

# Systematic Innovation



## e-zine

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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.

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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

More and more it seems the Western consumer, choked with an infinite amount of 'free' information, is looking for products and services that free up their time. The expression 'share of wallet' – how much a consumer spends with a given organization – is rapidly being superseded by 'share of calendar' as a business driver. The more of their time-poor day a customer stays engaged thinking about and using your products and services, and the more you can help them free up other precious moments in their day, the stronger the position of your organization becomes.

This time dimension has always been implied in the value equation, and the related Ideal Final Result end-point is often referred to by the expression, 'free, perfect and now', but recent experiments in our problem solving sessions seem to clearly suggest that now is the right moment to be more explicit about making sure 'time' is taken into consideration during those sessions.

Today, the equation takes on several forms. The usual, simplest form is:

$$\text{Ideality} = (\text{Sum of Benefits}) / (\text{Sum of Costs} + \text{Sum of Harms})$$

The one we often use most often, especially in sessions involving intangible factors is:

$$\text{Ideality} = \text{Perceived} \{ (\text{Sum of Benefits}) / (\text{Sum of Costs} + \text{Sum of Harms}) \}$$

This second form of the equation has, for the sake of ease of writing it has to be said, kind of blurred the role of the 'perceived' aspect. The intention has been to remind users that there is both a tangible and an intangible aspect to each of the benefits, costs and harms associated with the entity being analysed. The reality has been that too often the intangible aspects tend to get pushed away from centre-stage.

In every situation, of course, it's about presenting the problem solving team with the most appropriate level of granularity in order that they are able to define the best opportunity and subsequently the best solutions. Which is to say that, with a suitable prod or reminder, at the relevant moment, either of the above equations can be used to achieve the desired equation.

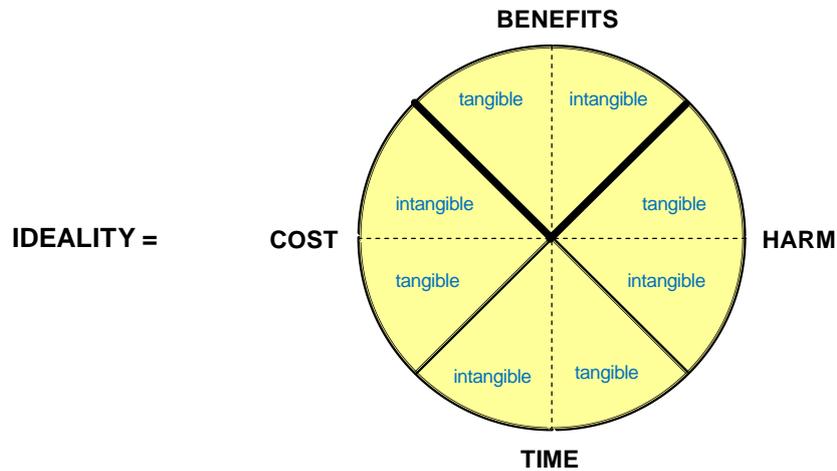
But then there are the groups (think 'Blue' on the Spiral Dynamics scale) who can often become a little perturbed when their facilitator keeps talking about things that aren't explicitly written down in the equation they've been given. Asking these groups to 'not forget time' when mapping the value story for their product or service is not likely to be received well when it 'wasn't on the template'.

For those groups, and for those that are performing a 'deep-dive' value analysis, we have increasingly been using this form of the equation:

$$\text{Ideality} = \frac{\text{Benefits}_T + \text{Benefits}_I}{[\text{Cost}_T + \text{Cost}_I + \text{Time}_T + \text{Time}_I + \text{Harm}_T + \text{Harm}_I]}$$

Where the  $T$  subscript refers to tangible and the  $I$  subscript refers to intangible aspects of each of the four components benefits, cost, time and harm.

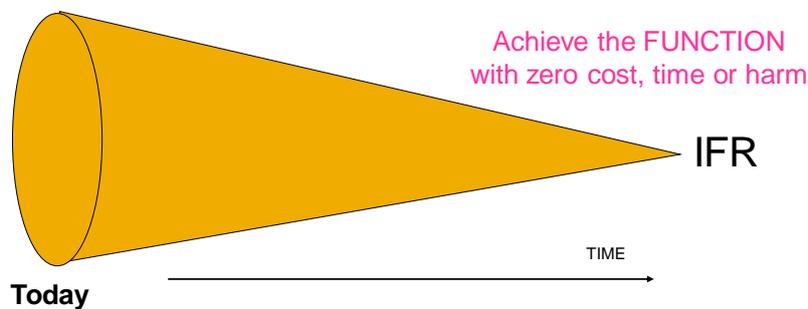
More graphically (which we find helps, for the non-mathematically inclined), we have increasingly been using the picture illustrated in Figure 1:



**Figure 1: The Value Equation**

An important (and it has to be said, accidental) outcome of using this graphical form of the equation has been that it permits a much more visual means of describing different customer types.

We know that the end-point of the value cone (Figure 2) represents the theoretical end of evolution when all the benefits are delivered with zero negatives.



**Figure 2: The Value Cone And IFR End-Point**

We also know, however, that different customers have a different priority sequence between, first off, benefits and negatives, and secondly between each of the different types of negative. So whereas in the long run, the IFR end-point is the universal destination, different customer types are highly likely to follow a different route to that point.

So, to take a few simple examples, the ‘early adopter’ type customer is typically much more interested in the benefits (and especially the intangible benefits – i.e. having new gadgets before others is ‘cool’) than the other three parts of the equation. In contrast, the consumer acutely aware of environmental issues, is typically driven by the desire to minimize tangible harms, while satisfying their minimal tangible function needs. And our ‘time-poor’ customer is making a similar benefit-versus-negative calculation when they are making a purchase decision, the only difference being their emphasis is on the tangible-time negative factor.

Figure 3 illustrates how the value equation ‘clock’ is able to make these different customer types explicitly visible:

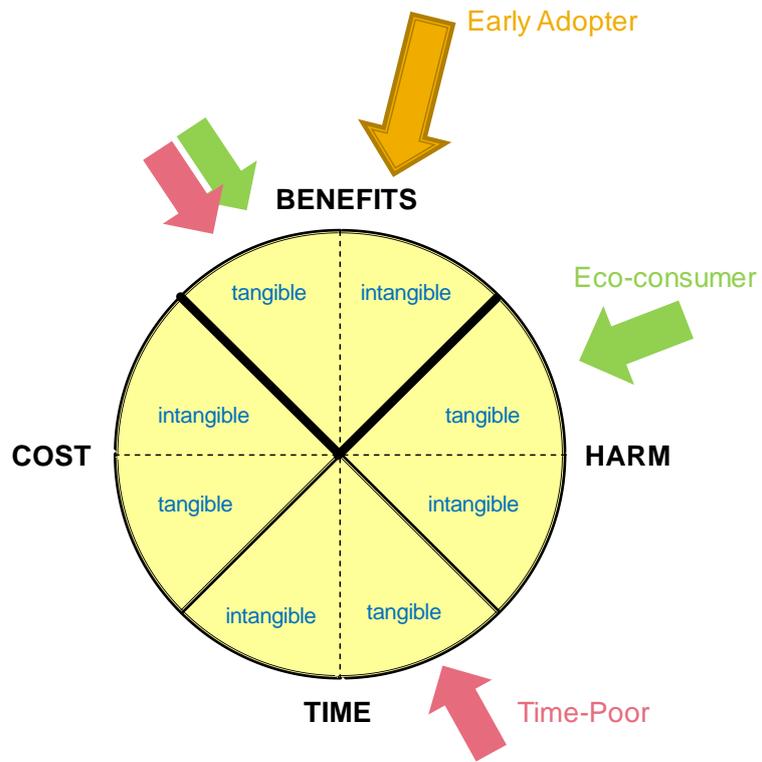


Figure 3: Different Customers Have Different Value Equation Biases

# The Law Of (Consulting) System Completeness

The thing about 'laws' is they are only laws if they apply to everything. The TRIZ 'Law of System Completeness' therefore must, if it is indeed a 'law', also apply to everything. This month we have had cause to think about something that doesn't traditionally get thought of as a 'system', but which nevertheless is one. Consulting. Consulting is a system, because, in theory at least, it exists to deliver a useful function. Hopefully to a client. As such the five elements of the TRIZ Law have to be present:

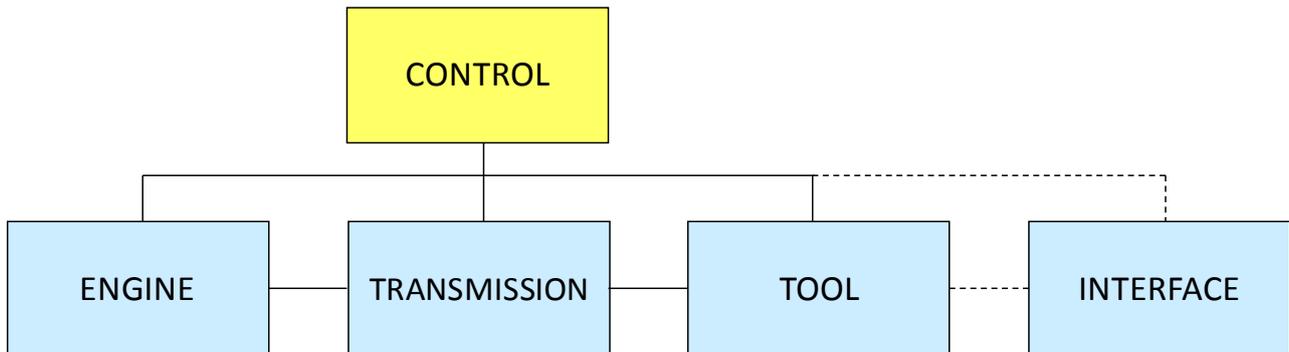


Figure 1: The Five Elements of A Complete System

As soon as the model gets connected to the topic of consulting, some interesting questions begin to emerge: what is the 'engine' part of the system? What is the tool? Who is in control? The questions seemed abstract and the answers didn't always seem so obvious.

When the abstract becomes too abstract, it is often instructive to shift to the specific. A consultant working face-to-face with a client to facilitate a problem solving session seemed like a pretty good example (especially since we spend a lot of our time doing exactly that).

The facilitator's role in such sessions is to make sure all the right things are happening at the right time and that the session is heading to the right end point. This role seemed to be clearly associated with the 'Control' part of the system, and the best analogy for the role we could derive seemed to be a pilot.

The pilot of an aircraft has a particularly difficult job to do. They have a number of instruments to look at and a number of buttons and levers they can press or manipulate in response to what the instruments are telling them. This analogy seemed particularly apt for the TRIZ/SI consultant, since here is a person with a great deal of buttons and levers (i.e. different tools and techniques) they could press at any point in a problem solving session, but knowing which one to use at any point in time depends on what the instruments are saying. Of course, prior to taking off, there needs to be a flight plan and therefore some kind of pre-defined set of activities that will need to be done. The instruments are then necessary to highlight the emergence of events that might require a deviation from the plan. Coordination between sensing the instruments and then responding with the right action is, we think, the key 'pilot' role of the consultant, and the one that, like for real pilots, requires the most experience. It is often easy to teach a new pilot how to follow a specific plan; very difficult to communicate the 'right' actions once the plan doesn't apply any more. The situation is analogous to a frequently used story in the

world of surgery: you can take anyone off the street and teach them how to perform an appendectomy in under an hour; the surgeon spends years training not for this hour, but for all of the possible things that could go wrong during the operation.



**Figure 2: The Facilitator's Pilot 'Control' Role**

Next up, the 'engine' role of the consultant, seemed to best connect to the knowledge the consultant brings to the client. In the majority of cases, this 'engine' is the reason that one consultant is used over another one: if the job requires the resolution of a contradiction, in other words, the necessary 'engine' is someone with sufficient knowledge of TRIZ/SI to help unravel and then solve that contradiction. Without this 'engine' the consultant doesn't work. Having determined this meaning of 'engine', the most appropriate analogy for the consultant-as-engine seemed to be the knowledge-able guide.

Which then leads on to the connection between the consultant's role and the 'tool' part of the system. In classical TRIZ, the tool is the thing that performs the useful function. In our consulting system, this seems to best connect to the role of the consultant as a do'er. The best analogy we could come up with for this role was the miner working at the coal-face; the person working with the client to dig out the useful product, in our case 'the answer'.

Transmission, next, seemed a little more tricky to interpret. The transmission in classical TRIZ is the thing that connects the engine and the tool. What, we asked, is the thing in the consulting world that connects the engine ('knowledge') to the tool (do'er)? In the end we decided this connection was all about the strange and mysterious workings of the human mind. Many is the time we have seen (usually Russian) TRIZ consultants playing the role of smart-alec (alexei?), getting frustrated with a client for their slowness, and then effectively pushing them out of the way to reveal 'the answer'. Kind of a 'I gave you a chance, but you weren't clever enough, so here, I made the answer for you' story. Never, ever in these situations have I ever seen the client stand up and say thank you. Also never ever have I seen that answer being adopted. Irrespective of how good it might have been,

it was never the 'right' answer because it was never the client's answer. This is all about taking into account the 'not invented here' problem. And the 'ownership' problem. And the 'I want to feel clever' problem. And the 'I want to be the coolest person in the room' problem. The role of the consultant in these and all the thousands of other potential psychological pitfalls is the psychologist. Or, better still, we eventually decided, the psychiatrist.

Finally comes the fifth part of the complete system. This is the 'Interface' part that isn't found in the Classical TRIZ Law of System Completeness, but has subsequently been viewed as 'obviously' present. Strictly speaking, in this more recent shift, the Interface is the thing that the Tool works on. It is the rock that the hammer hits. Which could be interpreted in the consulting world as 'the problem the consultant works on'. This connection didn't seem to really resonate with a particular role of the consultant in the system though, and therefore didn't seem to be such a useful analogy. Far better was the business interpretation of the Law of System Completeness, which defines the 'Interface' as the 'Market Demand', which in turn is explicitly about the essential part of the system that is outside the organization. This definition lead us to a question about what is the part of the client's problem that is outside the client? Which in turn lead us to the idea of 'thinking out of the box'; the client being 'inside' their box, and needing to get outside. With this in mind, the perfect analogy for the fifth essential role of the consultant was the person illustrated in Figure 3:

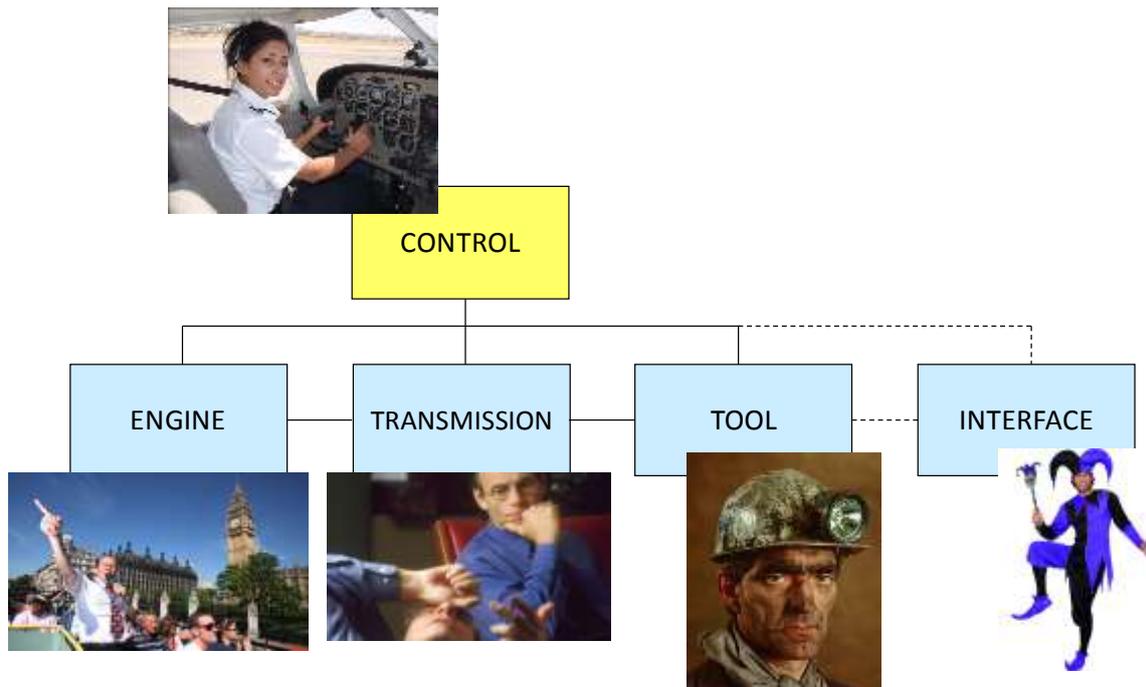


**Figure 3: The Fifth Consultant Role: Jester**

In historical times, the Jester played a crucial role in the kingdom. He (it usually was a he) was the only person allowed to joke about the King and get away with it. The joker had to be funny, but more importantly, was there to ridicule things that, once they saw them, everyone else in the Court would see needed attending to. In modern parlance, the Jester is the untouchable person capable of saying what everyone else in the session is thinking but is not allowed to or is not brave enough to say.

That said, like the Jester of old(e), the modern Jester frequently has to walk a fine line. Saying something 'dumb' in a problem session to get people thinking in a new direction ('I wish for a jet engine made of cheese') can all too frequently be interpreted as merely dumb ('who is this idiot?'). The real skill of the jester in this kind of situation is to get the team outside their box, but not so far outside that they can't see the box any more. The jester, in other words, is needed to find the out-the-box sweetspot distance.

Taken altogether, then, our thinking on the overall complete Consulting system converged on the picture shown in Figure 4:



**Figure 4: The Five Essential Roles Of The Consultant**

At any one time during a client engagement, not all five of these roles will be visibly active. And during an engagement like a problem solving session, only one is likely to be visibly active to the participants at any one moment in time, but in either case, the real need of any consultant is to have sufficient skills in all five areas, and to know which role is the one to be visibly wearing at each moment.

The immediate new problem as soon as these words are uttered is that it is extremely rare to find high (nay: competent) levels of all five in any one individual. To which the immediate answer is that if one consultant doesn't have enough of all five, they need to be working with other people who complement and compensate for their weaker parts. If any of the five is missing, Laws being Laws, then the likelihood of delivering the required useful function will be approximately zero.

## Not So Funny – Modern Britain

If you had to summarise the country you live in for a visitor, how would you do it? How about if you had to do it in under 30 seconds?

Here's what we think. Modern Britain....



... the land where sarcasm, the undoubted highest form of wit, has now reached such a peak of perfection....



...not even font choices are safe from biting ridicule any more. 'Font-rage' lives!...

...personally, I blame the diet....



...not to mention the lackadaisical attitude to customer service...



Come visit us soon!

## Patent of the Month – Microwave Bio-Identification

For our patent of the month this month we travel to the California Institute Of Technology and a pair of inventors working on the problem of security and specifically people identification. Their patent was granted as US7,889,053 on 15 February. In a mercifully brief disclosure document (often a sign in itself of something significant!), the inventors describe the problem they have solved as follows:

*Accurate identification of people is critical for law enforcement, as well as for many security and fraud-detection applications in the public and private sectors. Current methods employ high-resolution optical and infrared cameras or scanners to image the face, or read finger prints or iris patterns in the eye. These approaches work with reasonable accuracy but usually require direct (or extremely close) contact with the person to be identified: for example, by placing a hand on the scanner plate to record fingerprints, or placing one's head against a positioning-frame to allow a lens to produce a high-resolution image of the eye.*

*Identification based on fingerprints has been widely deployed in recent years for security and immigration applications, and is even being used in some computer systems for user login identification. However, such systems are sensitive to the presence of dirt on the fingers, often require reapplication of the finger, and are sensitive to variants such as the pressure of the finger during the fingerprint acquisition process. Fingerprint identification may also be fooled by using artificially gummy fingers. Facial recognition methods on the other hand, are not necessarily limited to very-close range, but the subject must be facing in the direction of a camera since a clear, well-lit image is required. Thus it is relatively easy to evade such systems by wearing a disguise, a face mask, or tilting the head down to avoid providing a clear image of the face. Visual face recognition methods of course depend critically on the quality of the image, which renders such systems sensitive to range and illumination.*

From a contradiction perspective the problem is about the desire to protect something that a) might not be very close, and b) might be disguised. On the Contradiction Matrix, the problem looks something like this:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Ability to Detect/Measure (47)

WORSENING PARAMETERS YOU HAVE SELECTED:

Length/Angle of Moving Object (3) and Other Harmful Effects Acting on System (40)

SUGGESTED INVENTIVE PRINCIPLES:

28, 24, 3, 26, 19, 22, 5, 17, 30, 29, 37, 16, 13, 9

And here's what the inventors have developed as a means of solving the problem:

*In one embodiment, the invention relates to a system for biometrically identifying a person using microwave radiation, the system including at least one processor configured to segment a microwave cardiac signal including cardiac beats into segments, to extract features from the segments, and to perform pattern identification of the segments and features with a pre-existing data set, where the microwave cardiac signal is obtained from reflected microwave radiation including an electrocardiographic waveform and an impedance-cardiographic waveform.*

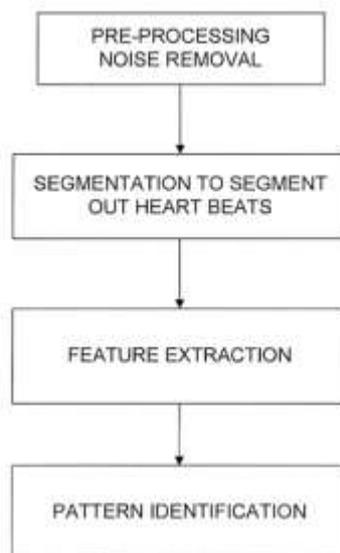
Taken at this level, the invention is first and foremost about using a microwave signal to perform the useful function, and thus represents a clear illustration of Principle 28,

Mechanics Substitution. The fact that the invention then makes use of a 'segmented cardiac signal' is an illustration of Principle 19, Periodic Action.

Whether this Principle (or others for that matter) would have been sufficient to connect the problem to a person's heartbeat is probably a tricky one to contemplate. In fact, the inventors were already aware of the following:

*In the past few years, it has been demonstrated that an electrocardiographic (ECG) waveform may be used to identify a person, with an accuracy of about 95%. This is significantly better than the typical accuracy of a fingerprint. However, an ECG usually requires at least 2 electrodes attached to the person, which has limited its usefulness in real world applications. A recently developed microwave cardiogram, disclosed in a published US patent application (publication number 20040123667), may be employed to provide a unique bio-signature for a person. This approach uses a specially designed microwave transceiver to form a narrow beam directed at the person of interest. The reflected microwave signal contains both the electrocardiographic waveform and the impedance-cardiographic (ICG) waveform of a person. This technique works over large distances, up to tens of meters, and it is very difficult to alter or disguise the ECG and ICG waveforms because they are a fundamental aspect of a person's physiology. The microwave signal may penetrate barriers such as walls and doors, allowing for new capabilities in human identification.*

So, ECG wasn't good enough, but microwave (at power levels 'less than 1 milliwatt, and expected to be hundreds to thousands of times lower than the maximum permissible dose level considered safe by the IEEE Standards Committee on RF Exposure' in case you were wondering) seems to be. The fact that the technology requires a database of pre-characterised people perhaps represents a significant logistical problem in using the solution for security purposes (i.e. someone has to replace the fingerprint database with a corresponding cardiac signal database), but let's not let that detract from the elegance of the solution and the utilization of a resource that we suspect will find a multitude of other practical uses before it finds its way to security.

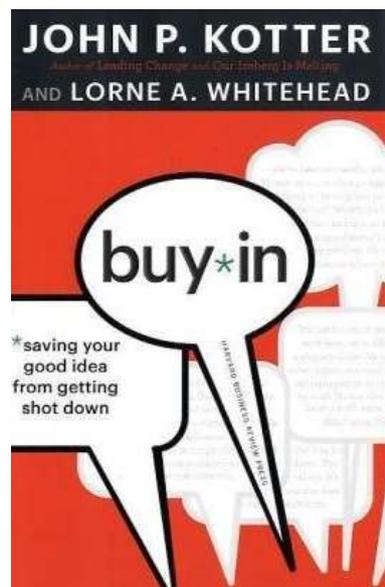


(Note: the reflected signal and feature extraction elements of the invention provide a clear link to another of the suggested Inventive Principles, namely, 26, Copying, where inventors are given the suggestion 'make use of optical copies'. Perhaps we now need to add the suggestion that as well as optical, other 'field' copy methods are also considered?)

## Best of the Month – Buy-In

Anyone that ever ran a problem solving session for a client at some point or other hit upon the 'yes, but' moment. The moment when the spark of a potentially neat idea gets shot down before it has a chance to be explored properly. TRIZ/SI tells us that these 'yes, but' moments are 'merely' the next contradiction that has to be solved. Usually problem solving groups are happy to go along with this idea, but even if they do, because there is always the next 'yes, but', it is very easy for a session to end without delivering 'the' desired solution. Sometimes this is because there simply hasn't been time to incubate and combine all of the available clues; sometimes it's because a critical mass of clues hasn't been generated yet; and sometimes it's simply because someone has a vested interest in not getting to a solution.

Our book of the month recommendation this month is the book you might want to consider having by your side in that latter case. 'Buy-In: Saving Your Idea From Getting Shot Down' is the latest offering from prolific leadership and change management author John Kotter.



Told through a story wound through the first half of the book and a method description in the second half, the book contains a sometimes elegant sometimes a tad trite, combination of theory and application of a series of strategies for making sure, as the title promises, your good idea doesn't get killed. In describing the twenty-four main idea-killers and the best responses to them, in many ways the book may be seen as a series of scripts. Kotter doesn't quite go so far as to suggest that readers memorise these scripts, but pretty close. Rehearsal, rehearsal, rehearsal seem to be the three primary recommendations: the best idea-killer killers being the people that are best able to respond in the moment to the range of 'yes, buts' that might strike at any moment.

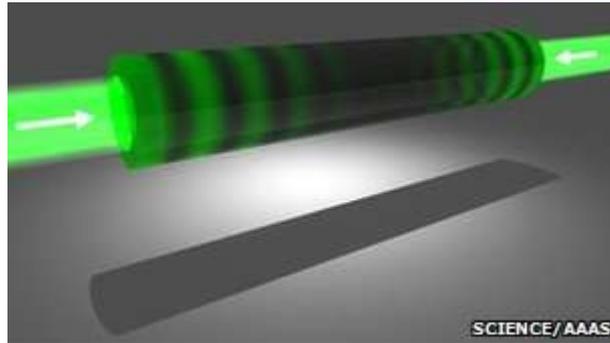
The twenty-four strategies – which Kotter is at pains to inform the reader aren't comprehensive – helpfully divide into four main categories. These are:

- Death-by-delay: Your enemies push discussion of your idea so far into the future it's forgotten
- Confusion: They present so much data that confidence in your proposal dies
- Fear-mongering: Critics catalyze irrational anxieties about your idea
- Character assassination: They slam your reputation and credibility

Few are likely to remember even twenty-four counter-strategy scripts; hopefully nearly everyone can remember four. And to that end, the book makes for a valuable addition in the armoury of anyone that has to ever stand up and justify any kind of change to a group of people that may prefer to stay where they are.

At just over 200 pages and what felt like 70,000 words or less (we read it through the first time during a three hour flight), the book makes for a very readable, very practical reference. Maybe not the comprehensive 'answer' that some might like – ultimately, Kotter recognizes that some thinking on the part of the reader is required! – but definitely a good start. And something that might just change the way that you set about convincing people about your good idea. Best yet, in some frequently very TRIZ-like ways.

## Investments – Anti-Laser



As anyone familiar with the SI trends of evolution will know, the trend of Increasing Differences tells us that sooner or later every system develops its inverse. And so it was with some degree of interest that we read about the recent announcement that physicists at Yale University have built the world's first device that can cancel out a laser beam.

The device, dubbed an anti-laser, is capable of absorbing an incoming laser beam entirely. As is often the case, the potential applications of the inverse system are not always immediately obvious. For many, the most direct use of an anti-laser would be as a defence against laser weapons. However, this is not their primary intention the researchers said. Instead they think it could be used in next-generation supercomputers which will be built with components that use light rather than electrons.

Professor Douglas Stone and colleagues at Yale University had initially been developing a theory to explain which materials could be used as the basis of lasers.

### Strange lasers

Recent advances in laser design have resulted in a number of unusual devices that do not fit the traditional concept of a laser, Professor Stone explained.

"So we were working on a theory that could predict what could be used to form a laser," he said. That theory also predicted that instead of amplifying light into coherent pulses, as a laser does, it should be possible to create a device that absorbs laser light hitting it. They have now succeeded in building one.

Their device focuses two laser beams of a specific frequency into a specially designed optical cavity made from silicon, which traps the incoming beams of light and forces them to bounce around until all their energy is dissipated. In a paper published in the journal *Science* they demonstrated that the anti-laser could adsorb 99.4 per cent of incoming light, for a specific wavelength.

### Light speed

Altering the wavelength of the incoming light means that the anti-laser can effectively be turned on and off - and that could be used in optical switches, Professor Stone said.

Building something which can absorb light over a wide range of wavelengths is pretty simple, said Professor Stone, but only doing so for a particular wavelength makes the anti-laser potentially useful in optical computing. The anti-laser's big advantage is that it is built using silicon, which is already widely used in computing.

It would not, however, be much use as a laser shield, according to Professor Stone. "The energy gets dissipated as heat. So if someone sets a laser on you with enough power to fry you, the anti-laser won't stop you from frying," he said.

While probably too premature to legitimately call this new discovery and 'investment', the speed with which the computing industry evolves probably means that patents in and around the anti-laser could well stand a very good chance of becoming commercially viable within the life of those patents. Definitely one to watch, we think. Especially when one of the MNCs starts to take an interest.

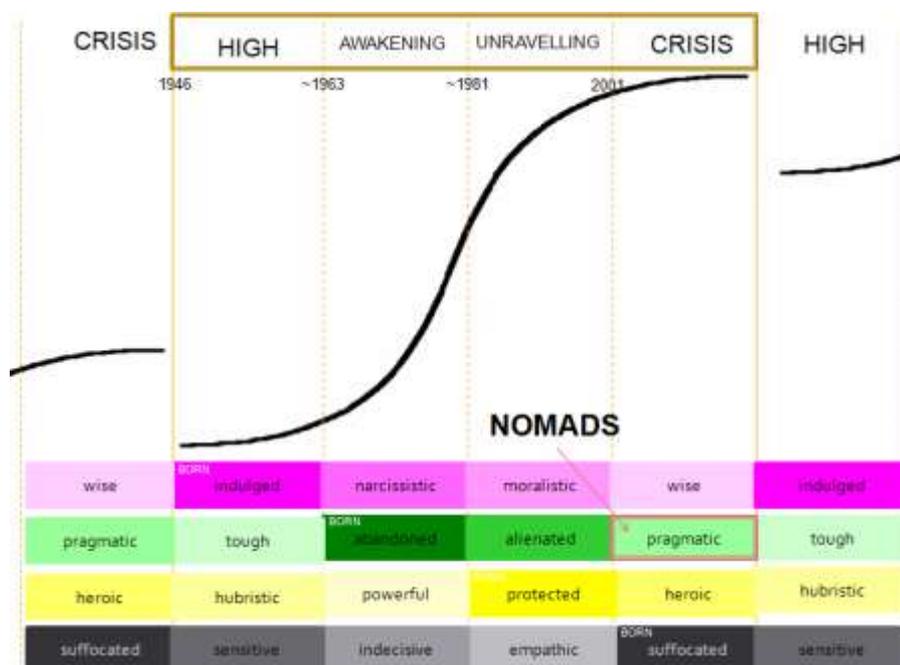
## Generational Cycles – The Pragmatic Nomad

Having received multiple requests in recent months for more detail regarding each of the generational archetypes at each of the different stages of their life, this month sees the start of a series of articles to provide exactly that kind of information. Our start point is the crude summary map assembled from the original Strauss & Howe generations research:

	0-20	21-41	42-62	63-83	
(Generation Y)	HERO	protected	heroic	hubristic	powerful
(Silent)	ARTIST	suffocated	sensitive	indecisive	empathic
(Boomer)	PROPHET	indulged	narcissistic	moralistic	wise
(Generation X)	NOMAD	abandoned	alienated	pragmatic	tough

And, as indicated on the map, the focus of this first article is the Pragmatic Nomad, i.e. the 40+ GenX'er. Who is this person, what are they like, what problems do they have, and what do they think of the people around them are the main questions we're looking to answer here. In order to best do that, it is first of all necessary to set these Nomads in the context of the world in which they live.

Here is the map we typically use to do that job:



What this picture tells us is that our Pragmatic Nomad lives during the 'crisis' period of the 4-generation meta-level societal cycle. Moreover, the Nomad is increasingly in charge of society and our institutions during this period. They also bring to the story their 'latch-key kid' abandoned upbringing and their 'alienated' early adulthood. So what does that make them during their Pragmatic years (remembering we're interested in generalities not the characteristics of any given individual)?

Here are what we see as their main characteristics (in no particular ranked order):

- Innovative and resourceful
- Willing to break the rules in order to improve a situation

- Sceptical and often cynical about society
- Realizing that, with responsibilities, they can no longer 'walk away' ('OMG it's up to me now')
- High problem solving ability often matched with low confidence ('I'm never completely sure I'm doing it right')
- Live to work
- Family very important
- Time-poor
- Self-reliant
- Finally reacting back against the difficult time they've had from their 'disappointed' parents ('we're not so bad after all')
- 'I am who I am'
- Comfortable with technology, but often preferring to stick with what they know than spend time learning something new
- Luxuries will tend to be understated
- Strong sense of humour ('you have to have in this mad world')
- Unlikely to be vain – 'graceful ageing'/'grey is good'

Although it can never be said that Hollywood-anything is 'typical', we can often look to Hollywood to see role-models and characteristics of the archetypes. Particularly useful Nomad archetypes are Brad Pitt and Jodie Foster, both very clear 'Pragmatic Nomads':



Key things to notice: acceptance of ageing (grey is okay; glasses are fine); small signs of rebellion (no ring, bare feet, facial hair their parents think 'looks ridiculous', un-buttoned shirt collar)

#### **Key Contradictions:**

- 1) Work versus family – here is a generation that truly 'lives to work', but who also want to spend time with their kids ('I'm not going to do what my parents did').
- 2) Does the hard work and increasingly makes the tough, unpopular ('right') decisions versus very unlikely to get the credit for it

#### **Relationships With Others:**

This table is all about how our Nomads see others around them. As we will do in future articles looking at each of the 16 different generation/age archetypes, we have divided the relationship story into two main dimensions: 1) how the Nomads see the four different Prophet, Nomad, Hero, Artist types, and 2) how they view the people inside their friends and family network versus how they view those outside.

	Prophets	Nomads	Heroes	Artists
Outside Friends/ Family Group	(moralistic) hypocritical, smug, greedy, Boomeritis (stuck at the 'everyone equal' stage of Spiral), preaching, they caused these (crisis) problems (wise) trusted advisor, voice of reason, nothing too much trouble, valuable albeit peripheral team member	(peers) sympathetic ('we're in this together', 'we don't deserve this'), trusted, hard-working, will get the job done no matter what, unsure, I'll ignore them before they ignore me, put-upon, funny	loudmouths, self-centred, arrogant, immature, impatient, naïve but think they know everything, high maintenance ('why do they need so much feedback?'), too open ('why would you reveal that to people?'), is it any wonder no-one wants to employ them?	(older) well-off, irrelevant, reluctant to join the 'real' world, snow-birds, independent (new generation) Veering between 'needs a smack' and 'poor things, they're not allowed to do anything'
Inside Friends/ Family Group	(parents) distant relationship embarrassment (am I really from the same stock?), 'they like their grandchildren more than me', I'm still a disappointment to them; they won't see past the old stereotype	(siblings/friends) solid network of good, long-time friends; great to be with them, but also great to escape and be by myself after a while, struggling to make sense of their place in life	(children) treated as equals/peers – but now beginning to worry if they should have showed more authority and less freedom, regretting edgy toy purchases (Bratz, etc) and permission to get tattoos, piercings, etc. Guilt – beginning to realize that their parenting is cause of current unpleasant behaviours	(children – late parents) dangerous world need to keep a balanced view but society pushes me to be over-protective, educational toys important (grandparents/late parents) living their own life, not really connected to my/our world, short visits work best

## Biology – Anna's Hummingbird



The fastest bird is widely acknowledged to be the peregrine falcon (*Falco peregrinus*). During a stoop it can reach speeds in excess of 300km/h (83.3m/s; 186mph). But it can only do this by freefalling, harnessing the force of gravity. Last year, scientists recorded male Anna's hummingbirds reaching speeds of 97.2km/h (27m/s; 60.4mph) during diving courtship displays in front of females, an extreme speed considering the bird's tiny size.

"The Anna's Hummingbird is now, relatively speaking, the fastest bird in the world. During courtship displays animals can attain amazing athletic performances," says Christopher James Clark, of the Museum of Vertebrate Zoology at the University of California, Berkley.

"I used high-speed video to show that during a courtship dive, the Anna's Hummingbird reaches speeds of nearly 400 body lengths per second, twice the top speed of diving peregrine falcons or fighter jets," he writes in a summary of a research paper published today in the science journal Proceedings of the Royal Society.

After filming a series of dives, Clark observed that in each one, the male powers the dive by pointing earthwards and flapping his wings 55 times per second. Once he's picked up some speed, he tucks his wings in only to pull out of the death-defying descent at the last minute by abruptly spreading his tail feathers. Clark found that pulling up this quickly subjects the bird to G-forces that are nearly 10 times greater than the force of gravity. These break the record for any aerobic manoeuvre by a living creature, with the sole exception of jet fighter pilots. For these human flyers, accelerations of over 7g can cause blackouts and temporary blindness as the blood rushes away from their brain, but usually only for manoeuvres that last for a second or more.

The hummingbird copes with that potentially fatal problem by ensuring that its peak of acceleration is much shorter, lasting for mere fractions of a second. Its network of blood vessels also contains relatively shorter columns of fluid, which are less sensitive to drastic changes in acceleration.

Clark thinks that one of the key limiting factors to the hummingbird's already impressive dive is the strength of its chest muscles. The acceleration that it experiences when it pulls up puts a massive amount of pressure on its wings and shoulder joints. Its needs to push

back with its chest muscles to stop its wings from ripping right off and Clark estimates that they are already at their limit.

The motive behind this extreme performance is (what else?) sex. It's part of an attempt to woo a female through song. Last year, Clark found that as the male spreads his tail at the bottom of the dive, air vibrating through the outer feathers produces a loud burst of song like a chirp. The tail feathers act like the reeds of a woodwind instrument and this acoustic stunt-flying could explain why Anna's hummingbird dives in the first place.

The noise that its makes gets louder the faster the air rushes through its tail. In horizontal flight, it can only move at speeds of 33mph or 215 body lengths per second. Diving allows it to travel much faster, making its sexy tail whistles sound as loud as possible. A desire for volume fuels its need for speed.

Only the fittest males can cope with the physical challenge of such a stunt, and only they can produce the loudest trills. There is no way to cheat with this display - it's an honest reflection of the power of the male in question. In this way, sexual selection has pushed the display of this species to its absolute physical edge Clark suggests that such displays are fertile ground for researching the limits of animal performance.

Even though the bird has now seemingly hit some kind of limit, clearly by achieving a level of performance almost two times better than its closest 'competitor', it has already had to solve several contradictions. Here's what the basic problems of speed and g-force look like when mapped onto the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE  
SELECTED:

Speed (14) and Force/Torque (15)

WORSENING PARAMETERS YOU HAVE  
SELECTED:

Area of Moving Object (5) and Power (18)

SUGGESTED INVENTIVE PRINCIPLES:

17, 19, 35, 14, 1, 29, 28, 3, 15, 4, 13, 10,  
37, 36, 2, 30, 5, 34, 38, 39, 40, 18

Interestingly, the first two recommended Principles tie in quite nicely with, firstly the network of blood vessels with their unusual 'relatively shorter columns of fluid', and the 'pushing back of chest muscles, then, secondly, ensuring that the peak acceleration g-force only occurs for the shortest amount of time.

That an adult Anna's hummingbird weighs around 4g makes the feat all the more amazing. The things that happen in the name of reproduction never ceases to amaze.

## Short Thort

Innovation is difficult.  
It's supposed to be difficult.

*"He who has a why to live can bear with almost any how."*  
Friedrich Nietzsche



"The right kind of suffering - facing your fate without flinching - is the highest achievement that has been granted to man."  
Victor Frankl

## News

### Everythink

Work is finally coming together to complete an introductory book on Clare Graves and his research on Thinking Styles. Think 'Spiral Dynamics for Dummies' and you'll be somewhere close to the mark. Anyone that has tried to fight their way through Beck & Cowan's book will probably have been left with the feeling that there has to be a better way. We think we've found it. 'We' being a small cluster of SD users, researchers and domain experts. The aim is to have the book (definitely an 'airport' – read in an hour – tome) on the market before the Graves Future session in June.



## **Recruiting**

I know, I know, the recruitment page on the website hasn't been updated for several eons now. But only because virtually no-one has submitted responses to the design challenge found there. Anyway, in case anyone thinks the page is redundant, even though it may be, we are nevertheless recruiting right now. Delivery is definitely our bottleneck, and so we'd be interested to here from anyone that might be interested in working in one of our offices around the world, and ideally Clevedon. Contact Darrell in the first instance for an informal discussion.

## **UK TRIZ Forum#3**

True to form in the TRIZ/SI community, everyone – okay, 'almost everyone' – ignored deadlines for expression of interest and presentation titles. It currently looks like we have 2/3 of an event, so hopefully with a following wind and a request that those that indicated 'yes' and then never followed up follow up by the middle of March, we should have a solid programme to publish by the time the March e-zine is published. Hannah will be chasing you. You have been warned... she can be a tough cookie sometimes.

## **Sustainability In Transformation**

9 May sees us taking part in a high-profile innovation and transformation event being convened in central London. Hosted by big-wig politico, Alastair Campbell (think Tony Blair's press-person of choice for those readers outside the UK), the event will also very smart people from P&G, MIT, Duke and RioTinto. More details on the website.

## **New Projects**

This month's new projects from around the Network:

- White Goods – Contradiction Hierarchy Mapping Study
- Automotive – Training workshops
- Energy – Training workshops
- FMCG – Eyes on the World study series
- FMCG – technology mapping study
- Medical devices – Long-term future technology strategy definition
- Automotive – Rembrandt's in the Attic study
- Agriculture – Patent future-proofing
- Government – Societal trend scenario study