

TRIZ Thinking Hats

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INTRODUCTION

One of the great strengths of TRIZ relative to other creativity methodologies is that it is built on solid technical rather than psychological foundations. That being said, the power of TRIZ can be shown to be enhanced greatly by appropriate combination with the best of the methods developed by psychology-based researchers. Edward De Bono's 'Six Thinking Hats' concept (Reference 1) is one area where a great deal of synergy exists with TRIZ. The paper describes how the Six Thinking Hats concept has been integrated into a generic TRIZ-based problem definition and solving procedure.

The Six Thinking Hats concept is built on the fact that the human brain works in different modes depending on the sort of task it is being asked to perform. Thus, to take two extremes, the mechanisms used by the brain when generating new ideas is significantly different to those present when we are calculating the pros and cons of an existing idea. In all, De Bono has identified six different modes of thought which are relevant across the range of actions taking place during the problem solving process (Figure 1). Each mode has been identified by a different coloured hat, such that:-

A **WHITE** hat - denotes a mode of thinking during which an objective look at data and information is required.

A **RED** hat - denotes the mode of thinking associated with feelings, hunches, and intuition.

A **BLACK** hat - denotes the mode of thinking associated with caution, judgement, and looking logically at the negative aspects of a problem - often described as the 'devil's advocate' mode of thinking.

A **YELLOW** hat - denotes the mode of thinking associated with examining the feasibility and benefits of a given situation, and looking logically at the positive aspects.

A **GREEN** hat - denotes the mode of thinking associated with the generation of new ideas, creative and 'lateral' thinking.

A **BLUE** hat - denotes the mode of thinking associated with the overall control and organisation of the thinking processes.



Figure 1: Six Thinking Hats - Schematic Representation

The article describes how the Hats concept might be integrated into a TRIZ problem solving scheme (Reference 2) covering the complete spectrum of activities - from initial situation assessment, to problem definition, to problem solution - present in a facilitated inventive problem solving session. Thus, for example we see the conducting of a function analysis conducted in two parts - the first, looking at the positive functional relationships in a system, operating in 'White Hat' mode, followed by a second 'Black Hat' mode in which the negative relationships in the system are systematically analysed. Similarly the value of switching between White and Green Hat modes when using the Contradictions parts of the TRIZ tool-kit is detailed.

We begin the article, however, with an examination of the different Hat modes, and the times we might chose to wear them when using different elements of the TRIZ toolkit:

White Hat

We wear the white hat when we are seeking to take a non-emotional, objective look at data and information. We are most likely to require use of White Hat thinking strategies at the following points during use of the TRIZ problem definition and problem solving process:

- During the initial problem assessment and definition phase. Specifically, when conducting the first stages of a function analysis - in which we are seeking to describe the actual functioning of the existing system - but also when examining statements describing the desired end point for the problem, and understanding the present level of maturity of the system in terms of it (and its sub-systems') position on their respective evolutionary S-curves.
- During the phase in which, having completed an initial problem definition, the problem owner is looking to select the most appropriate of the TRIZ problem solving tools.
- Defining the Ideal Final Result, and using the Ideality problem solving tool concept of working back from this IFR to a physically realisable solution.
- When defining contradictions, and when using the Contradiction Matrix or the Physical Contradiction solution method tools.
- When using a functional knowledge-base.
- When recording generated solutions.

- When assessing and ranking the quality of solutions during the down-select part of the overall process.
- In conjunction with the 9 Windows tool, throughout the overall problem definition and solving process in order to ensure that space and time dimensions are given appropriate attention.

As TRIZ has been configured as a 'systematic' creativity tool, it should not come as a great surprise to learn that the White Hat is worn most during a TRIZ session. The other 5 Hats, however, are still vital at certain points during the process:

Red Hat

The red hat is worn when we are using our intuition and relying on our feelings and emotions (frequently referred to as "gut feel"). The red hat mode of thinking may at first sight appear to be the complete antithesis of a systematic creativity process, but it has its uses, and - most importantly - we need to recognise that the way our brains operate means that many of us spend a large proportion of our time naturally thinking in a Red Hat mode. At the very least, therefore, we need to be aware of Red Hat thinking modes, if only to recognise that we need to step out of it for much of the time. We are most likely to wish to use Red Hat thinking strategies positively, though, at the following points during the TRIZ problem definition and problem solving process:

- Almost inevitably given the way our brains are wired and the way we have been thought to problem solve traditionally, when given a problem we shift immediately into Red Hat 'problem solving' mode. We should recognise this phenomenon and try to use it to positive effect. It is common, therefore, to include a five or ten minute period either right at the beginning of a session, or immediately after the initial problem definition phase, of brainstorming. The output from such a brainstorming session is commonly recorded and placed in a 'car-park' where all participants can see that their input has been registered and will be returned to at the appropriate time during subsequent parts of the process.
- Red Hat thinking mode can also be useful as a psychological inertia-breaking tool if use of the TRIZ problem solving tools has not produced any viable solutions.
- Red Hat thinking mode can also be used to good effect at times during a problem solving session to break out of the rut that can sometimes occur if participants have been kept in other thinking modes - but particularly White Hat - for extended periods. Provocations like 'spend five minutes thinking about the worst possible means of solving the problem' have not uncommonly generated some interesting and subsequently viable solution options.

Nevertheless, these points aside, Red Hat thinking mode should be deployed only sparingly when using TRIZ methods.

Black Hat

We wear the black hat when we employ caution and judgement, and looking logically at the negative aspects of a given situation. We are most likely to require use of Black Hat thinking modes at the following points during the TRIZ problem definition and problem solving process:

- During the initial problem definition phase, where we are attempting to identify all of the constraints that exist in and around our problem.
- During the conducting of a function/attribute analysis of the problem situation, when we are looking to identify the harmful, insufficient and excessive functions that exist in the current system. (NB it is very important to recognise that Black Hat thinking and White Hat thinking are two significantly different modes, and that a proper function analysis requires both. The most effective function analysis sessions occur when the White Hat and the Black Hat modes are conducted sequentially, with White Hat first, and Black Hat

- being allowed to commence only after a specific instruction from a problem facilitator that modes should now be shifted.)
- During a 'how can I destroy this system?' subversion analysis.
 - During assessment of solution options when trying to gauge the relative weaknesses of the solutions under consideration.
 - When answering the question 'is the chosen solution good enough?' at the end of a session. Another common human trait is that we are highly inclined towards accepting and settling on a solution that we think is novel. This is particularly evident when we have successfully broken a contradiction. An excellent example of the need to put on a Black Hat at the 'end' of a problem solving session comes from the bifurcated bicycle seat design previously described in Reference 3 - here the idea of bifurcation successfully eliminated the 'I want the saddle to be wide AND narrow' contradiction, and the company decided that this alone was a good enough solution. If they had put on their Black Hats at this stage, they might have forced themselves to recognise that the bifurcated seat had generated a number of new problems which, in retrospect, if they had solved before trying to launch the new product, they might have had a runaway success as opposed to the largely failed design they currently try to sell.

Yellow Hat

We wear the yellow hat when we are examining the feasibility and benefits of a potential solution, or are seeking to logically assess the positive aspects of a given situation. We are most likely to require use of Yellow Hat thinking strategies at the following points during use of the TRIZ problem definition and problem solving process:

- During the initial definition stage of a problem when we are examining the resources that exist in and around the current system.
- During assessment of solution options when trying to gauge the relative strengths of the solutions under consideration.
- When seeking to challenge the validity of the initially defined problem constraints.
- When using the Trimming part of the TRIZ toolkit - particularly when asking the questions 'do I need this function?' or 'can an existing part of the system perform the function for me?' or 'can a resource perform the function?' (NB some users find that Trimming works more successfully in White Hat mode; the author has generally had more success getting groups to wear a Yellow Hat.)
- When using the Standard Inventive Solutions, and trying to relate them to the problem situation. Solution triggers like 'add a substance' can be a little too obtuse for some people; this is less of a problem if such people are specifically asked to be in Yellow Hat mode.

Green Hat

We wear the green hat when we are looking to generate new ideas or are seeking to 'be creative'. We are most likely to require use of Green Hat thinking strategies at the following points during use of the TRIZ problem definition and problem solving process:

- During the initial definition stage, a short period of Green Hat thinking immediately after the Yellow Hat search for resources often sees the realisation of a considerable number of additional ideas that did not arise previously. (NB the preceding Yellow Hat mode is important and should not be replaced by Green.)
- During any point when using the TRIZ problem solving tools when we are seeking to translate generic solution triggers - e.g. Inventive Principles, Trends of evolution, translation of conceptual solutions from the Ideality tool, use of Smart Little People, Size-

Time-Cost, etc - into specific solutions. The importance of Green Hat thinking here cannot be over-estimated. It is a topic we will return to in a future article (Reference 4).

Blue Hat

We wear the blue hat when looking to provide a controlling function, or when organising the overall thinking process. The Blue Hat is the hat that we wear when judging when and where to put on the other Hats. The Blue Hat is the overall process organising Hat. It is the one worn almost continuously by the facilitator of a problem solving session rather than specifically by all members of a problem solving team. That being said, there are times when the team may benefit through collective donning of the Blue Hat:

- During post-session recording of events.
- Periodically during subversion analysis when trying to ensure that all failure modes are being adequately traced and recorded.
- When a problem solving team is getting bogged down in the detail of a particular part of a process, it is often useful for the facilitator to get the rest of the team to shift into Blue Hat thinking mode in order to zoom out of the details and to re-date or re-orient themselves to see where they are in the overall process.

Putting It All Together

There is no one definitive version of a 'TRIZ process'. In many senses, such a thing can only exist in the mind of an individual. With this in mind, this article does not in any way seek to propose an all-encompassing 'TRIZ process'. On the other hand, in order to examine how a 'typical' problem definition and solving session might require us to shift from one Hat to another, a number of generic steps are present in the vast majority of situations. These generic steps will be described below alongside a description of how we might shift from one Hat to another as we progress through the steps.

At the very broadest level we might see the systematic creativity process as consisting of four major steps - starting with Problem **Definition**, then **Selecting** the most appropriate solution routes, then generating **Solutions**, and finally **Evaluating** and down-selecting. We might see these steps as a looping process which repeats until we obtain a solution with which we are happy - Figure 2.

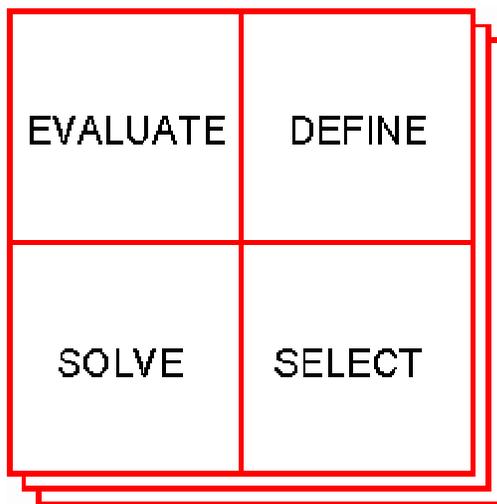


Figure 2: Four Major 'Systematic Creativity' Steps

Looking at each of these in turn:

DEFINE

- What benefits are we looking to achieve, how will we know when we've got there? (**White** Hat)
- What are the constraints? (**Black** Hat, possibly followed by **Yellow**)
- What resources are available? (**Yellow** Hat, possibly followed by **Green**)
- Where is the 'sore point'? (**White** Hat)
- What are the functions and attributes contained in the current system? (**White** Hat to define intended functions, then specifically followed by **Black** Hat to identify the harmful, insufficient and excessive functions)
- How mature is the current system (where does it and its sub-systems sit on their current evolutionary S-curves?) (**White** Hat)
- (Optional) Brainstorm and 'Car-Park' initial solution thoughts (**Red** Hat)

SELECT

- Determine the most appropriate problem solving techniques for the particular problem (**White** Hat)

SOLVE

A variety of options here, depending on which of the TRIZ tools are relevant:

- (Ideality) (**White** Hat)
- (Knowledge) (**White** Hat)
- (Contradictions) (**White** Hat to generate and look up contradictions; **Green** Hat to translate the generic triggers into specific solutions)
- (Trends) (**Yellow** Hat followed by **Green**)
- (Trimming) (**Yellow** Hat, probably followed by **Green**)
- (S-Fields) (Preferably **Yellow**; probably followed by **Green**)
- SLP/STC (**Green** Hat)
- (Subversion Analysis) (**Black** Hat; probably interspersed with periods of **Blue**)

EVALUATE

- Have solutions been generated? If no, then the problem needs to be re-cast (**Black** Hat, possibly followed by **Red**, **Green**, or maybe **Blue**, probably in that order)
- If yes, then solutions need to be ranked (**Yellow** Hat, systematically followed by **Black** Hat)
- Deciding where to go next (i.e. around the loop again or to finish) (**White** Hat, but the facilitator should definitely encourage participants to go into **Black** Hat mode one more time if possible)

Of course, the above does not claim to be in any way definitive, rather that it should be judged as a measure of the need for us to shift our mode of thinking both systematically and regularly during a problem session.

Six Thinking Hats and TRIZ-based Software

Some parts of the TRIZ community are strong advocates of TRIZ-based software. While being a frequent user of certain aspects of such software, this author believes that until such times as the software is able to take due account of the different modes of operation found in the human brain, it cannot hope to provide us with anything like a comprehensive problem definition and solving capability. Software tools currently claiming such a capability should be treated with a fair degree of (Black Hat) scepticism.

Conclusions

Successful use of TRIZ tools demands that we recognise that the human brain works in distinctly different modes. Edward DeBono's Six Thinking Hats show us the six main modes of operation. We need to ensure that we are aware of the different modes, and, as much as possible, make sure that we match the appropriate Hat to the appropriate parts of the overall process.

References

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