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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.

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Think Of Someone Who Has A More Extreme Version Of Your Problem...

(...and they are highly likely to have found a solution)

If we're caught using the phrase 'someone, somewhere already solved your problem', highly likely that another phrase will be pretty close by; 'think of someone who has a more extreme version of your problem and they are likely to have already found a solution'. Through the mathematics of chance, by the time we realize we have a problem we're on average likely to be somewhere in the middle of a normal distribution (Figure 1). By the same mathematics, someone at the extremes of this distribution saw the problem a long time ago, while others at the other extreme have not seen the problem yet and likely as not, will not see it for a long time to come.

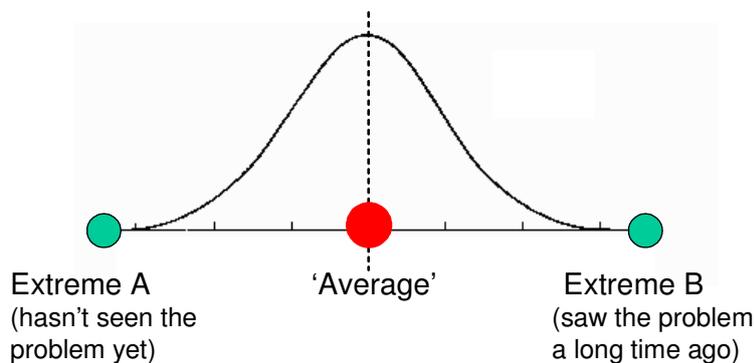


Figure 1: The Normal Curve and 'Extremes'

A good problem solving strategy given this phenomenon, is to somehow manage to find an analogous but yet more extreme situation to ours. This article is about a strategy for finding these extreme analogies in a systematic fashion.

As is often the case with systematic strategies, it is often easier to see the process in action through examples. Let's have a look at a few here:

Laundry

Suppose I'm looking to find a more convenient way of doing laundry. The function I am trying to deliver here is washing my clothes, and the main attribute I'm interested in improving is convenience. In order to find an extreme version of this problem I might well look for someone who is trying to deliver the same function but has a greater need for convenience than me. In order to exaggerate this convenience parameter, I might start to think about what if I had a thousand pieces of laundry to clean instead of a handful. Who might have this problem? And what might they have done to solve it? How about an Army? A large group of people who may be in the middle of nowhere and would really rather not have to think about the logistics of cleaning uniforms. And then how about a self-cleaning uniform?

Robust Cars

I might likewise look to the military if I'm interested in acquiring a more robust car. On the other hand, it may not be so easy to purchase a car from such a source. The attribute I need in this instance is 'availability'. Now I can again start thinking about who might have a more extreme robustness attribute problem than mine and yet still have the same availability? At this point I may chose to use geography as the variable in the equation;

where in the world might there be a more extreme need for robustness than I face? Where might the roads be worse? Or where might the off-road conditions be worse? At this point I might start thinking about places like Iceland or India. India turns out to be particularly interesting in this case because not only does it have some of the worst roads in the world (Figure 2), but it also has a lot of people that are wanting to travel on them. Enter cars like the Mahindra Scorpio:



Figure 2: Worse Driving Conditions Than Mine?

As India's automotive industry kicks into the 21st century we can expect to see that some of the problems they will have to solve for their domestic market will make them a potent force in the global market.

The 2500USD Car

We can stick with India and the automotive sector if we shift our attribute focus from robustness to cost. What if I decide that I want a low-cost car? Who might have a more extreme desire for a low-cost car than me? How about someone with (currently!) less disposable income than me? Enter the Tata 'people's car' initiative and their recent announcements of a one-lakh Rupees (circa 2500USD) car may be on the road in 2008. Tata repeatedly emphasizes that the company's one-lakh car would be a proper car with world-class safety standards, not a scooter or three-wheeler with extra wheels and body added. We can only start to imagine the potential impact on the global market when this solution hits the showrooms. Or maybe the 'showroom' doesn't feature in the equation anymore?

Keeping Warm

Suppose now that my aim is to keep warm while walking outdoors. I could again use geography as a means of finding someone with a more extreme requirement than mine. Or I could chose to shift my focus outside the world of human engineered products. Who in nature might have a more extreme keeping warm problem than me? How about the penguin? A creature that turns out to be able to sustain body temperature in Antarctic winter environments with just a few centimeters of protection. See the penguin feather structure shown in Figure 3.

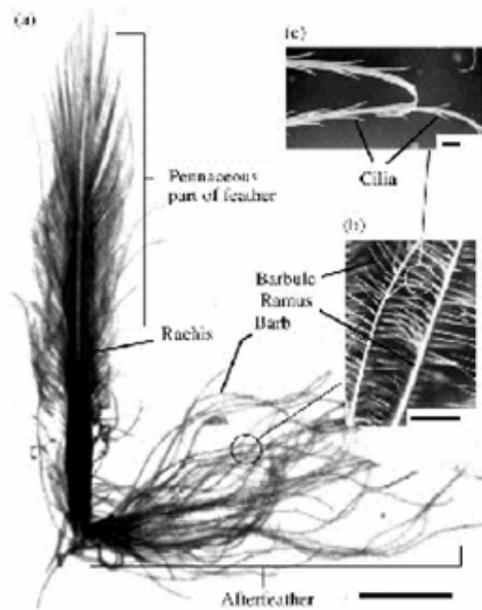


Figure 3: Better Thermal Insulation Than Mine?

The basic model repeating itself in each of these examples is that we first determine what function we wish to deliver (keep warm, transport, clean, etc) and then what attributes of that function we currently fail to get enough of. Then we exaggerate that attribute and start looking for who has to experience that extreme attribute condition more than me. The procedure is summarized in Figure 4. In many ways this is a more general version of the Size-Time-Cost-Interface psychological inertia tool found in TRIZ. In that tool we push ourselves outside the current box by exaggerating one or more of the size, time, cost or interface attributes. In the more general version, we simply identify and exaggerate the actual attribute we wish to obtain more or less of.

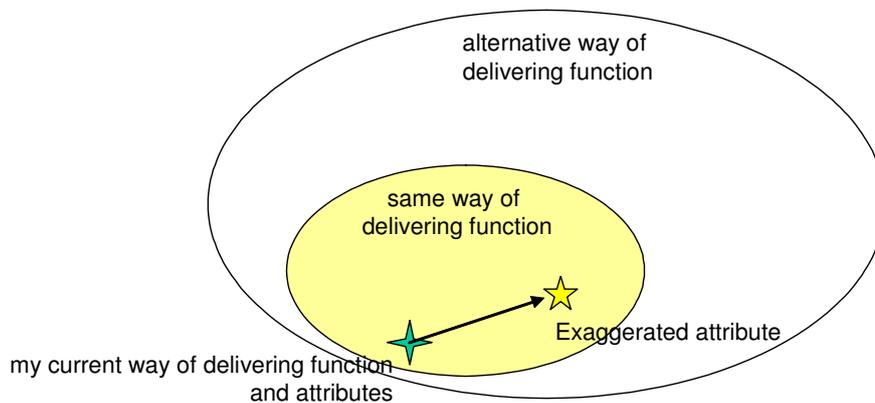


Figure 4: Attribute Exaggeration As A Means Of Finding Problem Solutions?

As shown in the figure, in the first instance, we are likely to conduct the attribute exaggeration exercise by looking at others performing the same function as us using the same mechanism as us. We should do this as it will give us the strongest likelihood of finding a solution that is directly applicable. Only when we haven't been able to find someone or something in this regime should we broaden our horizons to other means of delivering the function. The penguin feather example is typical in this regard – we could go out and buy a coat made in Greenland. This would be an easy (albeit bulky) solution. Shifting to penguin technology may mean an expensive development programme will be required to create a viable solution to my problem.

The 36 Literary Plots And Their Relationship To TRIZ

One of our longstanding readers recently asked us about how the so-called 36 literary plots might relate to the framework of problems defined within TRIZ. For an apparently simple question, the answer has – alas - turned out to be one requiring a substantial amount of research and analysis. The purpose of this article, then, is to review that research and to hopefully make a few conclusions that might benefit either those interested in literature or (more likely) those interested in TRIZ and how it might possibly be used more effectively.

The 36 plots story immediately becomes more complicated following even a very rudimentary Google search. Reference 1, for example, collates the thoughts of a number of literary theoreticians who variously conclude that there are 1, 3, 7, 20 36 or 37 plots. Let us start our discussion here then with the belief of several writers that there is only one 'plot'. Amongst this category are people like E.M.Forster, William Foster-Harris (Reference 2) and, perhaps most significantly, John Gardner (Reference 3). All three come to the conclusion that all literature is about the emergence and resolution of a conflict. While this might not strike us immediately as a 'plot' as such, it is quite significant from a TRIZ perspective. Gardner is the one who talks in most detail about the significance of conflict resolution. In particular he introduces the idea of the Fichtean Curve. Figure 1 reproduces this curve. Regular readers may recognize elements of this picture in our previous discussions on the basis of what evokes a 'wow' reaction in people when they hear a joke or see a piece of great design or hear a great piece of music (Reference 4, 5 respectively) – that is, someone expects one thing (the 'normal' path) which turns out to be different from the place the designer or composer or joke-teller takes them. Then, when the conflict is resolved – after a 'climax' in the terms of the Fichtean Curve – that is when the 'wow' moment is experienced.

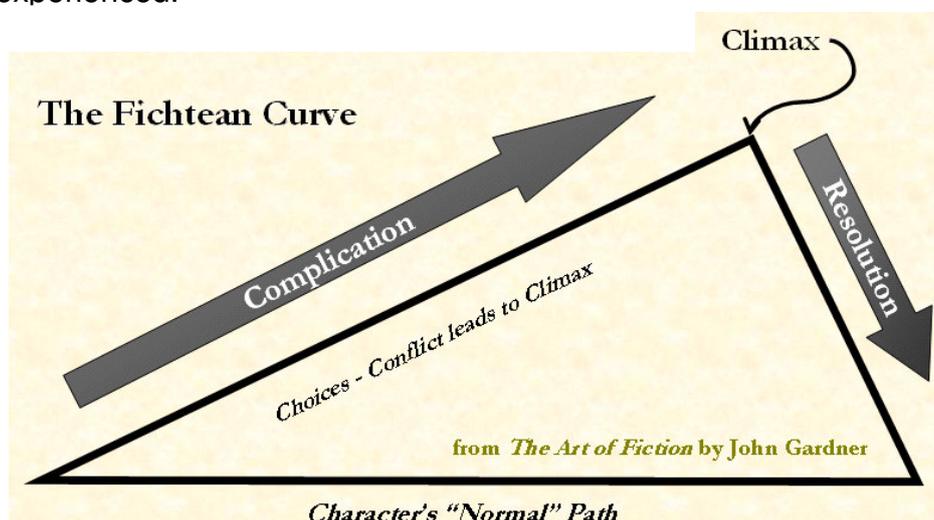


Figure 1: Theoretical Fichtean Curve According To Gardner

We can (and ought to) take this story further by picking out another aspect of this curve described by Gardner: The Fichte Curve shown in Figure 1 represents the basic 'plot' of a book or film. In reality, however, authors or screenplay writers often introduce a multitude of conflicts. Whether consciously or not, what authors are doing when they do this is increase the curiosity of the reader or viewer. As an audience, we appear to be naturally drawn to surprising and unexpected things in fact. Which probably goes a long way in explaining why it has been possible to correlate 'wow' and conflict resolution. We appear

to be inherently drawn to things that are not as we expect them to be. Figure 2 illustrates how authors frequently exploit this tendency.

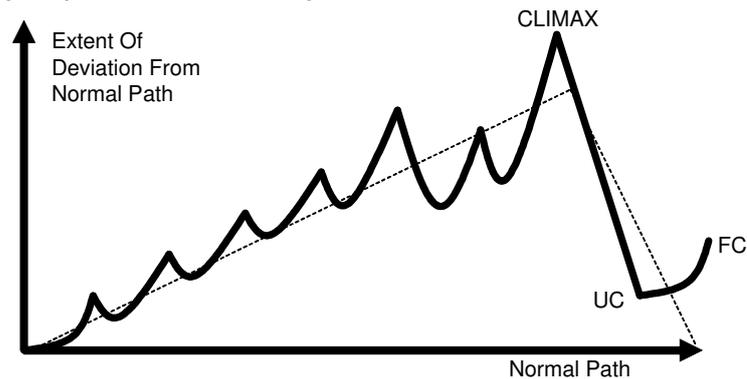


Figure 2: Fichtean Curve For A Typical Novel Or Film

What we observe here is the use of multiple mini-conflicts. The function of these mini-conflicts is to keep the reader interested throughout the book. Whether you are a fan or not, Dan Brown's current DaVinci Code book phenomenon represents a great example of this plot device in action – with the principal character being forced to find and resolve a series of clues in order to make progress towards an ultimate prize. Also worth noting in Figure 2 are the UC and FC points. While these aren't always present, they do represent common archetypes that are consistent with the overall Fichtean Curve premise. 'UC' can be thought of as the unfinished conflict resolution. We see this in many films and books in the 1970s and 80s where the denouement only partially resolves the main conflict. As readers or viewers we experience this unfinished resolution as a doubt. A good example is the ending of Ridley Scott's film, BladeRunner – does the principal character live happy ever with the replicant or not? We are not sure. In fact we are even less sure if we see the Director's Cut of the film. The unfinished conflict may thus be viewed as a device to keep the reader thinking about the book after they have put it down. FC, on the other hand is a device usually used by the film industry to set up the premise for a sequel. FC is a mini final-conflict that is introduced after the denouement and then deliberately left unresolved: did the baddy really die? Did the monster leave behind the seeds of another? And so on.

Meanwhile, before we get too far into detail, let's get back to our 'number of plots' story. Next up after '1 plot' is '3'. We won't give this one too much time as it basically says that the plot will close with either a happy, a sad or 'literary' ending (see Reference 1 if you want to try and understand this in more detail). Not much more interesting than 3-plots is 7. This is the man-versus-x theory, where 'x' is the seven different sorts of thing that man can be put in conflict with – from 'self' to the environment to 'God'.

The 20-plot view of the world (Reference 6) takes us into somewhat more fertile territory, at least from a TRIZ perspective. What Ronald Tobias appears to recognize is that a literary plot is all about a system in which something happens (ahem, we probably need to put Proust aside at this point – since almost nothing appears to happen in any of his books). Typical plots, according to Tobias, involve rescue or revenge or discovery or sacrifice. In broad terms, a plot can be expressed in terms of 'something or someone does something to something'. There is much commonality here with the subject-action-object (SAO) structure of TRIZ-based semantic knowledge tools – the essence of which is precisely that the important content in any text is the subject, action and object material. A tongue-in-cheek version of this SAO plot concept can be found in the 'Official Movie Plot Generator' book (Reference 7). Figure 3 illustrates a typical movie plot generated by this technique. What both the book and the overall SAO concept should pretty quickly tell us is

that there are rather more than 20 possible plots, very simply because there are more than 20 action words. All the 20 plots worldview in effect does for us is tells us that here are the 20 plot types that have historically been used the most frequently. This is not necessarily the same thing as the 'best' possible plots however.

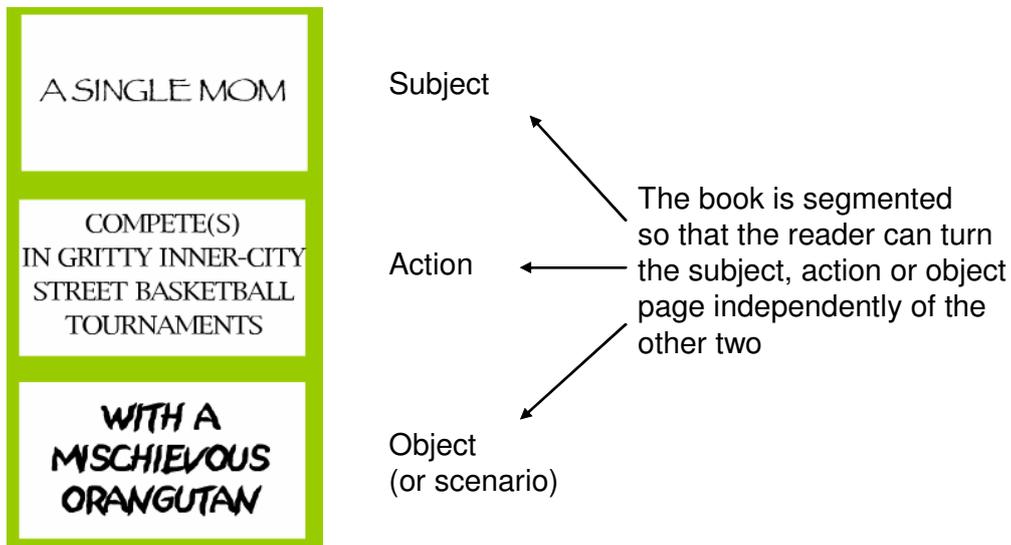


Figure 3: Typical Movie Plot From The 'Official Plot Generator'

Whether or not we take the 20-plot idea seriously, what it does give us to take further is the idea of the plot as a 'system' in which a function is delivered. Add to this idea the earlier idea that every plot must have a resolved conflict and we have (finally!) a bridge that can connect us to the 36 plot view of the world.

The 36 Plot view of the world (Reference 8 – the initial source – and 9 –an easy way to view the different plots) recognizes the existence of conflict resolution and a 'something being done' system and adds to it the concept of the different players that are present. Plot number 1 of the 36, for example, is reproduced in Figure 4 below:

No.	Plot Name	Actors and Elements	Brief Plot Summary
1	Supplication	<ul style="list-style-type: none"> a. Persecutor b. Supplicant c. Power in Authority 	Under persecution, a village sends out emissaries to the local lord, who is not known for his kindness, to beg for relief from bandits. They are harassed by the bandits along the way.

Figure 4: Plot 1 of 36

If we now take this collected concept of 'plot = conflict + system + essential elements' then it becomes possible to see each plot type as a different function analysis model. The above 'supplication' plot, for example, has three elements – persecutor, supplicant and Power figure – that we can connect as shown in Figure 5.

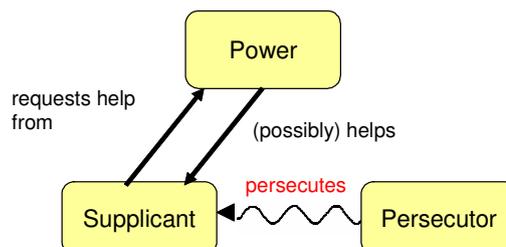


Figure 5: 'Supplication' Plot As Function Analysis Model

Browsing through the 36 plots quickly reveals that the number of characters or elements that need to be present to make a valid plot is variable. Immediately after we segment the world in this way, however, we can see that none of the 36 plots features only one character. This contradicts both the 20-plot model of the world ('man versus self') and also the possibility that we can construct a function analysis model in which an element both delivers a function 'by itself' and also contains a contradiction. We can see such a system in Figure 6. This is a plot we can see in films associated with madness or where the principal character is isolated in some way from the rest of the world. The film *Castaway* (perhaps ironically) doesn't fall into this category since it is a plot concerning an isolated principal character interacting with his surrounding environment (i.e. interacting with a second element). A film like *Memento* on the other hand – the story of a man unable to remember anything for longer than a few minutes - is very much a film built around a Figure 6 plot-line (with lots and lots of mini-conflicts a la Figure 2 along the route from beginning to end).

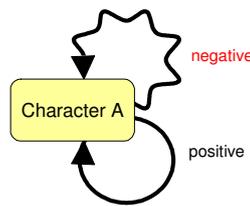


Figure 6: "Man versus Self" As Function Analysis Model

If we haven't already shown the 36 plot model to be flawed with the 'man-versus-self' plot, pretty quickly after we make this connection between function analysis modeling and plot lines we start to realize that 36 can not in any way be considered to be 'complete'. If the number of elements is variable, the number of actions is variable (rescues, revenges, discovers, etc) and the relationship arrows connecting the various elements can be positive or negative then it doesn't take long to see how different combinations will quickly reach a number higher than 36. This is bad news as far as the 36 plot premise is concerned. On the other hand, it should also suggest to us that there are not going to be an infinite number of possible combinations. If we also recognize the necessity for a conflict to be present if the plot is to be a valid one, this further restricts the number of possible 'plots' – each function analysis plot model must contain at least one 'positive' arrow and one 'negative' (wavy) arrow.

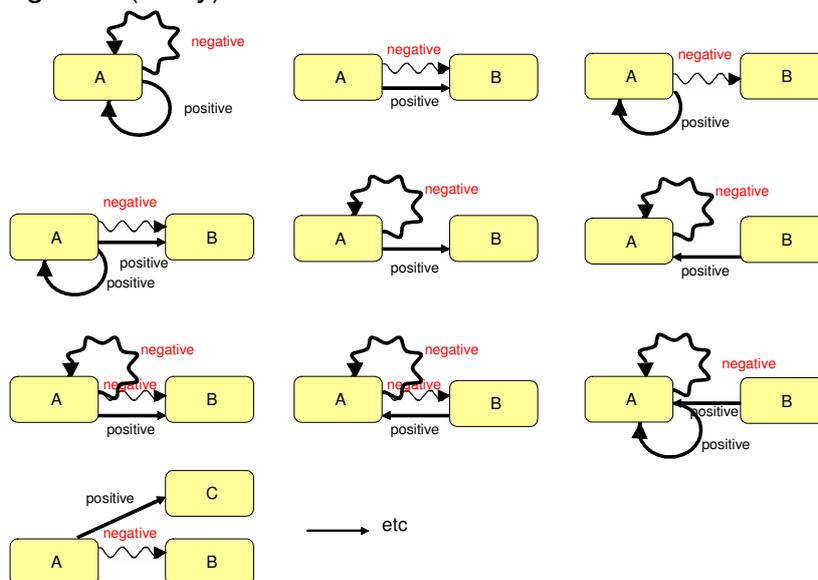


Figure 7: Various Different Plot Types As Defined By Different Function Analysis Models

If we were very patient we could proceed to draw out all of the possible combinations of numbers of elements and number and type of arrows. We could systematize this process by starting with plots involving first just one element and then two and then three, and so on. Figure 7 starts this job, without any great desire to finish it (especially when we start to contemplate the number of different combinations of connections that occur when we have three, four or more characters/elements).

If we were even more patient, we could begin to correlate these different function analysis model types to each of the 36 plots. When we start getting into the detail of the list, however and start seeing things like:

20	Self-sacrifice For an Ideal	a. Ideal b. Hero c. Person or thing sacrificed
21	Self-sacrifice For Kindred	a. Kinsman b. Hero c. Person or thing sacrificed

It starts to feel like there is some chicanery afoot – are these 36 plots genuine or has Georges Polti engineered the analysis to fit a prior decision to make it 36? As far as our function analysis model is concerned, both of these plots will look the same, with just the name inside one of the elements switched from ‘ideal’ to kinsman’. Switching names inside the boxes ought not to be thought of as a new plot, in the same way that making a film of Frank and Juliet wouldn’t necessarily make it any different from Romeo and Juliet. Sure, it may turn out that the relationships between the three elements might be different due to the possibility that, say, the kinsman character has an attraction to the person or thing sacrificed but the Ideal does not. The description in the 36 Plots text, however, fails to adequately distinguish between such differences. Our function analysis model technique, on the other hand, could quite elegantly show how the two *are* different – Figure 8.

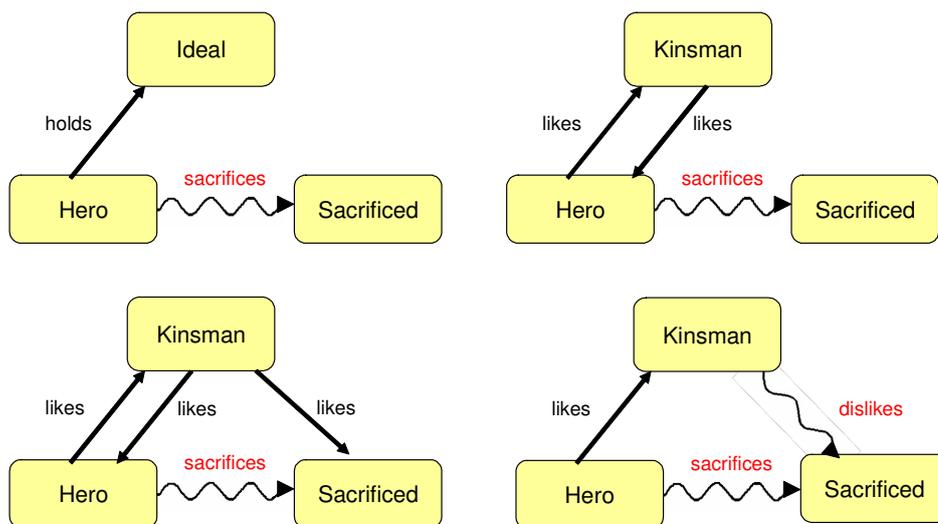


Figure 8: Sample Different Interpretations Of Plots 20 And 21
(note how all of these would be defined as different plots using the Function Analysis Model convention)

So What Is This Telling Us...?

In order to answer this question we need to look at things from 2 different perspectives; one literary and one TRIZ:

...If we are interested in literature and literary plots:

- 1) all legitimate plots involve the emergence and at least partial resolution of a conflict
- 2) all legitimate plots form comprise a somebody or something (subject) trying to *do* something (an action; a verb)
- 3) the number of genuinely different plots is determined by the number of elements present, the different possible actions and the number and type of connections that exist between the elements. There is a finite number of such combinations, but it is a considerably greater number than 36.

...If we are interested in applying TRIZ more effectively:

- 1) the 36 literary plots have nothing to contribute to what we might think of in TRIZ terms as the set of different problem types. The existing list of 36 turns out to be both incomplete and repetitive.
- 2) What this exercise should do, however, is cause us to reflect on the fact that there is a finite number of different problem types that can be described using distinctly different function analysis models. This number is greater than indicated in literary plots, since in a technical system we are interested in 'insufficient', 'excessive' and 'missing' actions as well as just positive and negative. Nevertheless, the number is still finite.
- 3) The finite number is big enough that we have avoided the temptation to try and calculate it here. Rather, this story ought to remind us of the importance of trying to construct the smallest possible function analysis model while still capturing the essence ('plot') of the system under consideration. The S-Field modeling tool found in TRIZ is an attempt to force problem solvers to think about the smallest possible viable description of a system. The two-substances limitation prescribed by the S-field tool, though, is often too limiting – hence the evolution of most people from that tool to the function analysis tool. Many people have unfortunately taken this shift as a need to include absolutely every component in a system. Films and books contain many characters, but not all of them relate to the main plot. Likewise, there will be many elements in a system that are present, but yet have nothing to do with the essence and for that matter purpose of constructing the model.

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Not So Funny – Bad Designs Of The World Part 137 – Hilton Wake-Up Call

It is always a great pleasure to find oneself staying in a Hilton hotel. Even better in some of their hotels if you bring your own alarm clock. Here are the instructions for setting a wake-up call should you wish to use the service at the Netherland Plaza Hilton in Cincinnati:

- Step 1: Pick up receiver
- Step 2: Press the "Messages" button.
- Step 3: Press "U" to change user options.
- Step 4: Press "C" to change call schedule options.
- Step 5: Press "A" to schedule automatic wake-up.
- Step 6: Press "C" to change your wake-up call schedule.
- Step 7: Press "A" to add a new wake-up call.
- Step 8: Press 3 or 4 digits to select wake-up time.
- Step 9: Press "A" for AM or "P" for PM.
- Step 10: Chose one of the following options:
 - Press "M" for Monday thru Friday
 - Press "S" for Saturday and Sunday
 - Press "E" for everyday
 - Press "X" for one time only (any day)
- Step 11: Press "K" to keep the wake-up call.
- Step 12: Press "X" to exit the automatic wake-up main menu.
- Step 13: Press "X" to exit the call schedule options.
- Step 14: Press "X" to exit the main menu.
- Step 15: Press "X" to exit the system.

Got all that?

Should anything go wrong, don't worry, because here is all you need to do to remove any wake-up calls you may somehow have managed to make:

- Step 1: Pick up receiver
- Step 2: Press the "Messages" button.
- Step 3: Press "U" to change user options.
- Step 4: Press "C" to change call schedule options.
- Step 5: Press "R" to remove all wake-up calls.
- Step 6: Press "X" to exit the call schedule options.
- Step 7: Press "X" to exit the main menu.
- Step 8: Press "X" to exit the system.

Our hearty congratulations to the designer of this wonderfully (not) intuitive, (not) clear and (not) simple to use system. How this sort of thing manages to make it all the way to the consumer (on pre-printed and laminated instruction cards no less) without someone in the organization questioning it almost beggars belief. Our award is thus divided equally between the system designer and the Hilton management team. An awesome achievement, other hotel chains might only dream of matching.

Patent of the Month

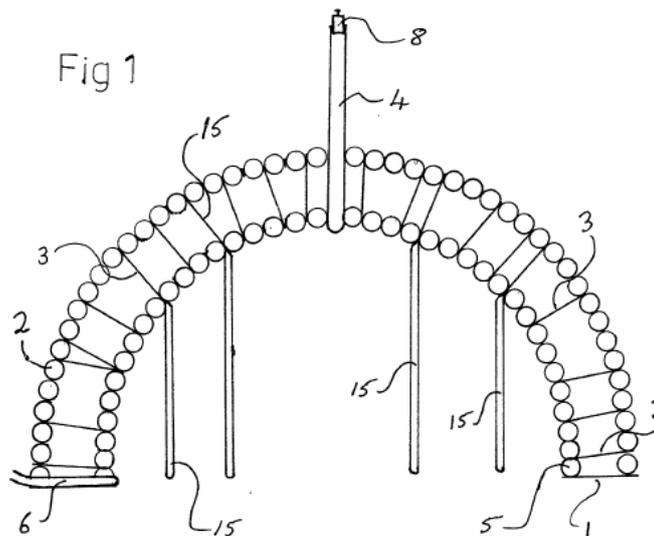
We've been through about 4000 patents granted in the month of March in order to find something worthy of our Patent of the Month award. The best we have come up with is GB2417681 awarded to lone-inventor Philip Mickelborough on March 8. The invention describes a device for bomb blast suppression. To be honest, we think it has a number of flaws that ideally ought to have been addressed before the patent was filed. Those flaws, however, should not prevent us from seeing the undoubted merits of the basic idea.

Here, first off, is the basic problem being addressed by Mr Mickelborough's solution:

When a bomb explodes the damage is caused by an initial air shock wave of high pressure and high temperature of short duration herein known as the shock wave, a subsequent pressure wave of longer duration comprising rapidly-moving hot air and gaseous products of combustion together with small fragments from the bomb or its environment known as the fireball, large fragments moving at a high velocity and a negative pressure that can develop behind either wave. Damage to property and to life arises from the overpressures of both compressive waves, from the heat of the initial shock wave and the fireball, from the propensity of the shock wave and of the fireball to ignite combustible materials that they encounter, from the kinetic energy of fragments of the bomb and its environment and from the negative pressure that can develop following the blast. This invention will reduce the damage that occurs from all of these effects.

Prior art solutions to the problem have tended to utilize physical objects placed around a bomb's location. Such objects are likely to be heavy and therefore difficult to move around. They may also turn out to present additional threats to surroundings due to secondary blast effects. Several inventors have thus tended towards use of liquids or foams to solve the problem. None of these has been found to be particularly efficacious, due to either their weight or expense or, in the case of sprays, limited ability to prevent physical damage to surrounding structures.

Mr Mickelborough's idea is very simple. It basically uses lightweight inflatable tubes that can be rapidly filled with water (an existing resource that is likely to be present somewhere in the vicinity of a bomb). The tubes are arranged spirally in such a way that, once they are inflated with water, they form a self-re-enforcing structure around the bomb:



The invention does a particularly elegant job of combining water tubes and surrounding air-gaps to create the best possible shock-wave absorption system with the smallest

possible quantity of water. An Evolution Potential analysis quickly reveals several opportunities that have not been exploited in the design, but this should not stop us from applauding the elegance of the basic design. From a contradiction perspective, the core problem solved by the invention looks something like this:

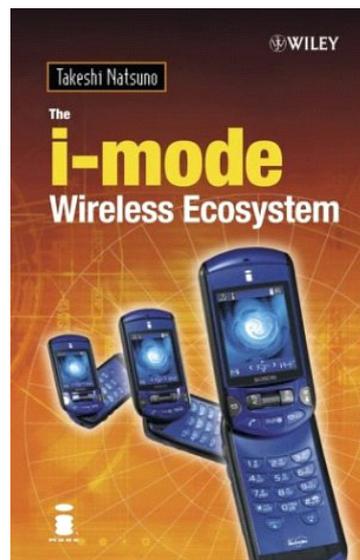
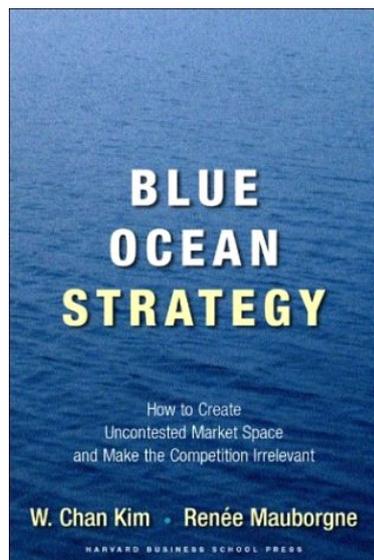
Improving Factor	Worsening Factor	Principles										
Safety/Vulnerability (38)	Amount of Substance (10)	<table border="1"> <tr> <td>35</td> <td>31</td> <td>13</td> <td>9</td> <td>5</td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	35	31	13	9	5	30				
35	31	13	9	5								
30												
we want to provide maximum protection against bomb blast, but want to use the minimum amount of material to achieve it												

We can see how Mr Mickelborough's design has made good use of Principles 30 ('Flexible Shells & Thin Films') and 31 ('Porous Materials' – water plus air-gaps). Dig deeper into the invention disclosure and you will also see Principles 35, 5 and 9 in action too. All in all, a very elegant solution and a nice case study of both the Contradictions and Resources parts of the TRIZ toolkit.

Best of the Month

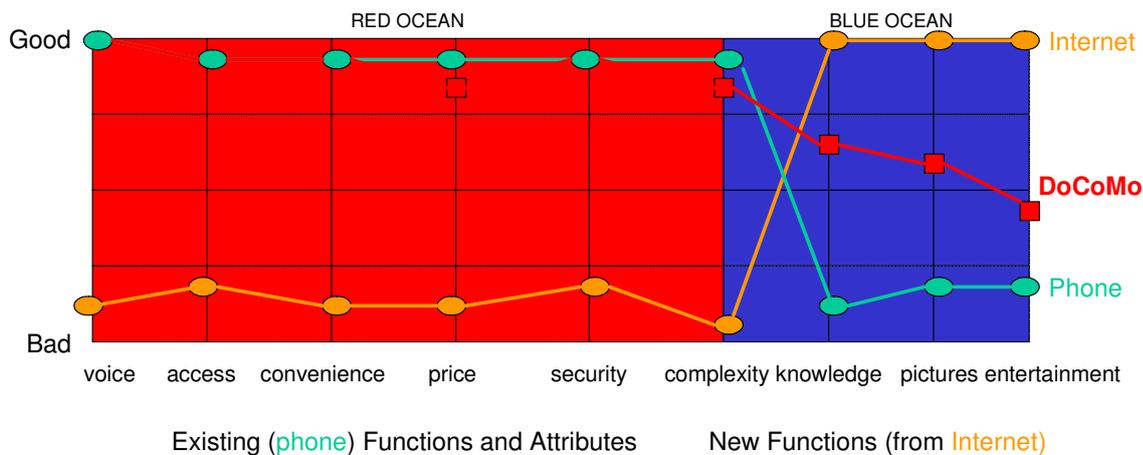
Have you ever read one of those books that you can't tell whether you really like it or really hate it? We had that dilemma with the mini-phenomenon that is 'Blue Ocean Strategy' by W Chan Kim and Renee Mauborgne. On the one hand it is a book with a lot in common with TRIZ; it has studied a number of actual business success stories (like [yellow tail], Cirque du Soleil and Curves) and attempted to identify some abstract-level commonalities. Plus it has coined a pair of great names in 'red ocean' and 'blue ocean' to respectively refer to the fiercely competitive, dog-eat-dog and uncharted, high value-returning places where companies can chose to position themselves. That aside, however, and we are left with a book of tiny ideas that are totally obvious to anyone with any TRIZ knowledge. A TRIZ-familiar person is thus unlikely to learn anything from the book directly. Indirectly, though, due to its current popularity, it may well offer a means of promoting TRIZ. Find anyone that has been captivated by the logic and need for companies to find 'blue oceans' and tell them that TRIZ is a far, far more effective way of finding those oceans (e.g. by solving a contradiction or making a jump along one of the discontinuous trends) than the rather weak attempts contained in the book.

Staying in 'glass-half-full' mode, the best thing about the book for us was the case study on i-mode – the Japanese mobile phone Internet service. This case study lead us pretty quickly to our real book of the month: 'The i-mode Wireless Ecosystem' by the company's chief strategist and designer, Takeshi Natsumo.



The main attribute of Natsumo san's eminently readable book is the solving of the classic 'can't get there from here' problem present in so many inventive solutions. For those that don't know, the i-mode phenomenon saw the acquisition of an unprecedented 32 million customers in its native Japan during the first three years following its entry to the market. Compare this to its equivalent in other parts of the world – WAP primarily – and its success record looks even more impressive. So why has i-mode taken off and grown so spectacularly while WAP continues to struggle to gain any kind of foothold? Well, according to Blue Ocean Strategy, it is because i-mode looked at the value proposition of the cell-phone and the Internet and formed a 'blue ocean' space between the two. The figure below represents a 'strategy canvas' (Blue Ocean Strategy invented term for a tool that we first started talking about several years ago and has been around for even longer under the title 'feature transfer') showing, across the x-axis, system attributes that

customers want, and then up the y-axis, a measure of how well a given solution satisfies those attributes:



What i-mode (DoCoMo in the figure) has essentially done according to this strategy canvas is to create an inferior Internet on a person's mobile phone. Crucially, what i-mode has done however, is to give people mobile access to at least some of the capabilities of the Internet (weather forecasts, news, etc) that they would otherwise only have been able to access from a fixed connection).

The key for i-mode has been to make use of existing resources. A vital early decision in the story was the one that said it would use html as the main communication language. What this immediately meant – despite the (currently) limited screen-size of a mobile phone – was that there was a massive amount of content in an already compatible form. It was thus easy for a content provider to become a part of the i-mode offering to customers – in fact they were basically being offered a new, potentially valuable, channel for material that they were already providing for their Internet customers. WAP on the other hand chose not to use html. Instead, the powerful European telecom companies decided that they were powerful enough to insist on a completely new communication protocol. Looked at in the most favourable light, this move could be seen as an attempt to achieve the highest possible quality of service for mobile users – ‘optimum’ for the Internet is not the same as ‘optimum’ for a mobile phone. On the other hand, it also looked like a cynical move to control the market. Even worse though, as far as content providers are concerned, is that there is no longer an easy win for them. A decision to put content onto WAP has thus far meant a complete re-configuration of existing content. It is no longer an easy win in other words. And hence there is our ‘can't get there from here’ story. Much as we would all love to be at a ‘there’ position where there is wonderfully optimized mobile phone Internet content, the ‘here’ position is one in which there is no readily available content. In the more technical terms of the TRIZ ‘law of system completeness’, WAP does not offer a viable system since the engine (content) and the transmission (communication protocol) are incompatible. Whereas i-mode absolutely does.

As the Wireless Ecosystem book makes clear, a key part of the i-mode strategy then is to have a clear intent to have an open system in which all parts of the overall system – content provider, network provider, handset manufacturer, co-ordinator (the i-mode role) and consumer – ‘win’ from each advance of the system. The use of the word ‘ecosystem’ thus becomes a wonderful way of describing the underlying philosophy of i-mode – since, just like a natural ecosystem, the system has to be viable at all times in its evolution. In order to get to ‘there’, in other words, we must have a system in which every advance from

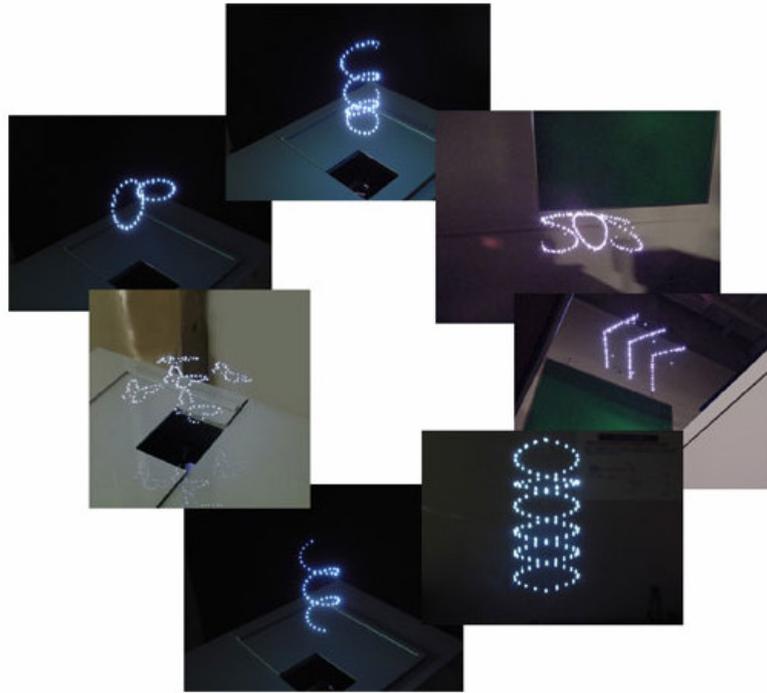
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'here' is both technologically possible and in the best interests of everyone in the value chain.

All in all, as well as being a really nice read, the book has a moral with applicability in just about every other industry we can think of. Highly recommended.

Investments – 3D Images in the Air

We remain in Japan for our investment feature this month. The National Institute of Advanced Industrial Science and Technology (AIST) and Keio University, in collaboration with Burton Inc. have succeeded in the experimental fabrication of a device displaying "real 3D images" which consist of dot arrays in space where there is nothing but air.



Most of the 3D displays reported until now draw pseudo-3D images on 2D planes by utilizing the human binocular disparity. However, many problems occur, e.g., the limitation of the visual field, and the physiological displeasure due to the misidentification of virtual images. The device developed by the collaborative research team utilizes the plasma emission phenomenon near the focal point of focused laser light. By controlling the position of the focal point in the direction of the x-, y-, and z-axes, they have succeeded in displaying real 3D-images constructed by dot arrays in air. A linear motor system enables the position of the laser focal point to be varied by high-speed scanning of a lens set on the motor orbit. Incorporation of this system makes the image scanning in the direction of the z-axis possible. For scanning in the x and y axis directions, conventional galvanometric mirrors are used.

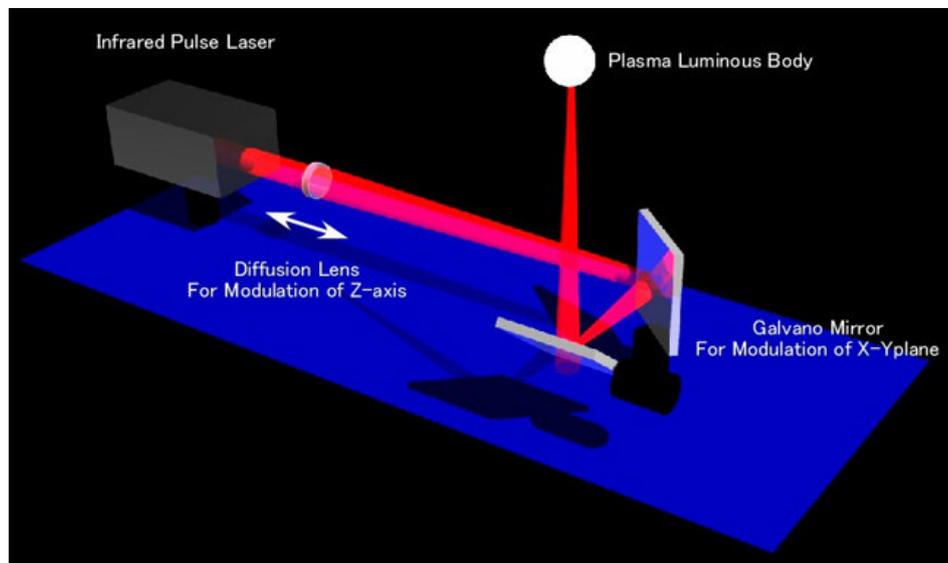
The laser light source used in the work is a high-quality and high-brightness infrared pulsed laser (repetition frequency of pulse: approximately 100 Hz), by which plasma production can be more precisely controlled, enabling brighter and higher contrast image drawing. In addition, the distance between the device and drawing points can be greatly extended (several meters).

The emission time of the laser pulse light is on the order of a nano-second (10^{-9} sec). Our device uses 1 pulse for each dot to that the human eye can recognize plasma emission by utilizing the after-image effect, and enables a 100 dot/sec display.

The basic underlying idea behind the system is the use of a laser produced plasma technology to make a flashpoint in the air. Judicious optimization of the laser energy gives greatly improved the brightness, contrast, and production distance of the plasma. The

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team is now the first in the world to succeed in displaying "real 3D images" in a space where there is nothing but air. The number of potential applications of the technology is likely to be highly significant.



Biology – Cane Toad versus Death Adder Evolution Arms Race

Ah the follies of mankind! When humans introduced the non-native Cane Toad (*Bufo marinus*) into Australia in 1935, it was in the hope that it would spread in sugar cane growing areas and, by consuming cane beetles, help control these costly pests. As is so often the case when man decides to tamper with systems it does not fully understand, things tend to go wrong. In the case of the Cane Toad, the net result – as best we can tell so far – is that the Toad didn't do such a good job of controlling the pests, but that didn't stop it from spreading like the proverbial plague, or affecting other parts of the natural food web.

Many of Australia's snakes feed on frogs. To these species a Cane Toad looks like a frog. Alas, however it doesn't taste like a frog and, for most snakes, the 'cardio-active substances' in the Cane Toad turn out to be lethal. Even mouthing a Cane Toad when capturing it spells doom for many snakes as can be seen in the case of the poor old Death Adder (*Acanthophis antarcticus*) in the picture below:



Enter, then, the dynamics of 'survival of the fittest' and sure enough, some snakes have started to develop strategies that are helping them to survive. A significant problem is that because death occurs almost instantaneously when a snake tries to take a bite out of one of the Toads, there is no opportunity to 'learn' or pass on learning to other snakes. It would also appear that no snake naturally possesses a means to counter the toxins present in the Cane Toad. Again the instant-death problem plus the very short (in evolutionary terms) 70 years since the Toad was introduced make trial and error experimentation a difficult option.

What has happened in this 70 period, however, is that we can observe a shift in the physiology of some of the affected snakes. Scientists have observed two distinct shifts in the Death Adder – firstly a shrinking of the size of the mouth, and second a fattening of the body. So what is happening here? Why do small-mouthed, fat-bodied Death Adders get to survive and big-mouthed, slim-bodied ones don't? Answer: the Cane Toad is a big frog, so if you're a snake with a small mouth, you don't get a chance to take a bite. Then, should you manage to take a small bite, if you have a big body, there is a higher likelihood that the toxins will be spread through a bigger volume and thus that they will dissipate before death occurs.

How amazing is that? If this arms race continues, we can pretty well imagine that the suitably modified snake will be able to survive ingestion of toxins and will thus, over time, have an opportunity to develop some kind of immunity. At which point it will be able to either 'pass on' that immunity to offspring, and/or be able to pass on the knowledge that Cane Toads taste bad, so don't try and eat one.

We can take this wonderful story of the resilience of Mother Nature a step further when we examine the current arms race through the eyes of TRIZ and the contradiction Matrix. The problem being solved looks something like this:

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Improving Factor	Worsening Factor	Principles				
Other Harmful Effects Acting on System (40)	Amount of Substance (10)	31	30	35	28	4
cane toads contain toxins that kill snakes, but the size of the toad (and therefore the amount of toxin) makes them an attractive meal		17	26	40	2	

Interesting to see in the list of recommendations emerging from the Matrix are Principles 17, 'Another Dimension' and 4, 'Asymmetry' – both of which point in the direction of the shape changes that have already occurred. The presence of Principle 35, 'Parameter Changes' is, we think, a strong indication of a solution that will see the emergence of a chemical antidote to the Cane toad toxins.

Nice to think (again!) that best practice in human engineers is closely related to the strategies that nature has evolved. What this case also tells us, we think, is that some Principles are easier to utilise than others – as the Death Adder has discovered in the last 70 years, a few subtle shape changes are far easier to 'evolve' than a chemical antidote. Principle 35 may be the more ideal solution in the long term, but in the meantime, available resources have meant that Principles 4 and 17 can be far easier to deploy.

Short Thort

Rather than to solve problems, it is better to *dissolve* them.
People who solve problems are highly likely to receive credit for their actions.
People who *dissolve* problems should never expect to receive any credit.

News

Thailand

We are happy to announce our recent partnership with the xxx consulting company based in Bangkok. Director, Anawat Jorapunyanont is a SixSigma Master Black and first attended one of our TRIZ workshops over three years ago. We have kept in touch ever since with the intention of finding a way to work together when the right moment arrived. That moment appears to be now, as interest in TRIZ begins to pick up in Thailand. We are very happy to be collaborating and are planning to translate books and software into the Thai language in due course. Work to translate the technical Hands-On book has already commenced. Check out the 'links' page on our website to find out more about Anawat's company.

Conferences

Our full programme of conference presentations now looks like it is finalized for the year. In addition to attending the main TRIZ events of the year – TRIZCON, TRIZ Future, Japan and Mexico – we will also be presenting at half a dozen other public events during the year. Check out the calendar on our 'Experiences' page for full details of events in the US, UK, Ireland, Turkey and Malaysia.

Public workshop In UK

So much for opening an office in the UK to reduce our travel. Our first workshop of the year will now take place at our brand-new Clevedon office on 9-10 May. The theme will be technology and business forecasting.