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In this month's issue:

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

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Psychological Inertia Tools: Omega Life Views

In this article we explore one of the strategies we can use to overcome psychological inertia. The systematic innovation methodology contains several such techniques, some like Smart Little People, the Size-Time-Interface-Cost Operator and 9-Windows coming from TRIZ, while others emerge from other fields of research. The 'Omega Life View' (OLV) tool is a new one. It has been designed specifically for situations in which we are examining customer needs when we have a parallel desire to identify disruptive innovation opportunities.

The tool is based on two important pieces of psychology research; in the first instance, it builds on the 'Other People's Views' (OPV) development work of Edward deBono (Reference 1). The OPV 'tool' very simply encourages problem solvers to shift their perspective to that of someone else. Typical OPV questions would be things like 'what would my manager think in this situation?' By putting ourselves in the position of others – empathizing with them – according to deBono, we are able to think out of the box defined by our own psychological inertia. Secondly we build on the work of Liam Hudson (Reference 2) and his research finding that if we force people to try and solve problems while taking on the role of someone else, they very often do it better than if they had remained in their own mindset. The basis of this 'frames of mind' research is that if we can get outside the confines of the box defined by our own psychological inertia, or 'get outside our zone of comfort', we are often much better able to generate new ideas. One of the most amazing findings made by Hudson and his team was that by asking people who were normally not felt to be very creative to work on a task by taking on the perspective of a creative person ('how would a creative problem tackle this situation?) they were able to markedly improve their performance.

So, in its very simplest terms, the Omega Life View uses exactly the same strategy as both the deBono and Hudson techniques; shift your perspective to match that of someone else. In both of those techniques, however, users are encouraged to shift to some fairly conventional 'other people' perspectives. This is great if, say, we are involved in an argument with another individual and wish to see the world from his or her perspective, and very often this kind of shift to seeing things from the 'other side' can be very effective. It becomes less effective, however, as we broaden the scope of which other people we chose to become. Microsoft, for example used to have a series of pre-defined customer characters that they used during product development. Thus, there may be a character called 'Bert'. 'Bert' is defined by a series of characteristics – say not very used to using computers, manual worker, etc – and then the developers would put themselves in Bert's position ('what would Bert do now?') in order to hopefully create a product that Bert and all of the other pre-defined characters would be happy to buy and use. Again this 'other people' technique can be very useful in helping us to design products that are robust and popular with a wide range of customers. Clearly, the more sorts of 'other people' we build into this thinking framework, the more popular our output ought to be. Except. Except there are two big problems here. The first is that pretty soon we can have so many different 'other people' types that it becomes impractical to manage them all (in most design teams using this kind of technique, the number is usually limited to 7 or 8); the second is that our common sense tells us to pick the most useful types of customer profile to become. Here comes our old friend the normal curve again. Common sense and the normal curve – a potentially fatal combination. Fatal? How come?

Let's have a look at what might typically happen when we go through the process of selecting which 'other people' to empathise with and design our products or services to please. The supermarket business is trying to make sure it attracts and retains the maximum number of customers. This is the common sense part. As a consequence of this common sense, the supermarket commissions all sorts of research to identify and understand the profiles of its different customers. This research will produce lots of useful data on things like average age of customer, average shopping bill, queue time, proportion of males to females, percentage of customers with small children, etc. All very useful. Then someone comes along and fits all of the data into an array of normal curves. Then as shown in Figure 1, they are able to find the 'optimum' average value of all of those measured parameters. It is only one small additional step then to design the supermarket to best match those 'average' values. If we do this well enough then our supermarket will become successful. What could possibly be wrong with this strategy?

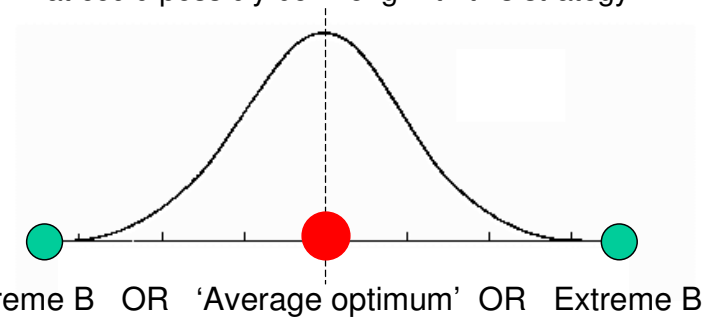


Figure 1: The Normal Curve and 'Omega Life Views'

The answer is our standard one whenever we see the normal curve or its cousins. What about the things at the extremes? What, in other words, about the Omegas?

The whole point of the normal curve, of course, is to allow us to make sure that we cover as much of the solution space as possible. Thus we can be pretty certain that supermarkets have designed their stores, check-outs, car-parks, etc to cover a pretty wide range of ages and customer types. Again, what's the problem?

Well, one problem is that every other supermarket has probably done exactly the same research, and drawn more or less exactly the same sorts of normal curve, and made all the same design decisions that we have. That's what makes it 'normal'. That's what makes just about every supermarket the same as every other one. Inevitably, there are some minor differences, but you only have to see how quickly one supermarket copies the shifts of another to see how this normal curve world-view spreads itself. One supermarket gets some new data to suggest that customer incomes are increasing and decides to launch a range of 'luxury' products. Guaranteed that within a couple of months, the second, third and fourth supermarket chains have launched their own 'finest' or 'gold-standard' or whatever equivalents. See also 'mother-and-baby' car-parking spaces, 'one-in-front' check-out queue strategies, loyalty cards, on-line store, in-city 'boutique' stores, or just about every other 'innovation' you've ever noticed, and see how quickly the second supermarket follows the first.

The other problem – the apparently less serious one – is that those people that sit outside the bounds defined by our normal curve are not going to be our customers. This one looks less serious because if we've designed a model to cater for 99% of the population, why should we worry about the last 1%?

This sounds logical. Potentially losing 1% of a market sounds like a fairly acceptable situation to most businesses. 99% is a big customer base after all.

Here, however, lies the big paradox. Our common sense focus on the 99% means that we miss the disruptive innovation opportunities. What? It's true; the overwhelming evidence from just about every type of innovation is that the spark for that innovation has come from the Omegas; the people outside the normal curve. Think about it. Those Omega extremes are not being catered for by the 'normal' system. Consequently, they have to find other ways of getting what they want. Ironically, the Omegas also tend to be the sort of characters that are the entrepreneurial rebels that are likely to do something to get what they want. Net result? The Omegas find alternative ways of doing things, and – crucially – some of these ways will turn out to be the things that will eventually displace the 'normal' way of doing things.

Now we have a new problem because the large majority of the solutions derived by the small population of Omegas will turn out to be effective niche solutions but completely useless in the wider context. As a consequence of this usually extremely poor success/failure ratio, most organizations tend to ignore the Omegas altogether. This happens until either it's too late, or they have to spend large sums of money to buy the Omega out. See the Ben & Jerry's ice-cream story for an archetypal example (Reference 3).

The 'Omega Life View' tool has been designed to improve the success rate of this kind of disruptive innovation finding problem. There are two important elements to the methodology. The first involves the selection of which Omegas to select. If it were just this part then we will not really have helped the situation very much as finding the 'right' Omega can be as difficult as finding the 'right' disruptive innovation. The second part of the method is thus aimed at resolving this 'right'ness problem. The second part takes advantage of the TRIZ discovery about the importance of contradiction elimination in the creation of disruptive innovations. Identifying a 'good' conflict opens the way to use of the Inventive Principles to remove them. The OLV tool is aimed at helping to find such 'good' conflicts and contradictions.

The method is very simple, comprising the following steps:-

a) identify the thing to be improved
b) identify a range of Omegas – potential customers who currently lie outside the normal curve(s), preferably at both extremes
c) put yourself into the life of those customers and write down the 'ideal' wish-list sorts of things they would like to have
d) compare the wish-lists of each of the Omegas in order to identify and define common themes and conflicts
e) ask whether any of the common themes suggest possible disruptive opportunities
f) for the common themes, also ask 'what stops us from delivering these requirements?' in order to identify other conflicts
g) explore means of 'eliminating' some or all of the conflicts

The power of the method lies in the fact that very often when we 'eliminate' a conflict – as opposed to making the usual trade-offs and compromises – that all sorts of nice things happen that we weren't expecting.

Let's take a look at an example of the process in action in order to explore the basic mechanics and to explore a situation that is currently ripe for disruptive innovation.

Cell Phone Services

Thing to be improved: cell-phone services
Omegas: a) CEO of Fortune 50 company
b) Epileptic traveller
c) Single mother with kindergarten-age triplets

(The general idea here is to identify a spectrum of people at different extremes laying outside the realms of the 'normal' curve. It is worth noting here that we have tended to identify specialized niches containing very few people at the edges of the societal structure. According to 'The Deviant's Advantage' (Reference 4) we ought to push the spectrum even further to those living at the very fringes of society. We will stick with 'edge' rather than 'far-fringe' for two reasons – 1) it is (hopefully) easier to empathise with a single mother or a company CEO than it is to empathise with a member of the Jim Rose Circus (www.ambient.on.ca/jimrose/jimrose.html - please take care!), and more importantly, 2) identifying and solving a 'good' conflict will likely as not also deliver a solution that a wrestling Mexican body-piercer might well also want.)

The next stage:-

Omega	'Ideal Product' Wish-List
CEO	- a handset that symbolises status - small as possible handset/integration with other tools - handset 'auto-charges' battery - instant access to share prices - instant access to PA and direct-reports - one-to-many conference calls - no loss of signal when on trains/planes - zero learning curve - direct voice-to-e-mail - boundary-less international calling - ability to store all desired information - theft-proof - 'scramble' facility for confidential communications - always the 'latest version'/'no-phone' - stress monitor
Epileptic traveller	- single-press emergency call to nearest emergency service irrespective of location - handset invulnerable to damage if dropped - power always available (battery always charged) - phone able to transmit vital-signs to emergency services - theft-proof - language translation facility - combine with airline e-ticket - combine with local currency e-cash/m-cash system
Single mother	- low-cost - rugged handset – invulnerable to damage from a wide range of (infant generated) situations - impossible (for baby) to accidentally press keys and make calls

	- story-telling facility/entertain infants simultaneously - loss-proof – handset able to inform mother where it is - hands-free, attachment feature - baby monitor facility connected to kindergarten CCTV - panic button - support-group communications (multiple users)

Each of these lists would typically be much longer if we were conducting the exercise for real. We have stopped at this stage in order to concentrate on the process rather than any specific solutions that might emerge.

Conflicts:
- open-access AND confidential
- low-cost AND high status
- long calls AND low cost
- long calls and battery capacity
- small AND loss-proof/theft-proof
- latest version AND zero learning curve
- 'One-touch' calling AND no accidental calling
- communication AND 'no-phone'

Common themes:
- damage tolerance
- auto-location of important numbers
- auto-link to external information sources
- one-to-many/many-to-one
- integration of different capabilities
- input of sensing information
- auto-charging/'self'-powered
- hands-free

Conflicts caused by these themes:
- rugged AND low-cost
- integration AND security
- sensing AND reliable
- battery AND no-battery
- hands-free AND theft-proof

Taken together, we may begin to see a number of interesting new possibilities and facilities emerging once some of these conflicts become resolved.

What this example shows is that even though it is not immediately obvious that any of the Omegas considered have anything at all in contact with one another, nevertheless a cluster of common themes emerge (e.g. each one wants single-press access to key numbers; but for very different reasons). Similarly, a number of conflicts emerge that we can quickly see that if they are resolved, the resulting capability satisfy the often wildly different specific requirements of each Omega.

Above all, the example demonstrates that the OLV tool is very simple to use and an effective way to 'get out of the box' and to places that will generate valuable new solutions.

References

1) DeBono, E., 'Serious Creativity'
2) Hudson, L., 'Frames Of Mind', Methuen, 1968.

3) Cohen, B., Greenfield, J., 'Ben & Jerry's Double Dip', Simon & Schuster, 1997.
4) Mathews, R., Wacker, W., 'The Deviant's Advantage: How Fringe Ideas Create Mass Markets', Random House Business Books, 2003.

TRIZ and Six Sigma
2) Special-Cause/Common-Cause

"Normality is the route to nowhere. If we are only willing to behave like all the others, we will see the same things, hear the same things, hire similar people, come up with similar ideas, and develop identical products or services. We will drown in the sea of normality. And Normal Inc. is bankrupt."[1]

or

"Mediocrity is the by-product of consistency"[2]

In this article we build on some of the ideas begun in the previous one – 'working the right project'. Specifically of interest is the idea of using TRIZ to help us that when we define a Six Sigma project, we have chosen the right goals and the right 'optimum' solution to aim for. The point in the previous article was about to think about 'eliminating' conflicts and contradictions as a much stronger project goal than trying to find an optimum.

To take a shorter example in order to review a very important conclusion, we might think about any kind of manufacture operation, service transaction, or whatever else we're interested in improving. That thing, whatever it is, has an 'optimum' form – or 'mean' – and variation about that mean. A large part of the Six Sigma toolkit is there to help to reduce the variation. The main point of the previous article was to show that there is very little point in reducing variation if you're optimizing towards the wrong mean. Sure, there are elements of Six Sigma and Design For Six Sigma that encourage you to think about the Customer and to use the Customer to help guide you to the best mean, but, guess what, different customers have different ideas about what the mean should be. Some don't even know what mean to ask for. Even fewer are asking you to eliminate it altogether. Take a confectionary manufacturer. The manufacturer wishes to know the 'optimum' size and form of a new cake product. To achieve this they conduct all sorts of customer research, consult dieticians, portion-size experts, psychologists, restaurant owners, the whole shebang, and hey presto, several hundred thousand currency units of consultancy fees later, out comes the magic number. The golden mean. The ultimate cake. And so, happy that they have discovered the ultimate cake, they go into production. As is normal in the food industry there are many uncertainties in the baking and cake making process and so defect rates are inevitably quite high. Obviously the fact that some cakes don't rise as well as others, that some have too much icing one them, that the edges occasionally over-cook means they can't be passed on to the customer – consistency is everything! – and consequently, the rejected cakes cost a lot of lost revenue. So the management embark on a Six Sigma programme with a goal of three defective cakes per million baked. Nine hundred and ninety nine thousand, nine hundred and ninety seven perfect cakes; all the same weight, the same height, the same ratio of sponge to filling to topping. Perfect.

Perfect, except. How many customers decided that that particular combination of weight, height and topping ratio was their own personal definition of perfect? Who, ultimately, wants the compromises that a mean anything ultimately forces on you? Is there really such a thing as an 'optimum' anything?

Answer; yes there is, but only until such times as someone comes along, recognizes that everywhere the words 'optimum' or 'mean' are being used, and says to themselves,

‘maybe there is a better way’. TRIZ tells us that someone, somewhere already solved our problem. Maybe not in the confectionary business, but someone, somewhere literally has found a way of making things ‘heavy and light’, ‘big and small’, ‘golden brown and dark brown’. Someone – at the risk of making a very bad pun – literally has already found a way of having their cake and eating it.

The world is increasingly choked with ‘optimum’ solutions that don’t meet the needs of their customer. Next time you are in your local supermarket, take a look at the fruit section. Observe how each of the bananas are the same size and colour, how each bunch looks exactly the same as the next. They got that way because someone decided there was such a thing as the optimum banana and forced a set of inspection criteria on the banana growers; we will only buy your bananas if they conform to these strict size and colour criteria. Result; the six sigma banana. Secondary result; they don’t taste anything like as good as they used to and they are rarely as moist, because someone decided that size and colour were more important than taste and texture.

What the supermarkets recognized was that we only taste the banana after we get home; at the point where we decide to buy, we are only able to look, and hence the ‘look’ is the thing they optimized. Infallible logic. At least until such times as they begin to wonder why bananas aren’t selling like they used to.

The main point of this article, though, is to provoke some thinking about how we might go about solving some of these ‘having your cake and eating it’ contradictions. Let’s think, then, about the concepts of common and special cause failures.

The two terms come from the work of Deming during his time thinking about measurement of processes. If we’re trying to achieve the ‘optimum’ (does TRIZ say that word should always be written in inverted commas?) size of our cake, then we might set up a cake-size survey to present to potential customers. Each customer is asked about their preferred size of cake and their answers are recorded. If we record all the data on a control chart we will get something like the figure shown below.

The first thing that this particular chart shows is that our process is ‘in control’. That is, we have surveyed enough people to deliver a statistically significant result, with a stable mean value, a standard deviation about that mean, and all of the survey results coming out within plus or minus three standard deviations of the mean. If this were not the case, then we have a problem of the system, or a ‘common cause’ problem. A ‘system problem in this case may mean that we have formulated the survey questions inaccurately, or that different surveyors are interpreting answers in different ways.

Now look at the second chart. This time a new data point – marked X – has been added. A new potential customer has suddenly given us a very different answer to the one the system would have told us to expect. Since we know that our process is ‘in control’ then we know that this can’t happen, that it cannot be a problem of the system. It is, whether we are aiming for Six Sigma understanding of our customer or not, a problem that, therefore, has a ‘special cause’.

Deming’s main point in discriminating between ‘common’ and ‘special’ causes was that each required a different problem solving strategy. Special cause problems are not caused by the system and hence any attempt to resolve them by modifying the system would tend to make the system worse. In this case, worse because it now routinely has to look for a special cause which, by definition of being ‘special’ is not going to occur again.

Conversely, if we treat a common cause problem as a special cause problem, we will miss an opportunity to improve the system.

Another quote from Reference 2 to complement the one at the header of the article:-

"The pace of… change is increasing at the same time that we're witnessing a radical contraction in the distance from the Edge to the centre of Social Convention. The result of this acceleration is the Abolition of Context, the disintegration of the social, cultural, and commercial framework. In commercial terms this means that market opportunities are created and disappear with a frequency that can't be monitored by conventional business thinking."

Connection to common cause and special cause problems? Answer; everything is becoming a special cause problem.

In other words, by the time we've worked out what our 'optimum' is, and 'optimised' the system to consistently deliver that optimum, somebody is increasingly likely to have changed the game on us and made that 'optimum' irrelevant.

If this is true, how might that influence the way we think about things? How would we think about our world if we treated everything as a special cause?

The thought is quite probably too radical for many of us to even contemplate. In that sense it is a deliberately provocative suggestion. If we are in charge of a manufacturing operation churning out nuts and bolts then clearly if we are going to continue selling our products in a highly competitive environment, then we absolutely have to have an SPC process in place and be driving towards elimination of defects and waste. But, the big point is that at least *someone* in the organization ought to be taking this 'everything is becoming a special cause' perspective. As we saw in the last article, this special cause view is precisely where the next major innovations are going to come from.

The additional thought here is that everything we treat as 'common cause' – everything, in other words, that we treat as an opportunity to improve the current system – is taking us along a well-optimised corridor to a dead-end.

Is GE a great company? Undoubtedly. Is it great because of its Six Sigma programme? Undoubtedly no. Sure, it helped – a massive reduction in waste and inefficiency means you inevitably have so much more money to spend on other stuff – but it was not the main enabler by any means. GE is a great company because someone had some radical ideas about what business the business was in, and then the unfailing will and determination to make them happen.

References

1) Ridderstrale, J., Nordstrom, K., 'Funky Business: Talent Makes Capital Dance', Pearson Education Ltd, London, 2000.
2) Mathews, R., Wacker, W., 'The Deviant's Advantage: How Fringe Ideas Create Mass Markets', Random House Business Books, 2003.

Humour

Everyone knows the ‘heaven and hell’ joke about defining the best and worst of a nation’s characteristics. Here are a few examples.

In Heaven:
The cooks are French,
The policemen are English,
The mechanics are German,
The lovers are Italian,
The bankers are Swiss.

In Hell:
The cooks are English,
The policemen are German,
The mechanics are French,
The lovers are Swiss,
The bankers are Italian.

We’re in the process of collecting more. We invite people of other nations to tell us the best and worst of the their own countrymen.

Patent of the Month

Several candidates for the Patent of the Month award this month. Two runners-up worthy of note were:-

- For those people interested in software applications, we recommend US 6,681,383 – the latest in a line of software systems that write other pieces of software.
- For fans of ultrasound – US 6,680,994

Our eventual winner is US6,680,961 awarded to BinOptics Inc in New York State.

United States Patent ***6,680,961***
Behfar **January 20, 2004**

Curved waveguide ring laser

Abstract

A ring-type laser including a traveling wave cavity which incorporates at least first and second straight cavity sections and at least one curved cavity section. Corresponding first ends of the straight cavity sections are interconnected at a first light-emitting facet, and second ends of the straight sections are interconnected by the curved waveguide. Additional curved and straight sections can be linked to provide various ring configurations.

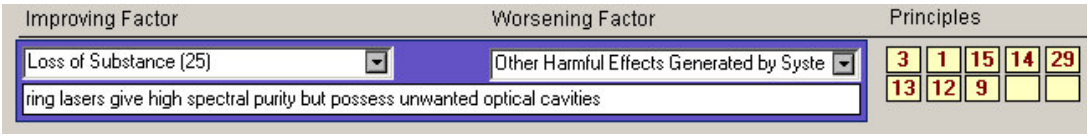
Inventors: **Behfar; Alex** (Ithaca, NY)

Assignee: **BinOptics, Inc.** (Ithaca, NY)

Ring lasers are, of course, not new, but, as described in the invention disclosure, the current design styles suffer from a number of problems:-

A ring cavity laser possesses benefits that a Fabry-Perot cavity does not provide; for example, it provides lasing action with higher spectral purity. The development of ring cavity lasers expanded the prospective applications for integrated semiconductor lasers, and added the attractiveness of greater manufacturability and reduced cost. Such ring cavity lasers have relied on total internal reflection (TIR) facets as well as partially transmitting (PT) facets to produce traveling waves within the laser which are emitted at selected locations. However, it has been found that the use of TIR facets in such devices can lead to large optical cavities, and accordingly a new technique for fabricating ring lasers that can reduce or eliminate the reliance on TIR facets is needed.

Translating this into a conflict gives something like:-



And, as it turns out, the inventors used Principle 14, Curvature to solve the problem. As shown in the figure, ring-lasers – despite the name – are conventionally made from straight-sided wave-guide components. The 'it's obvious' solution adopted by the inventors involves turning those straight sides into teardrop profiles.

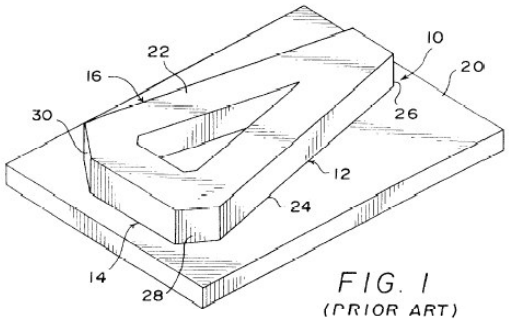


FIG. 1
(PRIOR ART)

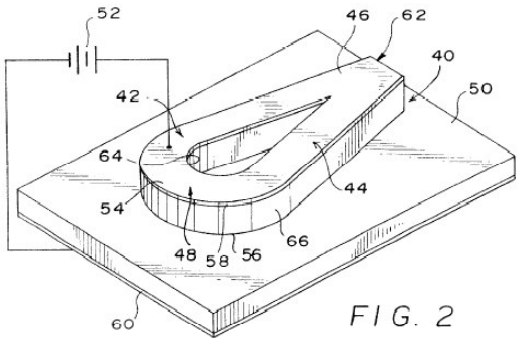


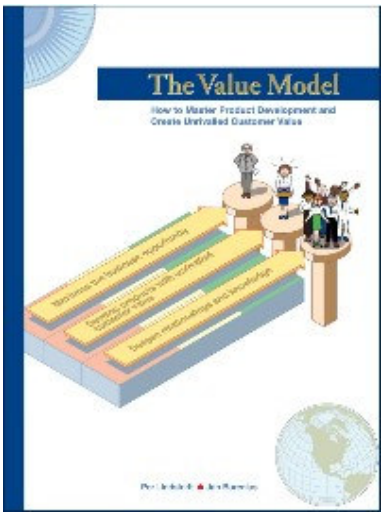
FIG. 2

Beyond this, interested readers may be interested to explore how advanced ring-lasers are becoming in terms of use of their available evolutionary potential. The invention disclosure talks about resonance, traveling waves and use of roughened surfaces, for example. On the other hand, it still appears that there is considerable untapped potential along other of the trend directions.

By way of a small plug, this patent is one of the hundred to be featured in our upcoming analysis of the new Contradiction Matrix.

Best of the Month

Our choice this month is the ‘Value Model’ book from Nimba Associates in Sweden. Nimba are long-time TRIZ users. While the book undoubtedly features many TRIZ ideas, they are seamlessly bound into a project management business model that takes a much more holistic view than a purely TRIZ perspective.



Printed in A4-size and containing nearly 700 pages, the book might not sound as though it will be very accessible. Don’t let these facts put you off, however, not only is the book beautifully bound and printed in full-colour, but the contents are eminently readable and absolutely hands-on practical.

Find out more at **www.valuemodel.com**.

Investments –

A bit of a long-term bet this month:

'Spintronics' Could Enable a New Generation of Electronic Devices –
http://www.eurekalert.org/pub_releases/2003-08/su-ce080803.php
Even if Moore's Law could continue to spawn ever-tinier chips, small electronic devices are plagued by a big problem: energy loss, or dissipation, as signals pass from one transistor to the next. Line up all the tiny wires that connect the transistors in a Pentium chip, and the total length would stretch almost a mile. A lot of useful energy is lost as heat as electrons travel that distance. Theoretical physicists at Stanford and the University of Tokyo think they've found a way to solve the dissipation problem by manipulating a neglected property of the electron - its "spin," or orientation. "Unlike the Ohm's Law for electronics, the new 'Ohm's Law' that we've discovered says that the spin of the electron can be transported without any loss of energy, or dissipation. Furthermore, this effect occurs at room temperature in materials already widely used in the semiconductor industry."

A very nice example of an untapped resource? We think so.

Biology – Tenebrionid beetle

The biology example this month comes courtesy of the BBC Wildlife Magazine 'Photographer of the Year' competition. The recently completed 2003 competition attracted over 20,000 entrants from all over the world. The Tenebrionid beetle photograph featured here was taken by Olivier Grunewald of France. His photograph was ranked 'runner-up' in the 'animals in their environment' category.

Here is the text submitted by Monsieur Grunewald to accompany his entry:

"I was in the northern, sandy part of the Namib Desert, Namibia, studying the adaption of the wildlife to this arid land. One early morning in October, after a foggy, cold night, I watched this tenebrionid beetle climb onto the edge of a high dune and do 'headstands'. It turned its body so that it faced into the wind, straightened out its rear legs and lowered its head. In this way, its back served as a condensation surface for the fog. Then the beetle could drink the water, which hung in droplets from its mouthparts."

An excellent example, in other words, of the use of Inventive Principles 25 and 17 to achieve the desired effect:

Principle 25A 'Enable an object or system to perform functions or organise itself' is the betles using its own body as a condensation surface, and

Principle 17D 'Re-orient the object or system, lay it on its side' is the part where the beetle performs a headstand in order to cause the condensed moisture to move towards its mouth.

Check out the other competition winners and entries at
http://flood.nhm.ac.uk/cgi-bin/wildwin/2003/index.html