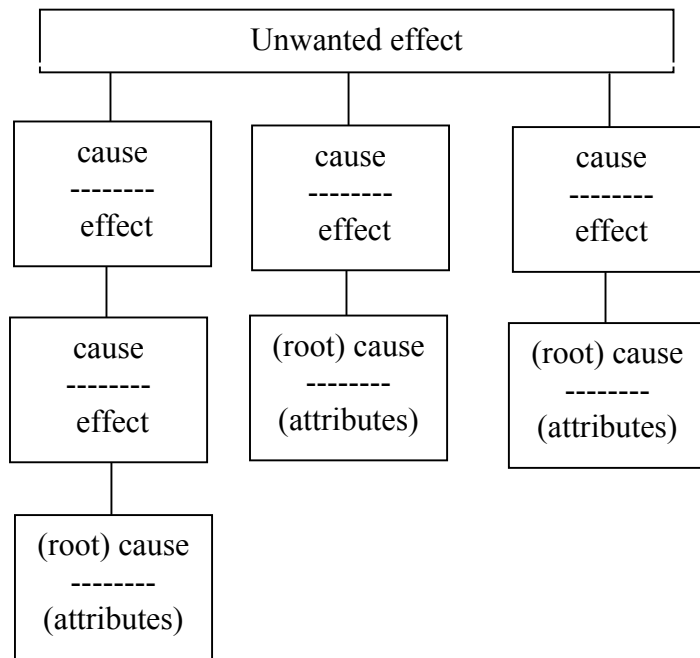
### Causes = Effects?

Early in teaching USIT to industrial technologists it became clear that finding root causes in problems brought to class often was a difficult task. This was the case even though the students had been trained in understanding the importance of knowing root causes and in methods for identifying them. From this teaching experience I developed the plausible root causes method. (See “Unified Structured Inventive Thinking – An Overview”, available at [www.u-sit.net](http://www.u-sit.net).)

Now I find that students still have difficulty with the exercise. It seems that part of the problem relates to student’s inexperience in structured problem solving and to their lack of careful application, or awareness, of the definitions of cause, root cause, and effect. Juan Carlos Nishiyama and Carlos Eduardo Requena of Argentina recently pointed out to me that students easily confuse causes, root causes and effects. I am grateful to them for this insight and am making it the topic of this newsletter.

### Discriminating Causes, Root Causes and Effects

The plausible root causes diagram deals with all three concepts: causes, root causes and effects. The diagram shown here is a modification of that published earlier in that it has been simplified to the case of a single object, which is not shown. When, in a specific branch, a root cause is reached the branch is terminated and the terminal box does not have an associated effect. Instead, it has a list of attributes (also not shown in this figure).

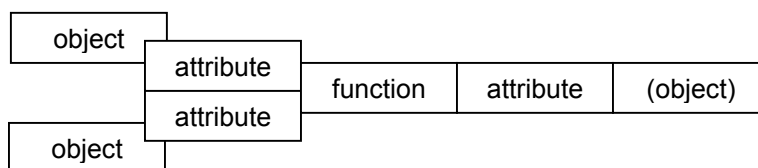


An unwanted effect is placed at the top of the plausible root causes diagram. In the next lower row causes of the effect are listed in separate boxes. Each of these causes is then treated as an effect for the next lower row of causes. Each column of boxes terminates on a plausible root cause.

However, this is may be difficult, that is, finding the termini of the columns. It is a two-step process: in the first step one is analyzing each effect for plausible causes. When no further analysis of causes of effects is evident each cause at the lowest level of each branch of the diagram is taken to be a plausible root cause. In the second step, each plausible root cause is then analyzed in terms of causal attributes. And this is where confusion sets in, three terms have been introduced for almost the same concept; they are, cause, plausible root cause, and causal attribute.

The confusion can be put to rest by reviewing several important definitions. Firstly, effects come in two varieties, “wanted effects” and “unwanted effects”. Wanted effects are given the special name of “functions”. Recall that a function, as well as an effect, modifies or maintains an attribute. Thus, both words, function and effect, carry the connotation of an action; either to modify or to maintain.

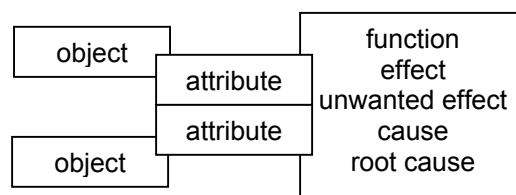
The role of causal attribute becomes evident on examining the graphic definition of object-object contact shown in the following diagram.



This diagram defines a major concept of USIT, namely, the concept of object-object contact to support a function. *Two objects make contact through one attribute from each object interacting to support a function that modifies or maintains another attribute in one of the contacting objects or in a third object.* The word function can be replaced in the diagram with effect, unwanted effect, cause, or root cause. The same object-attribute-function relationship exists for each.

The word *cause* is used in analyzing an unwanted effect. Analysis of an unwanted effect refers to breaking it down into other underlying effects, which we call causes. The initial concern is to determine if the unwanted effect is a single unwanted effect – a major issue in problem definition for USIT application. Hence, by analyzing a particular unwanted effect in terms of its causes, other, convoluted effects may become apparent. If the initial unwanted effect is a singular effect the first level of causes, in the plausible root causes diagram, immediately become a list of attributes.

With these similar terms in mind, I'll redraw the defining diagram as follows:



The purpose of this drawing is to emphasize that function, effect, unwanted effect, cause, and root cause are terms having equivalent relationships and that all of them have associated attributes. The associated attributes are referred to as causal attributes when referring to causes of unwanted effects and as supportive attributes when referring to functions. Listing the causal attributes to be associated with each root cause completes a plausible root causes diagram.

Suppose, for example, that dulling of a pencil point is an unwanted effect. Are there underlying causes of the pencil point becoming dull? The answers to this question should draw us closer to the fundamentals of the problem. Since dulling of a pencil point occurs when the pencil is used for writing, we have two objects to consider as being in contact, paper and pencil lead. Each is a source of basic effects. The paper can be seen as abrading the pencil lead. The pencil lead can be seen as fracturing during contact with paper. Both of these are causes of pencil lead dulling. One can stop at this level and define these as root causes. The next step would be to look for causal attributes of each object that support abrading by paper and fracturing of pencil lead. Other analysts may try to take abrading and fracturing to lower levels of cause and effect. Such efforts can lead to microscopic and molecular effects with their attendant causes.

In summary, discriminating the words cause, root cause, and effect is as follows: An effect maintains or modifies an attribute. Its USIT model consists of a pair of interacting attributes, one each from two objects in contact. Thus the cause of an effect can be described in three different ways: in terms of another effect (or function), in terms of two interacting attributes, or in terms of two contacting objects. The plausible root causes tool of USIT was developed to address this confusion. When searching root cause of an effect a plausible root causes tree can be constructed. The effect is placed at the top of the tree. Causes of this effect are listed in the next lower level, using any of the three possible expressions. Each cause is then treated as an effect and its causes are entered in the next lower level. Through iteration of this process the problem solver strives to discover causal attributes for which no further analysis is obvious. These lowest levels of causes are

termed root causes.

In this process the mind first considers actions and then gradually transitions to physical properties: transitions, such as effects → causes → attributes, aid our mental modeling of phenomena → fundamental causes → physical properties. Solution concepts can arise at any level, but are especially effective when couched in terms of physical properties.

5. Problem-Solving Tricks and Related Miscellany

6. Feedback

Questions you would like to have discussed are welcome.

7. Q&A

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](http://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](mailto:Ntelleck@u-sit.net)

**To be creative, U-SIT and think.**

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