Glossary   Updated: 11/04/2015 9:30 AM
Words from Structured Problem-Solving Methodologies

attribute; Active attributes are the distinguishing characteristics or properties of an object (think adjective) that are supporting a function. They distinguish two objects having otherwise similar inactive attributes.

bilevel model of the brain[1,2]; The bilevel model of a thinking brain arose from research at the turn of this century by cognitive scientists. They discovered, using brain imaging with fMRI (functional magnetic resonance imaging) that in solving problems the brain functions at two levels, the conscious and subconscious levels. The subconscious finds ideas and submits them to the conscious for vetting and voicing.

brainstorm. Brainstorming, as used in this blog and by individuals or in teams, is the rapid process of generating ideas in response to a problem. It is done without mental crutches of any kind, such as, computers, handbooks, etc. It simply uses quick thinking, neither with filters, equations, numbers, nor other pseudo-logical constraints.

contact (think interaction); Contact, or interaction, is the metaphorical contact of objects where a function of the objects can be described. If the attributes of one or more of the objects involve a field then action at a distance allows the function to extend beyond the physical boundaries of the objects.

falsification; For a theory to be viable it must be predictive and falsifiable. Falsification is the process of posing a contradiction of the theory that, if proven, falsifies the theory.[3]

function (or effect); A function (think infinitive), or an effect, is a desired design feature of contacting objects, or a single object, that modifies or prevents modification of attributes. Functions include to change elevation, to modify color, to adjust location, to react force, and many others.

heuristic; Heuristics are specific mental tools and tricks of problem solving. Some have been own through generations of problem solvers. Some are self-created. Some are taught in academia and others in on-the-job experiences. A few examples follow:

- **extremes**; In problems having repetitions and other redundancies, reduce the number of repeating units to zero and then to infinity to understand how much repetition is required to get a handle on the problem – a form of simplification. It applies also in problems have implications of size, number, intensity, and scaling – consider all scalars, vectors, and tensor concepts.

- **minimize number of objects**; This is a simplification process to reach a single problem by eliminating the objects that do not contain the principle problem.

- **OAF**, Object, Attribute, Function; OAF is a graphic heuristic that unites the three words into a logically, self-consistent functional group. All of USIT's heuristics are now bundled into this one efficient, graphic symbol. BlogGlossary.doc 2:40 PM 8/24/2015 2/3 O – A – \ F – A – O / O – A – Three objects are shown interacting at a metaphorical point of contact. Objects provide one attribute each that actively support a function (a desired function, F, or a mal-function, F). When selecting objects, attributes, and functions in a particular problem to fit this diagram, each must satisfy the self consistency of the diagram.

- **simplify**; Simplify a problem statement, a process, any complexity, etc. This is the number one consideration in every phase of problem solving.

- **step through the alphabet** to recall a name or other attribute by which you may know a sought after object.

I3-theory Innovation—Insight—Innovation; I3 is a problem-solving methodology that avoids the logic contained in heuristics commonly found in structured problem-solving methodologies.

logic; A not so strict word in practices of problem solving is logic. Sometimes plausible may be a more appropriate word. I will not stress the issue here. I often use plausible as a personal preference. I prefer plausible as a less proven concept than possible.

metaphor; Metaphors are used to describe adjectives and nouns in problem situation descriptions in order to avoid restrictive words that concretize an idea.

plausible; Plausible substitutes for possible when credibility of an idea in question has not had validation of independent proof.

point; Point is the very effective simplification of the shape, volume, surface, or extent of an object's contact. All of an object's unchanging attributes that extend beyond its point of interest are redundant and are reduced to the point.

problem; A problem is an unanswered question. When answered the problem disappears. I don't know if this definition is original, but I began using it in the early 1980s to satisfy the need for breadth in its application and simplicity of its understanding. It immediately raises the issue of what is the definition of question? Since the basic interest here is how the brain solves problems, a question is a disturbance arriving on the brain's neural network that causes immediate action to determine whether it is benign or dangerous. If dangerous, the brain initiates instant action to remove its host body from the danger. The question is answered when the disturbance is nullified. This can happen entirely in the control of the unconscious. If benign, the brain begins to process the disturbance according to its properties and the brain's resources. Often a problem is encountered first as a logical issue. Later it may become a neuronal issue.

problem situation; Problem *situation* is used in contrast with problem *statement* to distinguish an ill-defined problem (*situation*) expressed in metaphors from a well-defined problem (*statement*) expressed in concrete engineering specifications.

problem statement; (See problem situation)

solution; Solution is any nullification of a specific logic or neural net disturbance. Some solution methodologies have heuristics for deciding when a question has been answered.

solution-concept; Solution concepts are the first ideas to flash into one's mind when brainstorming. They may be vague, not fully developed, and certainly not adorned with engineering improvements. They are the first fruits of mental problem solving.

structure; A common tool for describing and simplifying a heuristic is to display it graphically; e.g., a flow chart, a branching tree diagram, a fish-bone diagram, and others.

theory (**logical**); Ideally a theory should have several characteristics: it should be descriptive of a single problem or a set of similar problems; it should be predictive; and it should be falsifiable. Descriptive means a theory should be precise rather than verbose. Predictive refers to independent substantiation, i.e., independent of its originating circumstances. Falsifiable refers to: "One of the requirements for a valid hypothesis is that it be falsifiable.[3] There must be some way to find evidence, which could disprove the hypothesis."

theory (**practical**); In the practice of structured-problem solving the word theory needs a broader interpretation. It often is not mentioned specifically but may be inferred from individual methodologies. For example, play the role of lower level theory. From this observation it is evident that different collections of heuristics can constitute the theory of a particular methodology and thereby arise multiple, practical theories of problem solving.

theory (**neuronal**); Recent discoveries of cognitive scientists on how the brain works has shed new light on the relative functions of the conscious and subconscious in problem solving. The latter discovers ideas while the former voices them logically.

USIT, unified structured inventive thinking; USIT is a problem-solving methodology begun as a fourth generation of methodologies designed to simplify the Russian methodology called TRIZ. Originally, USIT was based on the bilateral model of the brain where one half of the brain favors logical thinking and the other favors intuition. Since its start a continuous effort has persisted to further simplify it and find ways to blend in a more realistic model of the human brain. For example, hazy heuristics were introduced (E. Sickafus, 'Subconscious Problem Solving Using Hazy Heuristics', Int. J. Systematic Innovation, 2(4), 2013) as a technique for softening the constraints of typical USIT heuristics at that time. Since 2014 the bilateral model has been deprecated and the bilevel model adopted where one level emphasizes conscious thinking and the other level emphasizes subconscious thinking. The bilevel model of the brain arose from laboratory research of cognitive scientists around the beginning of this century. (Ref. S. Dehaene, "Consciousness and the Brain – Deciphering How the Brain Codes Our Thoughts", Viking, 2014.)

REFERENCES

1) Dehaene, Stanislas, 'Conscious and the Brain – Deciphering How the Brain Codes Our Thoughts', Viking, 2014.
2) Sickafus, Ed, 'Introspection—Insight—Innovation Problem Solving for Innovation', www.edsickafus.wordpress.com.
3) Wikipedia and http://www.skeptic.com/ eskeptic/11-08-17.