

Systematic Innovation



e-zine

Issue 21, October 2003

In this month's issue:

Article – Seven (TRIZ) Habits Of Highly Effective People

Article – Evolution Potential Hierarchies

Humour – Use Of Resources

Patent of the Month – Polymeric Film

Best of The Month – Brain Of The Firm

Conference Report – ECCI8, Mainz

Investments – Wax Balls

Biology – Guillemot Egg

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Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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

Seven (TRIZ) Habits of Highly Effective People

Stephen Covey's book 'The Seven Habits of Highly Effective People' (Reference 1) is one of the all-time classic texts of human psychology, selling several million copies within a very short time after its original release in 1989. As a study of 'best practice' of human communication, relations and values, the book has few if any peers. We periodically check the book out for links and parallels with the content of TRIZ. TRIZ is often seen as a highly mechanistic approach to problem-solving, and therefore in-effective when dealing with the tangle that human relations often form. The truth, however, is that there is an awful lot of commonality between the approaches described in Seven Habits and those of TRIZ. This article examines some of the common features and complementarity between the two.

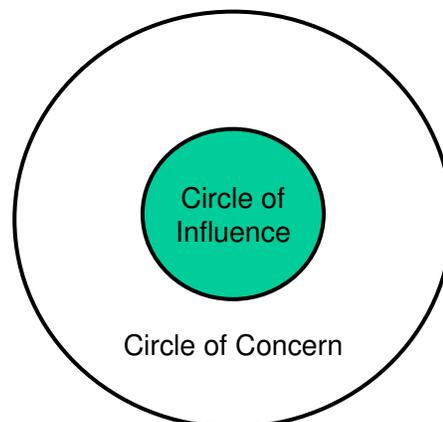
The Seven Habits described in Covey's book are simply summarized as:-

- 1) Pro-activity
- 2) Beginning with the end in mind
- 3) Putting first things first
- 4) Thinking win-win
- 5) Seeking first to understand... and then to be understood (empathy)
- 6) Synergism
- 7) Sharpening The Saw (continuous evolution and advance of processes)

In the book, the seven habits form a progression from (in the first three habits) personal growth to teamwork/co-operation/communications (the next three) to the renewal of all of the habits (habit seven). We examine each of them individually, emphasizing their connections to TRIZ.

1) Pro-Activity

The first of the seven habits is the one concerned with choices. The biggest single idea underlying the Habit is that given a situation, be it a pleasant one or an unpleasant one, we have a choice on how we respond. If someone cuts in front of us in a queue or on the freeway, our inclination is to become angry with the offender. But this response is a choice. A far more useful response states the book, is to choose to take the opposite perspective. If, the book argues, we can turn our negative emotions into positive ones, then we open up the possibility of a happier and more productive life. Channeling energy to anger is ultimately futile if we do not have the power to influence a situation.



A very useful image contained in the book is that of circles of influence and circles of concern. Within our circle of influence are things we have the ability to change. Within our

circle of concern are things that we are concerned about, but have no power to influence – like the driver that cuts us up on the road. Pro-activity is about not wasting our time on circle of concern and instead seeking to utilize and expand our circle of influence. The pro-activity habit is totally concerned with TRIZ Inventive Principle 22, ‘Blessing in Disguise’ - our ability to make lemonade out of lemons – and the use of Resources.

2) Beginning With The End In Mind

Habit 2 is about ‘imagining what the future could look like’ and the old adage of ‘if you don’t know where you are going, any road will take you there’. Beginning with the end in mind is about envisioning where you would like to be. The TRIZ and Edward DeBono idea of defining the ‘ideal final result’ (IFR) and working backwards from it to today’s picture is intimately connected to this Habit. If anything, the IFR definition – all the benefits with none of the cost or harm – is a means of extending the Habit 2 concept considerably beyond that conceived and presented by Covey.

3) Putting First Things First

Habit 3 is essentially about the realization of the imagined directions produced in Habit 2. In this way it is primarily about turning thought into action. With TRIZ being primarily focused on thought processes, the link between Covey and TRIZ is less strong in this Habit. Nevertheless the classic important/urgent matrix used in the Seven Habits book –

URGENT & IMPORTANT	IMPORTANT & NOT URGENT
URGENT & NOT IMPORTANT	NOT IMPORTANT & NOT URGENT

is implicitly related to TRIZ. The big idea behind ‘putting first things first’ is the need to focus on the important stuff, and particularly the (often still paradoxical) ‘not urgent’ category. This ‘important and not urgent’ category tends to be the big strategic, paradigm shift stuff in life. TRIZ is at its strongest when helping us to see those discontinuous shifts in the direction of the IFR. TRIZ, in other words, helps us to identify and discriminate the ‘good’ shifts from the less good – to, in other words, identify the important and not urgent.

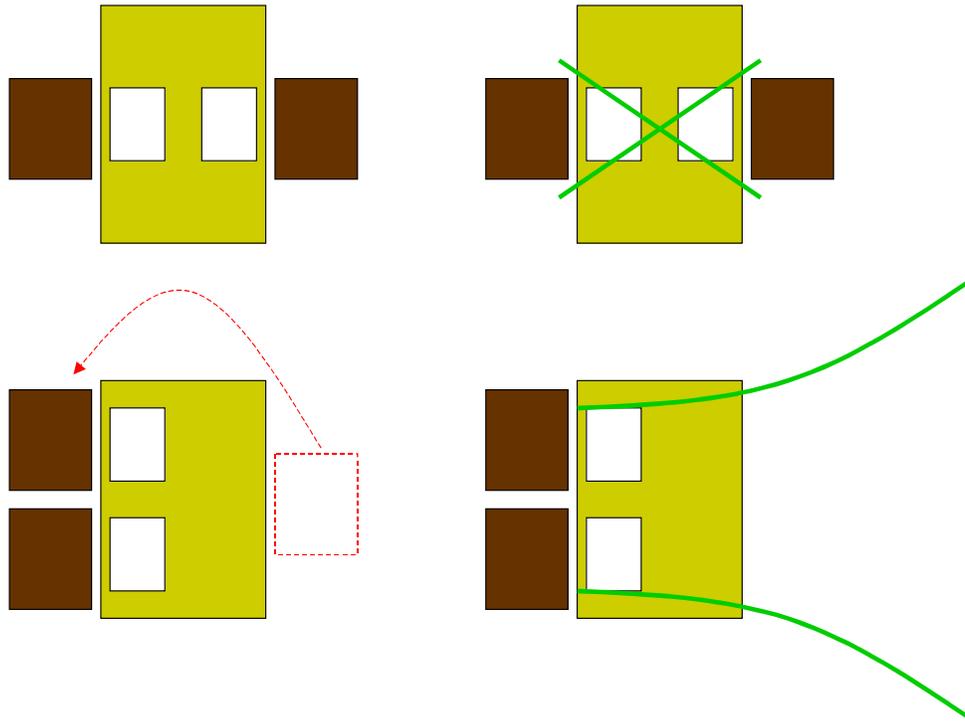
More specifically, some of the TRIZ tests of a ‘successful’ solution – for example increasing ideality, elimination of contradictions, using existing resources/not adding new ones – exist to help us to determine which solutions are stronger than others.

4) Thinking Win-Win

Moving to the inter-personal Habits, Habit 4 ‘Thinking win-win’ is perhaps the habit most obviously connected to TRIZ. Effective people think win-win; TRIZ helps to achieve win-win solutions in systematic ways. The two are intimately connected with one another. Not

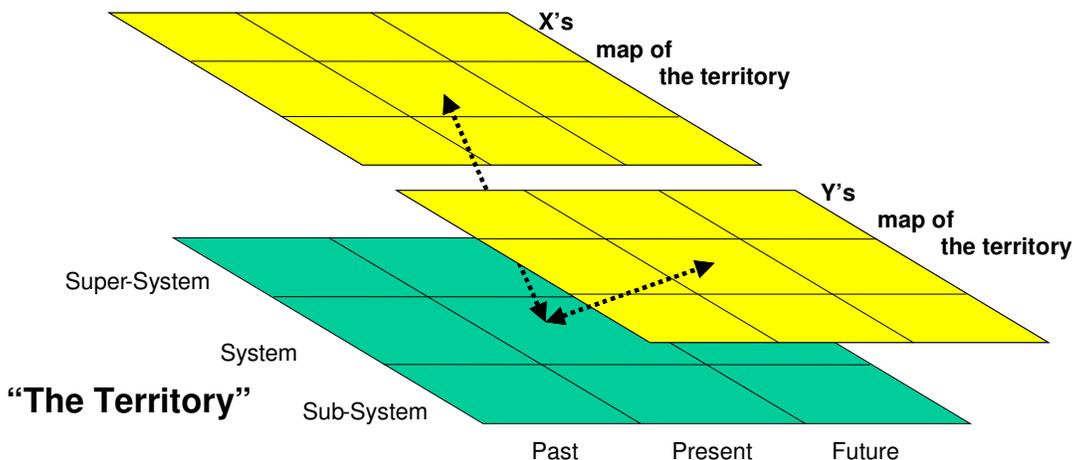
much more needs to be said about this habit, except perhaps to illustrate the wonderful win-win negotiation image briefly mentioned by Covey in his book.

Imagining a negotiation situation between two parties, the usual image involves people sitting at opposing sides of a negotiating table. In a win-win negotiation, both parties move to the same side of the table, and as a consequence are able to focus not just on an either/or I win/you win battle, but on a mutual 'look at the big-wide world of outside possibilities' outlook:



5) Empathy

'Seek first to understand, then be understood' is a conceptually simple, yet often very difficult to implement and practice application of Inventive Principle 13, 'The Other Way Around'. The strongest link with TRIZ comes when we think about the Perception Mapping tool in our forthcoming Hands-On Systematic Innovation for Business book, and the 9- Windows tool. This 9- Windows tool is a means of forcing us to shift our perspective on a problem situation.



Habit 5 is about forcing us to look through the 9-Windows from the perspective of others before we look through them with our own ideas.

6) Synergy

The Synergy Habit is concerned with the concept of the sum being greater than the sum of the parts. 'Synergy' has unfortunately become something of a cliché word in recent times. The idea of tapping into previously untapped resources when we bring two different parties together is fortunately still a relevant and effective means of delivering powerful solutions. The main link to TRIZ here, is precisely that associated with identification of untapped potential and Inventive Principles 5 and 6, Merging and Universality.

In Covey's book, Habit 6 is described as the culmination of the previous five habits. It thus contains elements of all of them. From a TRIZ perspective, the Habit reflects the importance of merging of systems (the above mentioned Inventive Principles, plus the Mono-Bi-Poly trend) in the evolution to higher capability solutions.

7) Sharpening The Saw

Sharpening the saw is about recognizing the importance of the journey compared to the destination. Effective people, according to Habit 7, are people seeking to continuously reviewing and renewing what they do and the way in which they do it. The main link with TRIZ is the cyclic nature of the problem solving process. The idea of Contradiction Chains (Reference 2) for example suggests the concept of successive emergence and resolution of contradictions as the primary means of advance of systems. Sharpening the saw is about recognizing that this contradiction chain idea applies also to the problem solving process.

Putting It All Together

If TRIZ is about the distillation of best practice, then everything of excellence in the Seven Habits should either already be in, or should be integrated into its philosophy and methods. To a large extent, the concepts and ideas described in Seven Habits may already be found somewhere in TRIZ. Summarizing the links, we may see the following:

Pro-Activity	-	Resources/Blessing-in-Disguise
Begin With The End In Mind	-	Ideal Final Result
First Things First	-	(Increasing Ideality/Contradictions/Existing Resources)
Win-Win	-	Contradictions
Empathy	-	The Other Way Around/9-Windows
Synergy	-	Merging/Universality/Mono-Bi-Poly
Sharpening The Saw	-	Contradiction Chains/Process of Processes

References

- 1) Covey, S., 'The Seven Habits of Highly Effective People: Restoring The Character Ethic', Simon & Schuster, 1992.
- 2) Mann, D.L., 'Contradiction Chains', TRIZ Journal, January 2000.

Evolution Potential Hierarchies

In this article we examine a simple extension of the evolutionary potential concept focused on how it can help us to zoom-in to the micro-level detail of a system and identify untapped resources at that level.

We often use the example of the toothbrush as a means of illustrating the concept of system hierarchy. Figure 1, for example, shows how we might think of the toothbrush as a system within a super-system, and comprising a series of sub-systems.

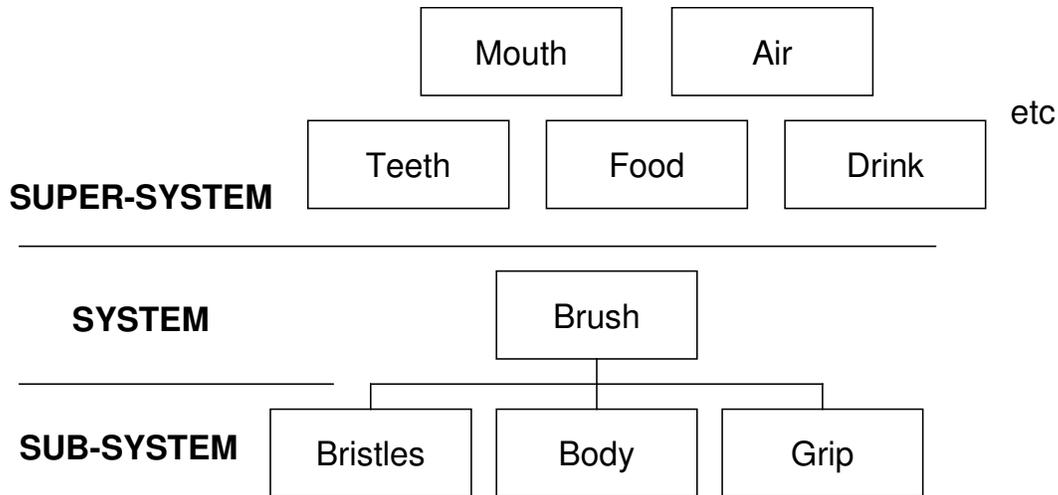


Figure 1: Toothbrush – System Hierarchy

We frequently translate this hierarchy into an equivalent hierarchy of evolutionary potential plots. Figure 2 illustrates what the system-to-sub-system part of that hierarchy might look like for the toothbrush example:

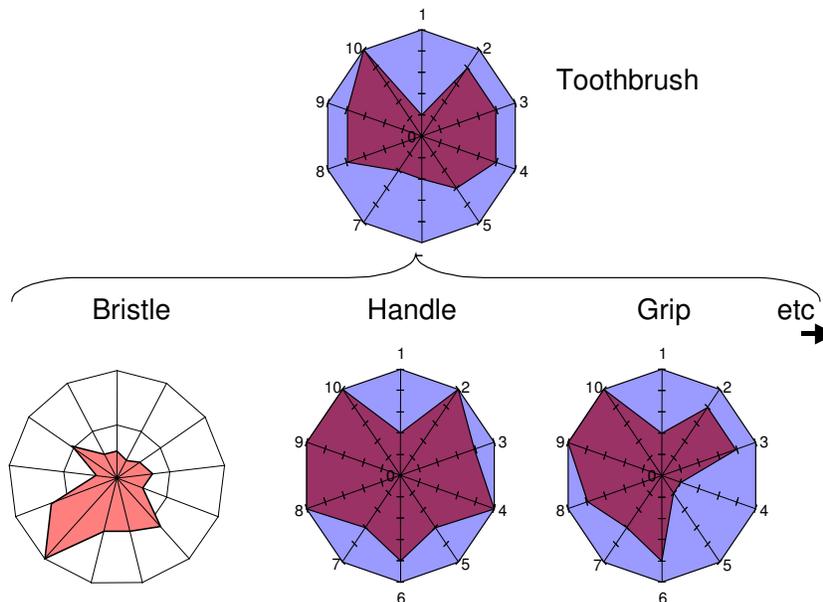


Figure 2: Toothbrush and Subsystems Evolution Potential Hierarchy

The basic idea behind the construction of this hierarchy is that it helps us to identify which parts of the toothbrush are least well evolved, and thus which are most able to deliver improvements to the overall system. In this regard, we believe the overall evolution potential concept is extremely valuable.

A situation that often occurs when we ask people to focus on a single bristle of the toothbrush and to draw its evolution potential radar plot, is that it often appears somewhat subjective. Take the example of the geometric evolution trend shown in Figure 3.

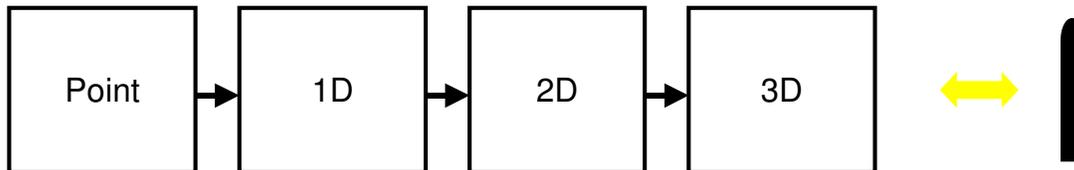


Figure 3: Geometric Evolution Trend

If we ask the usual evolution potential mapping question ‘where is the bristle on this trend?’ we may find ourselves generating several answers. The most usual is that the bristle is at the 1D stage, because it is a straight line. But we could also see it as:-

- a point – if we look at the tip of the brittle end-on for example
- a 2D curve – the side-view profile of the tip of the bristle
- a 3D surface – if we zoom in and examine the micro-structure of the surface of the bristle.

So which of these is the ‘right’ answer?

Answer; all of them.

The most important aspect of the trend-mapping activity is making connections between system and trend. Every connection we can make is an evolution opportunity – and so someone making a connection between the bristle and a point has created an opportunity to evolve that point into a line – and thus create a new benefit – that the person who fails to make the connection will not be able to deliver. In this regard, the evolution potential plot is merely an elegant way of presenting the information.

But what about those situations where we do actually want the evolution potential plots to accurately model the reality of the system? The answer is very simply that we take the system hierarchy to another level of detail. Thus, in the case of the toothbrush bristle we might construct a new sub-sub-system hierarchy something like that shown in Figure 4.



Figure 4: Toothbrush Bristle – Sub-Sub-System Hierarchy

What this new level of detail then allows us to do is to repeat the trend-mapping analysis for each of the different parts of the bristle. The value of doing this is that it opens the door to more connections that in turn will allow us to generate more evolution ideas.

The only limit to this process of zooming-in to more detailed levels is in fact the patience and determination of the people doing the analysis. If we were seriously in the toothbrush business (and thought there was a future for the bristle!), we might well explore deeper levels. We might, for example, construct the radar plot for the tip and then decide that we need to further break this analysis down into another level of detail – looking at the micro-structure, or the material formulation, etc:

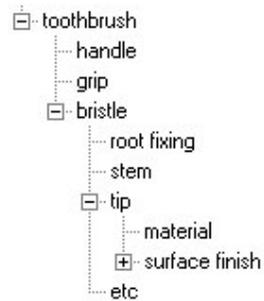


Figure 5: Toothbrush Bristle – Sub-Sub-Sub-System Hierarchy

There are no general rules here, except to repeat the message about more connections equals more evolution opportunities. The main message of this article, then, is that more connections emerge through this kind of hierarchical ‘zoom-in-to-the-fine-detail’ thinking.

Humour – Use of Resources

We have Boris Zlotin to thank for this month's best example of making good use of untapped resources. What should be done with all of the redundant computer hardware we have laying around is the question under investigation. There are probably a dozen redundant carcasses residing in the CREAX computer museum. We clearly haven't been thinking effectively about what to do with them all. Clearly, however, someone, somewhere already solved our problem:-



Patent of the Month

Patent of the month this month goes to 3M for their patent on thin film sound absorbing material – US6,617,002, granted on September 9. A very nice invention offering the potential for use in many noise-reduction environments, the micro-perforated film – see summary below – manages to combine a whole host of Inventive Principles.

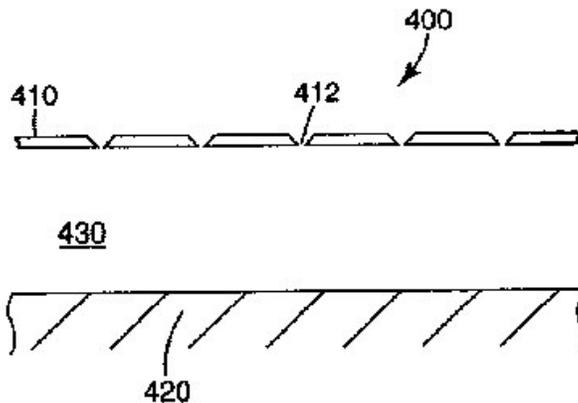
United States Patent
Wood

6,617,002
September 9, 2003

Microperforated polymeric film for sound absorption and sound absorber using same

Abstract

Microperforated polymeric films and sound absorbers using such films are provided. The microperforated polymeric films may be relatively thin and flexible and may further include holes having a narrowest diameter less than the film thickness and a widest diameter greater than the narrowest diameter. The microperforated polymeric films of a sound absorber may also have relatively large free span portions, which, in certain embodiments, may vibrate in response to incident sound waves.



Although quite convoluted in its description, readers may like to examine the invention disclosure in more detail by checking out one of the on-line patent databases.

As suggested by the above summary and picture, the invention achieves its extremely impressive sound absorption properties using a combination of:

- Principle 31 – Holes in the form of micro-perforations
- Principle 15/35 – increase flexibility
- Principle 4 – Asymmetry in the form of tapered holes
- Principle 1 – Segmentation – and the splitting of the sound absorbing film from a 'surface'
- Principle 18 – Vibration – allowing the film to 'vibrate in response to incident sound waves'

The main conflict being challenged by the inventor is the fight between sound absorption and the amount of material required to deliver that absorption. Traditional absorption

methods are based on fibres and foams to deliver the required functionality, with a direct correlation between amount of fibre used and sound absorption capability.

Examining this problem through the lens of the new Contradiction Matrix, we see the following:-

Noise [29]	Amount of Substance [10]	31	9	14	35	4
we want to absorb sound with the minimum use of material		1	10	15	39	

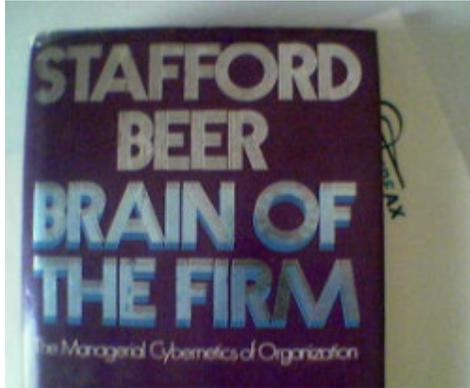
Of the six Principles used by the Inventor, five are featured in the recommendations of the Matrix. The original Matrix does not feature the 'noise' parameter and so a direct comparison between the two different versions is not possible.

Closer examination of the patent suggested to us that further application of Principle 14, Curvature – also recommended by the new Matrix – would offer other advantages to the design

Best of the Month

Nothing of a TRIZ variety to recommend this month.

As we begin putting the finishing touches to the Hands-On' book for business and management, we have been reviewing a large number of other management books. A very lucky find (in a dusty second hand book-shop in Cornwall of all places) was one of the key texts of Stafford Beer.



The 'Brain of the Firm' book has been out of print for some years now, but upon reading it some 30 years after its original publication it is amazing how relevant and foresightful it remains in today's rapidly moving and turbulent world. The book is subtitled 'The Managerial Cybernetics of Organization' and presents Beer's 'Viable System Model' for the first time. The Viable System Model presents the tests that dictate what makes an organization viable, and perhaps more importantly, introduces the idea of recursion – demonstrating that the things that make an organization viable are also required to make a department or work team viable.

For those feeling a little cheated that the 'best of the month' recommendation is unlikely to be located in their local bookshop, we suggest 'The Visionary's Handbook (Nine Paradoxes That Will Shape The Future of Your Business)' by Jim Taylor and Watts Wacker. Originally recommended to us by Ellen Domb with the health warning '85% junk and 15% useful', we found the book easy to read throughout and that the 15% of good stuff (p180-225, minus the exercises) was well worth the effort of the preceding 179 pages. If you're interested in civilization level trends and the importance of paradox in paradigm-shift, then this is a thought provoking place to start.

Conference Report – 8th European Conference on Creativity and Innovation, Mainz, Germany, 3-6 September

Our experience at the previous EACI conference in Enschede in 2001 meant that we approached this one with more than a little trepidation. The overriding sense at ECCI7 was that creativity was more to do with jumping up and down, banging a drum and wearing a false nose than science. This time around the ratio of propeller-heads to scientists was biased much more in the favour of the latter. Hence, although we were only able to spend one and a half days at the conference, we were able to attend several presentations that – shock horror – actually contained some useful content. Admittedly two of these were TRIZ presentations – very nice work by Rolf Herb and Veit Kohnhauser on introductory overview and business case study respectively – but nevertheless, it was great to be able to come away with some new ideas.

More than this, like the last conference, ECCI is a very friendly experience. Even the most cynical types will find it difficult to avoid getting into an interesting and stimulating conversation during one of the ample networking breaks. ECCI8 was attended by delegates from over 25 countries – including, interestingly, several delegates from China. Felicitations and greetings to anyone we met that happens to be reading this.

Highlight paper of the ones we attended was 'The Creative Omega' by Hans Fronius. The creative omega relates to those people within organizations that do not fit the norms and conventions of the organization. The paper tried to draw distinctions over when and where these individuals are a necessary success factor. Add in a few TRIZ thoughts about contradictions – 'I want omegas in my organization and I don't want omegas in my organisation' and you have the recipe for some very nice separation in time space and condition solutions that are worth some serious consideration. Not everyone in the room agreed with everything being said, but it was certainly a twenty minute period where we wrote a lot of ideas down.

CREAX presented the bravely titled paper 'Beyond Systematic Innovation'. The theme of the paper was how Six Sigma, complexity theory and the Viable System Model of Stafford Beer might affect TRIZ/systematic innovation at the philosophical level. Anyone interested may care to download a copy of the paper [here](#).

Investments – Wax Balls!

Investment of the month this month comes from research at the Fraunhofer Institute for Solar Energy Systems. One of the problems being tackled by the group has involved the desire to solve the conflict between parallel desires to make the walls of buildings thin, while at the same time allowing them to have good insulation properties.

The solution derived by the researchers involves a plaster incorporating tiny wax balls. By judicious choice of wax it becomes possible to configure a system that stores thermal energy during warm weather through latent heat absorption effect when the wax melts. Conversely, when the outside temperature returns to normal, the wax resumes its solid state and releases the latent heat that it has been storing.

Thanks to the fact that different balls are placed homogenously throughout the plaster and that the plaster can be applied to walls at different levels of thickness (6mm is stated as typical), the heat-storage/release effect can be prolonged so that a beneficial effect is realized over typical day/night periods. By tailoring the melting point of the wax (a temperature range of 10 to 90°C is claimed to be possible), it is possible to generate systems tailored to different parts of the world.

From a TRIZ perspective, the Fraunhofer researchers have successfully challenged the conflict between wall thickness ('length of a stationary object') versus temperature. As far as the original Contradiction Matrix is concerned, the inventors have not used the recommended Principles. The new Matrix, on the other hand, successfully recommends the Phase Transition Principle used in the wax ball solution:

Improving Factor	Worsening Factor	Principles				
Length/Angle of Stationary Object (4)	Temperature (22)	35	36	10	24	32
I want a thin wall with good thermal insulation properties		3	15	17		

(As an additional detail, we may also note that the inventors have also incorporated Principle 24 – Intermediary – in their design when they specified that the wax should be isolated from the plaster by sealing within plastic micro-balls.)

TRIZ and Biology – The Guillemot Egg



The guillemot is one of a number of sea-birds living a precarious existence on steep coastal cliffs. Building a nest in situations where horizontal space is limited and weather conditions can be highly turbulent is something that is to be avoided if at all possible. A nest, however, performs a number of useful functions, the main one of which for most birds is protection of eggs. So absence of nest would, under normal situations, result in the likelihood of loss or damage to eggs.

In TRIZ terms, we may see the existence of a conflict here; we want a nest and we don't want a nest. We want a nest to protect eggs, but we don't want a nest because building them takes time and effort and, in any event, may in itself be vulnerable to damage. The new Contradiction Matrix may be used to model the conflict as follows:-

Improving Factor	Worsening Factor	Principles
Security (37)	System Complexity (45)	2 6 4 17 13
We wish to protect the egg from damage without the need for any additional systems (e.g. nest)		26
Loss of Substance (25)	System Complexity (45)	28 5 2 10 24
We wish to protect the egg from damage without the need for any additional systems (e.g. nest)		4 31

Alternatively, we could examine the problem from a slightly different perspective. The guillemot is often forced to lay its eggs on ledges that are, by definition of being on the side of a cliff, narrow. Even though the ledge is narrow and there is no nest, the egg should not be allowed to roll off and into the sea. Looking at it this way, the conflict is slightly different. In terms of the new Matrix again, we may see it as:-

Improving Factor	Worsening Factor	Principles
Security (37)	Length/Angle of Stationary Object (4)	17 28 14 29 26
We don't want the egg to fall off its ledge, even though the ledge may be very narrow		
Loss of Substance (25)	Length/Angle of Stationary Object (4)	17 28 24 10 4
We don't want the egg to fall off its ledge, even though the ledge may be very narrow		3

The solution that the guillemot has evolved employs a combination of Principles 17, Another Dimension, and (mainly) Principle 4, Asymmetry. The guillemot egg has evolved an elongated and highly tapered shape – still nicely curved of course because at some point it has to move from inside the female bird to outside – that gives it a very small turning circle. The elongated, tapered shape means that if the egg is knocked or blown from its current position it tends to rotate rather than translate – it stays fixed about a centre, rather than rolling off the ledge:



The guillemot egg, in fact, has one of the largest length to diameter ratios of any birds egg – 1.64 compared to a mean, taken across all species, of 1.37.