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e-zine

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In this month's issue:

The Systematic Innovation e-zine is a monthly, subscription only, publication. Each month will feature articles and features aimed at advancing the state of the art in TRIZ and related problem solving methodologies.

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

Readers' comments and inputs are always welcome.
Send them to **darrell.mann@systematic-innovation.com**

More Parallel Thinking

Introduction

Last month we referred to Edward deBono's book Parallel Thinking (Reference 1), in our article on finding the future from the past. This month, we pick up on another feature of the book – the concept of parallel thinking – and connect it to the systematic creativity and innovation process we discuss in the Hands-On Systematic Innovation book.

Parallel Thinking

The main reason for us to pick up a copy of 'Parallel Thinking' was its discussion about some of the dangers of traditional Socratic (either/or) type thinking, and the importance of an alternative thinking style De Bono describes as parallel thinking. Parallel thinking in large part is closely related to the TRIZ idea of contradiction resolution. In parallel thinking terms, DeBono discusses the importance of permitting conflicting or contradictory views to be held in parallel as a means of stimulating creativity. This idea of, for example, allowing the possibility that something can be 'big and small', or 'heavy and light' lies at the very heart of the contradiction elimination tools within TRIZ.

DeBono's book contains little if anything to match the separation and inventive principles contained within TRIZ as means of actually eliminating contradictions, but it does describe simple means that can be used to help in the process of uncovering and eliciting contradictions. Those means are primarily concerned with the Six Hats™ tools described in one of his earlier books.

Figure 1: Six Thinking Hats

Hands-On Systematic Innovation describes how the Six Hats concept can be fitted into the systematic creativity process, but by way of a brief introduction for those not familiar with the Six Hats concept, it is useful to know the following: The six thinking hats (Figure 1) described by DeBono each relate to different modes of thinking. The main thesis of the six hats method is that because each of these different modes uses different parts of the human brain, it is very important to control when we use each. Thus, for example, because our brains are operating very differently when we are criticizing something or when we are trying to generate new ideas, we should not try and do both together. Hence

we put on a hypothetical black hat when we want to do a critiquing job, and change to a green hat when we wish to be creative.

The discussion in Hands-On describes how the different thinking hats best suit each different part of the systematic creativity process.

One of the things we said in describing the match between process and each Hat was that it was necessary to wear the Green Hat during the 'creative', idea-generating parts of the process. In retrospect, the suggestion seems somewhat obvious.

The point being made in Parallel Thinking is that it is also often useful to put on some of the other Hats when we are in this idea generating frame of mind. This is, in fact, the essence of 'parallel thinking'. The basic idea is that we use the five 'non-creative' Hats while we are in Green Hat, creative mode.

To give a simple example, we might consider the possibility that within an idea generating session when everyone is in 'idea generating' mode – i.e. is wearing a Green Hat – that we throw in to the session a provocation like 'what would be the worst possible way to try and solve this problem?' or 'what would be the worst possible connection between 'Nested Doll' (or whatever TRIZ solution trigger we are considering) and the problem?' The key word here is provocation; what we are trying to do when we ask this question in an idea generating session is to try and move the participants to a different idea generating space. Very often it seems that the 'what's the worst….?' question actually turns out to generate some very useful insights when people approach it in the right (Green Hat) spirit.

Similarly, if during the same idea generating session, we went on to ask people to think about 'how would a fiery, impulsive person solve this problem?' or 'what connections would a fiery, impulsive person make between Segmentation and the problem' we are asking people to creatively think (Green Hat) how a Red Hat attitude would solve the problem.

If this all sounds a little too odd for comfort, take some re-assurance from the research of Liam Hudson (Reference 2). Hudson's primary research interest was in the differences between 'convergent' and 'divergent' thinkers. A convergent thinker is one who likes problem situations with very definite outcomes (e.g. a typical mathematics exam question – which has a 'right' answer), while divergent thinkers are much happier in more open-ended situations, where there may be many answers to a problem. The essence of Hudson's findings was that although the two character types most definitely existed, they could very often co-exist in the same person. More importantly, what he found was that if he asked people to questions like 'how would a convergent person solve this problem?' and 'how would a divergent person solve this problem?' not only could people switch between the two modes, they could also generate considerably more solution options.

This highly consistent with the 'A and B' hypothesis within TRIZ – something that runs counter to much of the prevailing logic in psychology research, and particularly personality testing. Think for example of the Kirton Adaptor-Innovator method; a test that is intended to determine whether a person is *either* an adaptor *or* an innovator. From the TRIZ perspective, a person can be both. From Hudson's research perspective, if you tell someone to think like an adaptor they can; and similarly if you ask them to think like an innovator, they can also.

The conclusion and main point of this article, then, is that if during a 'Green Hat' creativity session, people are asked questions like 'how would a Red/Blue/Black/Yellow/White Hat person solve this problem?' or 'what connections would a Red/etc Hat person make between this Principle and the Problem?' we will generate not only more, but very often stronger solutions.

Consistency With TRIZ Trends Laws

Some of you may have made a connection between this idea of wearing one thinking Hat and then thinking about how someone wearing a different coloured Hat (NB we should think of this as a very definitely hierarchical process – if we are thinking with a Green Hat about how a Black Hat person would solve the problem; the Green Hat is the dominant thinking hat) is highly consistent with the Mono-Bi-Poly trend – where a shift has taken place from one to two hats. The general Trend rule is that 'somewhere there is an advantage in evolving from the mono to the bi-system. The evidence of DeBono, Hudson and the TRIZ sessions we run using these Hat-on-Hat techniques is that there are very definite solution quality and quantity benefits.

References

1) DeBono, E., 'Parallel Thinking', Penguin Books, 1995.
2) Hudson, L., 'Frames of Mind', 1971.

Getting Worse To Get Better…Revisited

Anyone that read our newsletter last month may have made a connection between the article on finding the future from the past and the short article on how the evolutionary potential plot can sometimes show sub-systems getting worse to support the greater good of the higher level system. The connection is that the former contained an example of the latter. You may remember the 'finding the future' article ended with a series of shapes being arranged as shown in Figure 1.

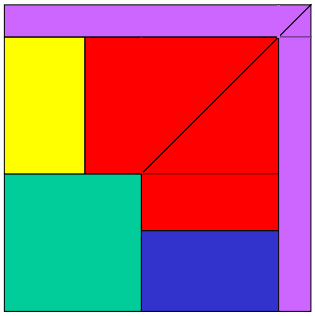

Figure 1: Final Optimum Solution to the Stated Problem

As the blocks were gradually added from the initial start-point of the 2 red shapes – Figure 2, it may be seen that the 'optimum' arrangement of the red shapes changed between the early Figure 2 state and the eventual Figure 1 'optimum'.

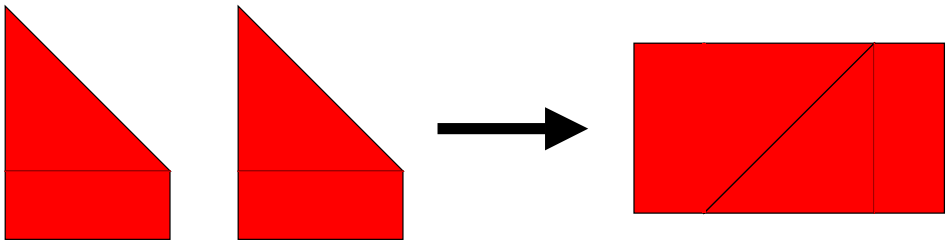

Figure 2: Earlier 'Optimum for the Arrangement of the Red Shapes

The change required that the two red-shapes were 'de-optimised' – made worse – in order for the higher level solution to achieve its optimum – Figure 3.

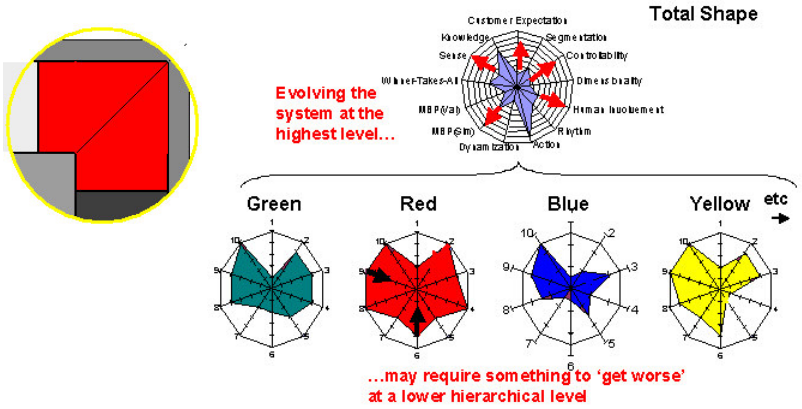

Figure 3: The Red System 'Gets Worse' for the Greater Good…

Contradiction Matrix for Software Problems

Anyone that has tried to use TRIZ to solve contradictions when writing software (we do it all the time!) may have noticed that the 40 Inventive Principles can be used to powerful effect. Knowing which Principle to use in any given situation, however, is a task which can be much more difficult.

The real problem here seems to be the Contradiction Matrix of classical TRIZ which, despite its intention to be very generic in terms of how the 39 parameters that make up the sides of the Matrix are concerned, still look very 'mechanical' to a software engineer.

In order to counter this problem, CREAX is in the process of re-configuring the Matrix in order to remedy this problem. We have already analysed a very large number of software-related patents, but now we need to know how to arrange the results to best suit the needs of the user (you!).

To this end, here is the current list of parameters we think should be in the new Software Contradiction Matrix. Firstly, parameters that read across from the current Matrix (current parameter number in parenthese):-

- Speed/Processing Time (9)
- Stability (13)
- Loss of Information (24)
- Reliability/Robustness (27)
- Accuracy (28)
- Harmful Side Effects (31)
- Ease of Operation (33)
- Ease of Repair/Modification/Update (34)
- Adaptability/Versatility/Upgradability (35)
- Complexity (system/control) (36)
- Difficulty of Detecting (37)
- Extent of Automation (38)
- Productivity (39)

And then some new ones:

- Size
- Programming Time
- Aesthetics/Appearance
- Transportability
- Autonomy
- Customer Feedback
- User Learning Time
- Security
- Information Flow
- Compatibility

VERY IMPORTANT – your input is required if we are going to be able to deliver you the most useful tool possible. Please send us your thoughts – we hope to be able to launch a first version of the new Matrix by the end of 2002.

Humour

A much more subtle humour section this month. The picture below is a photograph taken in England a couple of months ago. The theme of the photo is ‘this is why I am sometimes embarrassed to be British’.

Your job is to work out what events have lead up to the scene depicted in the photograph. Your second (optional!) task is to then think about what you would say to the painter involved in the subject of the photograph if you were his boss.

Patent of the Month

Patent of the month this month was a relatively easy one to pick – the 'molecular computer' patent granted to the University of South Carolina on August 6 – Figure 1.

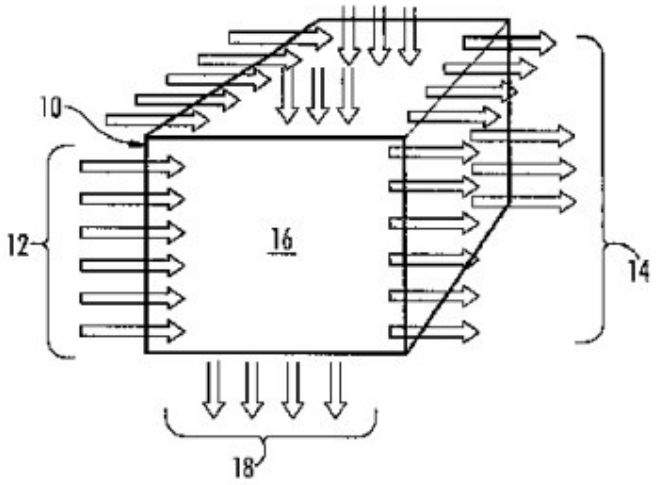

Figure 1: US Patent 6,430,511 'Molecular Computer

This is a technology we have been tracking for some time now – since the University published the results of their experiments to measure the current flowing between two gold electrodes connected by a single molecule (Reference 1).

The interest in the invention lies in the demand for more powerful computers and the fact that current technologies will soon begin to hit the fundamental limits of miniaturization. As outlined in the patent disclosure:-

The investment by society in computer technology has been astonishing in both its rate of increase and its extent. In less than three decades, the personal computer, for example, has gone from experimental prototype to being an essential tool of business. Demands for computers with greater and greater capabilities to perform more and more tasks continue unabated. Heretofore, better computers have resulted from increased miniaturization, among other improvements.

Presently, however, we do not have a viable technology for our near future computer needs. Although Moore's law (an accurate empirical law at this time) predicts the doubling of computer power every 18 months, this trend cannot continue. Digital computers are presently based on silicon technology. More precisely, very large scale integration (VLSI) is a lithographic technology, and although silicon is indeed quite important, Moore's Law is essentially lithography driven. The law of diminishing returns will eventually conquer Moore's Law, perhaps by 2005, when the cost of an integrated-circuit fabrication factory will become exorbitant and spell the demise of the growth of VSLI-based computer systems.

This article cannot hope to do justice to the work done by the inventors. We can only recommend that readers take a look at US6,430,511 and admire the work that has been done. More importantly, you may like to contemplate the potential impact of the invention.

It is one of the very few Level 4 inventions that we come across during our research. The usually phenomenon with such high level inventions is that they eventually spawn a large number of Level 3, Level 2 and eventually Level 1 inventions.

Best of the Month

August is normally a pretty thin month – thanks to the holiday season in most parts of the world – as far as new papers and publications is concerned. We were very fortunate, then, to have the opportunity to meet with Professor Hansjurgen Linde and his colleague Gunther XXX during August to discuss some of their work on 'the hidden patterns of evolution'. We were impressed, and we think you will be too if you have a look at their web-site **www.wois-innovation.de**.

A bit specialized for some, perhaps, but we also recommend '40 Inventive Principles in Microelectronics' by Gennady Retseptor in the August issue of TRIZ Journal.

Investments – 'Conductive Lithographic Films'

A team of British design engineers has invented a way of using conventional paper-and-ink printing presses to manufacture electronic circuit boards.

The new technique could potentially slash the costs of producing circuit boards for many applications. It is also likely to be more environmentally benign than conventional methods, and because specialised machinery is not needed the process could be used in Third World countries that do not have access to expensive manufacturing plant.

The concept is a simple one: circuits are, literally, printed onto paper using ordinary printing presses. The key to the process lies in the ink, a special patented formulation which can conduct electricity.

The team is part of Clean Electronics Research at Brunel University led by Dr David Harrison.

Printed circuit boards are present in virtually every electronic appliance, from washing machines to sophisticated chemical sensors.

They are usually made by coating a 'substrate', for example a fibreglass plate, with a thin film of conductive material such as copper. A photographic image of the circuit is applied to the conductive film, after which it is treated with acid to etch away the excess material, leaving the circuit behind. This is known as a 'subtractive' technique, and as such generates a large quantity of waste.

The Brunel technique, on the other hand, is 'additive' - the circuit itself is applied directly to the substrate.

The team has successfully incorporated paper circuit boards into a range of devices, from telephones to microprocessor-based products.Of particular interest are disposable devices, such as diagnostic kits used in medicine and industry. The circuits can also be printed onto more robust substrates, such as polymer-coated paper, to increase the durability of the end product.

Having demonstrated the feasibility of the concept, with the potential to mass produce circuit boards very quickly and very cheaply, the team is now seeking industrial partners to take the idea to the market place