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Systematic Innovation

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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Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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.
Send them to darrell.mann@systematic-innovation.com

Case Studies In TRIZ: An Advertising Problem

In a previous article we discussed the importance of conflict elimination in advertising (Reference 1). According to that article, by a significant margin, the advertising messages found to be most memorable and appealing by consumers involved those campaigns that identified and somehow resolved a conflict. The aim of this article is to take this story a stage further, by shifting from analysis of what has happened in the past, to a synthesis of what might be in the future. The story is told in two parts. In the first part, we take a detailed look at a current advertising campaign in order that we might describe a generic campaign design framework. Then in the second part, we take this generic framework and attempt to apply it to the design of a new campaign. The focus area for this new campaign is the highly competitive IT services sector. It is not our aim to create a solution that could be considered to be 'definitive' in any way (we could only seriously hope to achieve this aim if we knew all of the real constraints and aims of the specific company), but rather to demonstrate how the generic process is best utilised in the design context. Before we get to that stage, however, let us examine the already defined advertising campaign:

Accenture: Innovation Delivered.

This campaign is primarily centred around a poster campaign (Reference 2), strategically sited in and around airports. The primary focus, therefore, is very clearly on business travellers. Figure 1 illustrates some of the campaign posters.



Figure 1: Accenture Tiger Woods Print Ads

So, what are the elements of this campaign that we should be taking note of? We propose three elements: connection, disconnection and re-connection. Let us examine each in turn:

Connection: in this first element we would like to make a connection in the mind of the viewer of our campaign between our offering (which we can suppose they don't know), and something that they do know. Further than this, we would very much like to design a connection that is consistent with the message we wish to communicate about our offering. The crucial factor here is that the thoughts and images that the viewer has already recorded for the 'something they do know' are the same things that we now wish them to connect to our offering.

In the case of the use of Tiger Woods images used by Accenture, it is highly likely that the connections that people will make will be things like:

- highly successful sportsman
- someone who came along and 'changed the game'
- someone who has made a breakthrough advance in the way that golf is played

These all appear to be consistent with the sort of message we might wish to communicate as a company selling innovation. We have also made a good connection to the sort of person and image that our target audience is very likely to be aware of and have admiration for. In this case that means senior managers – a population with a high proportion of golfers amongst them. In other situations, with a different target audience, we may well seek to connect to a very different type of image. More on this in the second section of the article.

Meanwhile, as shown in Figure 2, what the advertising agency has successfully achieved in this specific 'connection' story is to take an image that the recipient will be familiar with and to connect the attributes that the recipient has of that image with our offering.

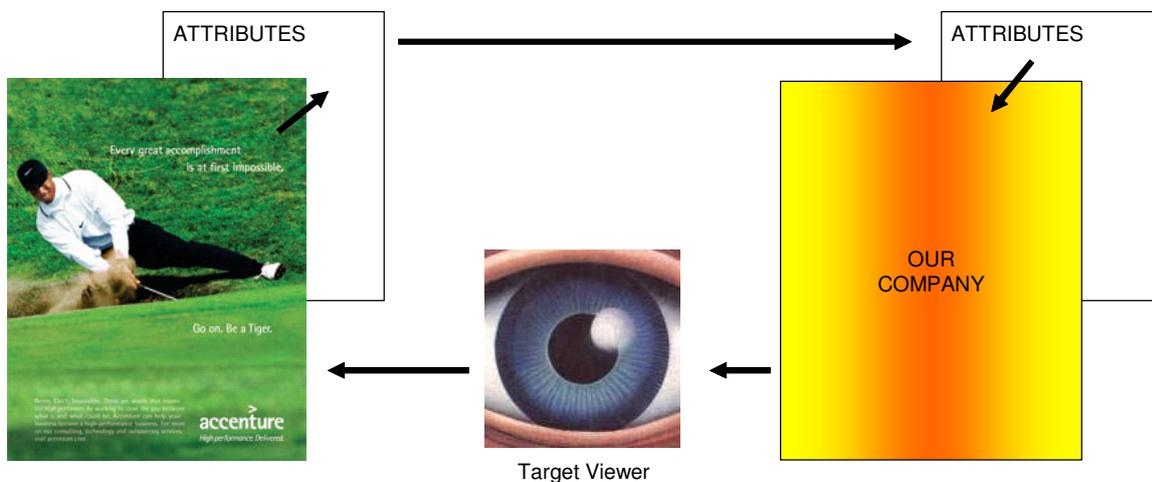


Figure 2: Accenture Tiger Woods Print Ads

Disconnection: Here's what will probably be the most difficult part of the story conceptually. Not many advertising campaigns attempt to do this. Perhaps because in many ways what we are about to describe runs counter to prevailing 'common sense'. Common sense or not, what we have noticed during our research of most successful advertisements is that they nearly all do what we are about to do (Reference 1 again). In the first part of this story, we have tried to make a connection in the mind of the viewer of our advertisement. In this second part we are looking to create some kind of a dis-connect in the viewer's mind.

Here is how we think the disconnect works in this Tiger Woods case. Accenture is trying to sell their innovation capability. In most people's minds 'innovation' is associated with change which in turn is usually associated with things like risk, discomfort, crisis, and pretty much any other bad business word; we might well also know that it is something that is 'necessary' in today's business climate, but we are likely to think of it as a 'necessary evil'. Now we get our disconnect. What on earth has Tiger Woods got to do with necessary-evil, risk, discomfort, crisis or any other negative word? Answer: apparently nothing.

Re-Connection: Having apparently disconnected something that viewers have a positive perception about (Tiger Woods) and something that they have a negative perception about (innovation), our task in this third part of the story is to somehow resolve the conflict we have created. Moreover, our aim ought to be to resolve the disconnect in a manner

whereby the viewer maintains or increases their respect for the positive image, *and* loses the negative image. The job, in other words, is to resolve the conflict in a win-win manner. So how does Accenture set about achieving this feat? If the answer to this does not become apparent from one of the posters in the series, it absolutely becomes clear when we look at several (in actual fact, if you see the campaign posters, there are frequently at least two of the posters on display within a short walking distance of one another). In these posters we see that Tiger Woods has got himself into a very difficult situation – the ball is on the edge of a lake, or at the bottom of the deepest bunker in the world, or up a tree. In other words, Tiger is in a risky, uncomfortable crisis. That then in turn should cause us to reflect on one of the things that makes Tiger Woods the phenomenon that he is; he's the guy who's the most likely to get himself out of these difficult situations. Whether or not we know enough about Tiger Woods to make the desired connection in this way, we should definitely make the connection between the fact that Tiger is a serial-champion even though he might find himself in these difficult situations on the golf-course.

What Accenture have now achieved in making this re-connection is to make the link back to innovation as a risk, uncomfortable thing; Tiger gets in these same situations and still wins, and that – by designed analogy – is exactly what we, Accenture, will do for you our client; ergo 'innovation delivered'.

Turning The Story Around The Other Way

Connect, disconnect, re-connect. What happens when we use this process in a forward as opposed to backwards direction? To see the thing in action, we need a start point. For the sake of argument, let us make our start point a desire to advertise an IT services company and a blank piece of paper. To make things a little bit more specific, let us also say that the company is based in India, is large and growing, and has a global client base. We also need to identify some of the key and unique attributes of the business that we wish to connect into the minds of our current and potential future clients. Such attributes might include:

- total reliability
- high intelligence
- proud team spirit
- 20/20 foresight (i.e. they are protective of not just a client's current business, but also their future; they are 'future-aware'; there to think of the things that the client hasn't thought about)
- always willing to go beyond the call of contractual duty

In the general case, your problem setting will have its own list of attributes.

Next up we need to work out who the advertising campaign is aimed at. Who, in other words, would we like to make the desired connections to the attributes of our business. In this case we can fairly clearly assume that our target audience is very similar to that of the Accenture campaign – a senior decision maker in what is likely to be a large high-value corporation, probably in the US or Western Europe.

Our final job in this 'connect' part of the process, then is to identify an image or images that our target audience already connects to our attributes. This is in undoubtedly the most difficult part of the connect process. We can help to systemise the process by examining the sorts of things that our target audience will connect to. Accenture tapped into a sporting connection. Figure 3 illustrates other typical connections that may be made by senior managers.

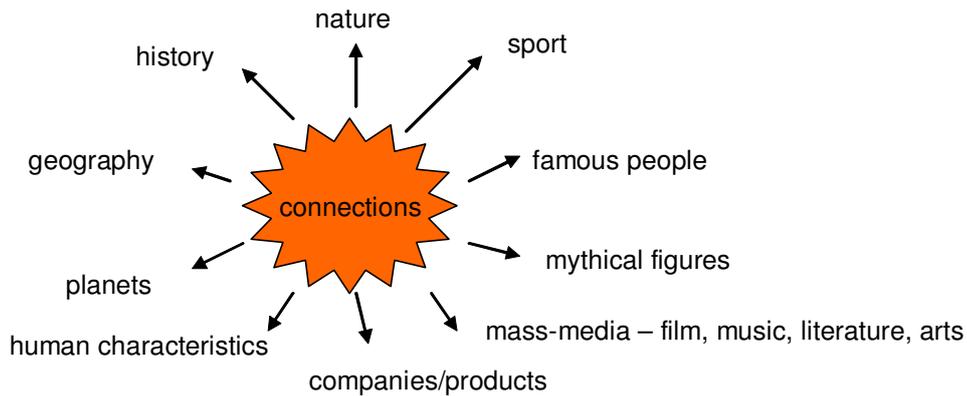


Figure 3: Connection-Type Check List

Our next (difficult) job now is to try and see if there are any images that connect to some or preferably all of our defined attributes. A good way to do this is to map candidate images to each of our defined attributes. Table 1 illustrates a few examples for some of the categories in our Figure 3 check list as may be viewed from the perspective of our target audience:

	nature	sport	famous people	companies
Reliability	Sunset, turtle Old Faithful Elephant	British rowing Shane Warne	Father Time	Rolls-Royce
Intelligence	Dolphin, whale, owl	Mike Brearley Bishen Bedi	Einstein Feynman Drucker	IBM 3M JPL
Team Spirit	Ants, bees, Termites meerkats	US women’s world cup Soccer team, Korean World Cup team	Gang Of Four U2	Samsung WL Gore John Lewis
Foresight	Monarch butterfly	Round-the-world sailor	Gandhi Da Vinci	JPL 3M
‘Going Beyond’	Penguin tardigrade	Arctic Explorer Everest mountaineer	Columbus Marco Polo	NASA

Table 1: Attribute Versus Check-List Connections

What we can quickly see from this table is that while it is pretty easy to connect an image to one attribute, finding something that connects to several is difficult. This happens because an individual is likely to carry some datum image of each of the chosen attributes. Ask someone to think of what connection they might make to ‘total reliability’ and they are likely to think about a Rolls-Royce car, or the rotation of the planets, or a never-defeated British rowing team. Unfortunately, when we then start comparing a Rolls-Royce to other attributes like ‘team spirit’ then quite probably there will be either no correlation, or even a negative one. While none of these neutral or negative attribute connections should cause us to eliminate an image at this stage (we could, for example, turn a negative connection into a positive one in the disconnect and re-connect stages of the process), the more positive connections we make the better.

For the sake of argument in this case study, let us assume that we like the Einstein-intelligence link as a concept. We like this one since Einstein will likely be one of the first images many people will connect to when we say the word ‘intelligence’, plus Einstein is positively correlated to other of our desired attributes – foresight and going beyond.

Next we need to think about a disconnect to use in our advertisement. We could begin this process by looking at our desired attributes in which the Einstein image is not so positively correlated. In this case this appears to be ‘team spirit’ – which is probably ‘neutral’ – and ‘reliability’ – which is more likely to be negative (i.e. most people have a recollection that Einstein was not successful in school, and/or was a guy with wild unkempt hair and a propensity to stick his tongue out when having his photograph taken).

We could also take a step back and think about other kinds of dis-connect. In this case for example, we have a fundamental disconnect in that we have not got any apparent connection to our IT services company.

Our advertisement, therefore has at least three candidate dis-connects – team spirit, reliability and Einstein-our-company. Somehow we need to resolve at least one of these disconnects. Since the re-connection process is all about resolving conflicts, a good way forward will be to examine the 40 Inventive Principles of TRIZ. As we know, so far, these are the only 40 known ways of resolving a conflict. What we might care to do, then, at this stage is to brainstorm through the 40 Principles while thinking about our Einstein image (our connection) and each of the disconnects.

Here’s the sort of re-connections that we made when we tried the exercise:

1) in order to resolve the ‘team-spirit’ contradiction we somehow need to turn one Einstein into many Einstein’s. We could do this by cloning Einstein (Principle 26), or we could take an aspect of Einstein and extrapolate that to involve multiple people (Principle 2, then Principle 5). We can resolve the conflict, for example by taking Einstein’s famous relativity blackboard image – Figure 4 – and have a group of people doing a mathematical derivation on a very large blackboard. The bigger the better.

2) We can resolve the ‘reliability’ conflict, by introducing into this image the concept of people checking the mathematical derivation as it advances. We can also re-inforce the message if the derivation can be shown to reach some kind of conclusion. Ideally this conclusion should say something about our business. Perhaps something like:

$$\sum_{1}^n x > nx$$

The image shows a blackboard with handwritten mathematical equations. The first equation is $D = \frac{1}{c} \frac{1}{l} \frac{dl}{dt} = \frac{1}{c} \frac{1}{P} \frac{dP}{dt}$. Below it are two equations: $D^2 = \frac{1}{P^2} \frac{P_0 - P}{P} \sim \frac{1}{P^2}$ (1a) and $D^2 = \frac{K \epsilon}{3} \frac{P_0 - P}{P} \sim \frac{1}{K \epsilon}$ (2a). Further down are several lines of numerical approximations: $D^2 \sim 10^{-53}$, $\epsilon \sim 10^{-26}$, $P \sim 10^8 \text{ J}$, and $t \sim 10^{10} (10^{11}) \text{ s}$.

Figure 4: Einstein’s Relativity Blackboard Image

3) We still need to resolve the disconnect to our company. This is a more difficult one, but an appealing idea seemed to emerge when we applied Principle 7 to the problem: As the team work their way to the end of the derivation, utilising lots of blackboard space, we gradually begin to zoom-out with our camera, so that we can see the extent of the derivation. As we zoom-out to view the whole enormous blackboard, amidst all of the detailed mathematical information, we reveal that the whole together forms the name of our company.

The Point

The point here in this article is not so much about solving a particular advertising problem, but rather to describe a reproducible process. Hopefully along the line, we have shown that our hypothetical IT services company could take any one of a host of diversions from the specific route that created our solution. We could very easily have picked a connecting image other than Einstein; or we could have identified different disconnects; or made a host of different re-connects using different Inventive Principles. Our creativity is still absolutely required, but we have given it some structure.

If there is a single most important lesson from the story it is also perhaps the most subtle. Why is the disconnect-re-connect conflict and conflict resolution so important? Answer; conflicts play a very strong role in human psychology. Our brains are hard-wired to *notice* contradictions on one hand, and are then very likely to *remember* things that successfully resolved that contradiction. Noticing and remembering would appear to be the two key desirable attributes of any advertising campaign.

References

- 1) Mann, D.L., 'Disruptive Advertising: TRIZ and the Advertisement', TRIZ Journal, October 2002. <http://www.triz-journal.com/archives/2002/10/g/index.htm>
- 2) http://www.accenture.com/Global/About_Accenture/Company_Overview/Advertising/PrintAdvertising.htm#obstacles

Legislation Drives Innovation

The world is full of cases in which crisis acts as the spur to breakthrough innovation. Make things difficult for people and by their cursed nature, someone, somewhere will find a way to achieve the unachievable. This article discusses the sort of crisis brought about through legislation, and the different sorts of reaction it can produce.

We will begin the discussion with a story from a well-known British engineering company where one of the Systematic Innovation team used to work. Some time ago (about twenty years if we are being honest), the culture inside the company was rather formal by the standards of today. One sign of this was the proportion of the population that wore a tie. At the start of the story, that proportion was about 95%. Aside from an occasional piece of peer sarcasm or management 'tut'ing, this was an entirely self-regulating system. Then one day the HR department (or more likely someone above the HR department having a bad day) decided that the 5% non-tie-wearing offenders should not be allowed to get away with their indiscretions any longer. And so along came a notice-board dictat informing us that, as from next week, since we were supposed to be professionals, we should all dress accordingly, and thus the wearing of a tie was to be made mandatory. The self-administering system was thus swept aside in favour of a legislated behaviour. To some people, and not just the 5% of non-tie-wearers, this new legislation represented a distinct crisis. The whiff of revolution could be detected in the offices and corridors.

Come the next Monday morning, a visitor looking around the building would have observed a very impressive number of ties on display. Although I'm sure no-one actually counted, the compliance rate with the tie-regulation must have been pretty darn close to the 100% level. An actual count might actually have determined that the ratio of ties to people was greater than unity. Some people seemed to be wearing two ties.



Figure 1: Two Ties Anyone?

A few were wearing their tie where their belt had once been. One or two were wearing their tie backwards. Others had it tied around their arm. Or their leg. Or in one particularly Haight-Asbury, Grateful-Dead casualty case, around their head.

By Tuesday morning, the compulsory tie notice had disappeared from the boards, and no doubt someone in the HR department was in for a roasting. Clearly this had been nonsensical legislation implemented with little if any consideration for what people might think. Net result; people apply their creative talents to resolve the crisis contradiction. How to wear a tie and not wear a tie? Or how to comply with a stupid rule and simultaneously not comply with it.

Now spool forward a few years and make a shift to the vitreous china industry. Around the mid-1990s, it looked like the UK government was going to change the law regarding the design of toilets. The prevailing 3-gallon (around 14 litres for those of a non-Imperial persuasion) flush designs were deemed to be highly wasteful of water, and that from a future specified date, all new systems should reduce consumption by around 50%. From an environmental perspective, this looked and sounded like a fairly sensible piece of legislation. Alas, as is often the case when legislation is drawn up by politicians with no comprehension of the way the (technical) world works, simply changing one design parameter, offers designers the option to simply move a trade-off from one place to another. This particular water-consumption legislation focused purely on how much water was released each time a user pressed the flush lever. It made no connection to either function or trade-off. Looked at from either of these perspectives, the reason that 3-gallon designs existed was that that was how much water was required to satisfactorily remove solid matter from around the U-bend. Rather than using actual solid matter, the British Standard had configured a somewhat less realistic test. We needn't get too embroiled in the details of this test, suffice to say that the regulations stipulate that British Standard (yes, really) 'solid matter' must be successfully flushed away four times out of every five attempts. The primary function of the flush, in other words, was 'remove solid matter'. If I tell you that this British Standard solid matter is basically about the same size, shape and density as a billiard ball (i.e. not particularly similar in any way shape or form to actual solid matter), the toilet designer's new job effectively became one of making a snooker ball go around a bend with half as much water. As it turns out, the 'billiard ball' was not at or even close to its limiting contradiction, and so when the designers tested a conventional toilet with half as much water, it was still very highly likely to pass the British Standard test. Actual solid matter, alas, is much, much closer to its limiting contradiction, and so the result for the consumer when the water-per-flush was reduced by 50% was that far from working '4 times out of 5' the actual disposal performance could be much worse. It suddenly became common for users to spend several minutes waiting for cisterns to re-fill so that they could try again. And again. And again. It is far from clear that this half-baked legislation change actually produced any reduction in water consumption in the UK at all thanks to the sharp increase in 'failed' flushes. The legislation failed (and as it happens, continues to fail) because it focused on only half of the story. It forced designers to change one thing, but allowed them the freedom to achieve it by making something else worse.

(As a slight aside to this story, avid patent-watchers may know that one of our number has a patent on a low-water consuming toilet system. When we tried to interest UK manufacturers in this idea at the time that the new government legislation was being talked about, we were surprised to find that non-one was in the least bit interested in the idea. Even though the design achieved a water consumption performance well inside the new regulations, was cheaper to make, did not require any changes in the design of people's bathrooms, and had a higher solid matter disposal efficiency, no-one was interested. This seemed quite odd. One of the reasons we pursued the invention at the time was indeed strongly driven by the fact that the new legislation was coming and the industry would therefore have to change. By the time we received our rejection from the last of the manufacturers, we were desperate enough to ask one of them why they weren't interested. Didn't they know about the new legislation? Answer, of course they did, but it didn't necessarily mean they would have to change the way they did things. Far better, they said, for our CEO to write to the government to say that the proposed changes would bankrupt the company and put several hundred people's jobs at risk. This, if it can be believed is the line that they actually took – and succeeded with – for several years. Far easier to write a strongly worded letter than actually change anything.)

Meanwhile, before we allow ourselves to get too cynical, let us shift our attention to one or two other recent pieces of legislation. Figure 2 shows a schematic of the new legislation for diesel engines. What is interesting about this legislation is that it has clearly thought about aspects of in this case emissions that are important and sent a clear sign to designers that trading-off between the two is not an option. Rather, the designer must actively seek to shift the trade-off to a more ideal state in which both of the harmful emissions are reduced. For the TRIZ-initiated, what Figure 2 also clearly shows is the characteristic hyperbolic curve used to indicate the presence of a conflict. We use this kind of curve during many of our workshops. It is a curve intended to compare and contrast the traditional trade-off versus TRIZ contradiction-eliminating paradigms. Trade-offs find the optimum position on the curve; TRIZ solutions shift the curve to an overall more ideal position in which both parameters are improved.

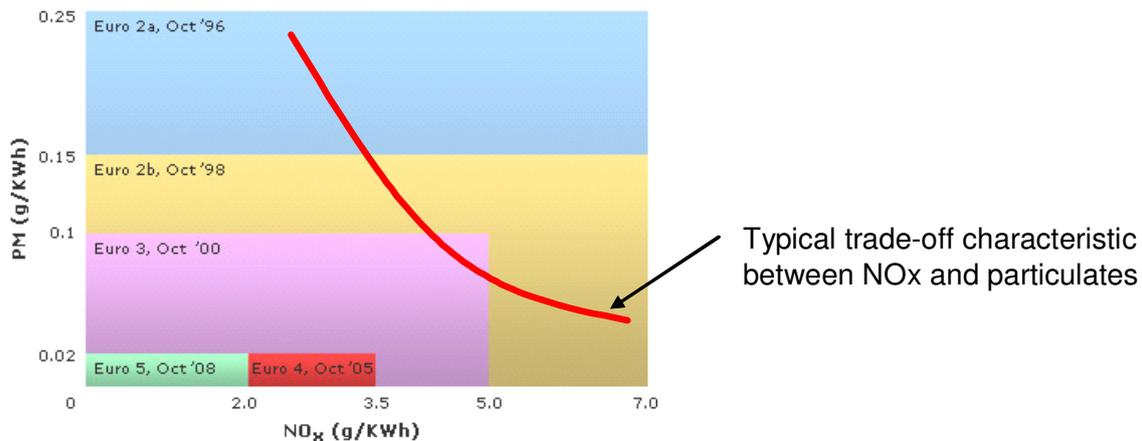


Figure 2: Euro 4 and 5 Regulations For Diesel Emissions

We can see similar enlightened legislation in other walks of life too. When the US was looking for a new generation of powerplant for its aircraft, it did not specify just an ambitious strength/weight ratio target *or* a challenging specific fuel consumption improvement, it insisted that potential suppliers delivered *both*. Here were a group of legislators who knew that if you asked engine designers to create a lighter engine with more thrust, they could achieve it easily by letting the fuel consumption go up, or conversely, that it was easy to improve the fuel consumption by making the engine bigger (and therefore heavier). These legislators knew where the important trade-offs were and used those to force designers to develop innovative '**both-and**' design solutions.

On such occasions, legislation can be viewed as the bringer of a crisis that forces designers to think out of the box and to develop breakthrough new solutions. The final point of this article, therefore, is to point out that, according to history, when such legislative targets are set, almost invariably the industry (or a new player) will one day deliver compliant solutions. In this way legislation absolutely drives innovation. So well does it do this that economists and predictors of our future will usually take it as read that once a piece of legislation is in place, someone, somewhere will make it happen. In the case of stupid rules about wearing ties, the innovation will take place over the course of a weekend. In the case of the US Air Force engine targets, it took a decade, but in both cases what was legislated was eventually – inevitably – delivered.

Where, then, does this leave TRIZ and other systematic innovation tools? If legislation drives innovation, and when forced to do it, an industry will invariably find a way to deliver the impossible with or without aid from a 'method', why do we need such a method?

Perhaps the simple answer is time. In our increasingly competitive world, should the risk-aware management team of a company rely on the fact that innovation will happen sooner or later given the right spur, or ought they to seek to deploy means that will allow the things to occur in a far more predictable and manageable way. We are, of course, biased in our opinion given our vested interest in the success of systematic innovation methods. On the other hand, as in our toilet invention, we have shown that even though we didn't get something to market at the time, we were able to out-pace the natural innovation rate of the leading industry players by a considerable margin. While we were patenting solutions, they were still writing letters to the government.

Legislation plus systematic innovation equals crisis plus timely solution.

Not So Funny – IKEA Business ‘Service’ Twilight Zone



During the last couple of months, while moving in to our new offices, we have had occasion to have 8 transactions involving some kind of delivery. Of those 8 transactions, 7 had something which went wrong in some way; either the wrong stuff arrived, or they turned up on the wrong day, or caused damage to the building. All in all, this doesn't suggest that the UK service infra-structure is too familiar with the concept of 6 Sigma. Of the seven, the prize for incompetence of the highest order has to go to IKEA, a strong contender for our 2006 Customer Service Award. Here is a reflection on the IKEA experience to date:

11 November – I open a business account on the understanding that I am to receive a 10% discount on purchases made in the first month.

2 December – I email in an order. I then receive a very prompt fax detailing my order and saying that I am not eligible for the 10% discount. I ring the number on the fax asking why not. I do not receive a satisfactory answer. I cancel the order. Ten minutes later I receive a phone call saying that, in actual fact, yes, I am eligible for the 10% discount. We re-institute the order.

21 December – the order is delivered to my office. All is well except that the CD shelves are not included in the order, the shelf extensions are the wrong colour and one of the bookcases is faulty (having 2 left-hand sides instead of a left and a right). I report the fault. Am told that 'CD shelves are not delivered and have to be collected from the store', and that a replacement bookcase will be ordered.

6 January – I visit the store to buy other goods. I return the wrong-colour shelf extensions, but cannot fit the bookcase in my car. I wait for 30minutes to be served at the returns area. I then wait another 20minutes while the person dealing with my case disappears (I don't know where because I was not given any explanation when she returned). I am given a card containing a refund for the shelf extensions and told that the delivery department will contact me regarding a date for replacing the faulty shelf unit. I buy more product from the store, showing my business account card at the check-out. The check-out person has never seen one of these cards before and doesn't know what to do with it. We wait a while, then I give up and pay for the goods with my debit card. Same day, the Delivery people do ring me and arrange to deliver the replacement bookcase on 19 January.

19 January – the delivery team arrive with the wrong replacement book case. I am told to ring the Delivery department to re-arrange a delivery of the correct bookcase. I do this and we agree a delivery date of 1 February.

1 February – I receive a phone call from the central delivery people to say that my order has been dispatched to Bristol. I phone the Bristol office to see what time my order will be arriving with me. They know nothing about a 1 February delivery, and this date will not be possible. They say that the bookcase can be delivered on Friday 3rd.

3 February – I wait in the office all morning, then arrange for someone to come in to the office to be there in the afternoon. Mid afternoon I phone the Bristol office who inform me that my order will not be delivered that day after all. I try to remain calm. We arrange another date, this time February 9.

8 February – I am out of the country, but land back into Heathrow airport at 5pm. There is a message on my answer machine from the Bristol delivery people informing me that my order will be delivered 'sometime between 12 and 6pm'. I assume this means on the 9

February. At 6.45 pm I am driving along the M4 at Reading –still 90 minutes away from home – when I receive a phone call from the guys on the delivery van; ‘we’re on our way to you’. I tell them I am in Reading and that the delivery is arranged for tomorrow. They tell me that this will not be possible.

9 February – I ring the delivery people in Bristol. No-one is answering the phone. I ring the central delivery department. They tell me that there was a ‘failed delivery’ on 8 February. The next available delivery slot is 22 February. I ring IKEA asking for the name of the Customer Services Manager. No-one wants to give me the name, despite the fact that I am very calm and showing no signs of my anger. Eventually, I am given the name. I try to ring this person and am told ‘he does not take calls’. I write a letter. The letter goes into the post-box. Two hours later I get a telephone call from the guys on the delivery van; they are outside my office and are waiting to drop off the new bookcase. I rush to the office to let them in. They drop off the new bookcase, but tell me that they do not have any paperwork that will allow them to take the faulty bookcase back with them.

At the point of writing, the saga still has not ended. Except to say that no reply to the letter has yet been received, and there is a faulty bookcase sat in the corner of the office.

Feeling a little paranoid that it may just be me, I went to a well known on-line forum to see what the other IKEA experiences were like. Here’s the result:

Overall Merchant Rating:	★★☆☆☆
Ease of Ordering:	★★★☆☆
Availability:	★★★☆☆
On-Time Delivery:	★★☆☆☆
Customer Care:	★★☆☆☆
Recommend Merchant:	Yes 29%

IKEA® UNITED KINGDOM BRISTOL

Live your life. On the phone to us.

Patent of the Month

Patent of the month this month sees us zooming again into very small size scales. The theme this month is molecular switches. The patent in question is US6,995,312 granted to Hewlett Packard on February 7:

United States Patent

6,995,312

Zhou , et al.

February 7, 2006

Bistable molecular switches and associated methods

Abstract

A bistable molecular switch can have a highly conjugated first state and a less conjugated second state. The bistable molecular switch can be configured such that application of an electric field reversibly switches the molecular switch from the first state to the second state. Additionally, the bistable molecular switch can include a hydrophobic moiety and a hydrophilic moiety. Such molecular switches can be incorporated into a thin film as part of a molecular switch system which can include a layer of molecular switches between a first electrode layer and a second electrode layer. The layer of molecular switches can have substantially all of the molecular switches having their hydrophilic moiety oriented in the same direction. An electric potential can then be induced between the first and second electrode layers sufficient to switch the molecular switches from the first or second state to the second or first state, respectively. The first and second states have differences in resistivity which are suitable for use in electronic applications. Thin films containing these oriented molecular switches can be used to produce a wide variety of electronic components such as ROM memory and the like.

Inventors: **Zhou; Zhang-Lin** (Mountain View, CA); **Zhang; Sean Xiao-An** (Sunnyvale, CA)

Assignee: **Hewlett-Packard Development Company, L.P.** (Houston, TX)

Molecular computing represents one possibility for the next step-change breakthrough in computing capability. One of the main hurdles to overcome is creating the ability to create reversible switches. Previous attempts to solve the problem have resulted in either irreversible solutions or solutions that are seemingly fundamentally slow due to the size of the molecules being used.

We can express this conflict as follows:

Duration of Action of Stationary Object (13)	Volume of Stationary Object (8)	35	40	31	3	34
we want a molecular switch, but molecule size means that we can't achieve the desired switching speed		38	19	13		

The HP inventors appear to have made good use of Inventive Principle 3, Local Quality in developing their solution. This from the invention disclosure:

*'..in accordance with the present invention, electric field induced rotation **of a portion** of the molecular switch can be a highly effective mechanism for reversible switching..'*

Clearly, reading the patent, the inventors have done rather more than just this simple inventive leap. Like most other patents, the disclosure is not an easy read. Nevertheless it seems to us that not only does it represent an invention with potentially significant implications for the future (it is definitely in the Level 4 class), but it makes for a valuable insight into the whys and wherefores of molecular computing.

For those looking for an easier read or a more radical invention, check out this month's 'reserve best of the month':

United States Patent
Parkin

6,993,898
February 7, 2006

Microwave heat-exchange thruster and method of operating the same

Abstract

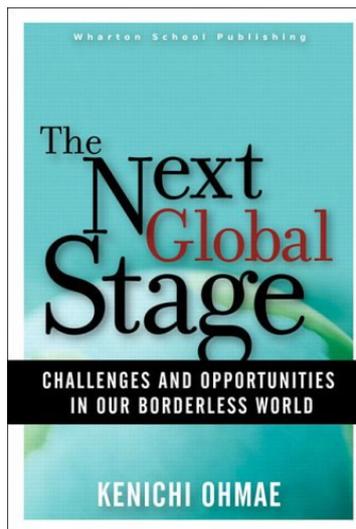
A propulsion system is disclosed that uses microwaves originating from a ground-based or on-board source to provide energy for propulsion. The energy produces thrust by coupling into a propellant via a microwave absorbent heat exchanger, and by subsequent conversion of the propellant thermal energy to kinetic energy through a thrust converter or nozzle.

Inventors: **Parkin; Kevin** (Pasadena, CA)

Assignee: **California Institute of Technology** (Pasadena, CA)

Best of the Month – The Next Global Stage

Book of the month recommendation for this month is the new offering from business strategy guru Kenichi Ohmae. 'The Next Global Stage' is a detailed examination of what Ohmae sees as a transformative shift in the way in which the global economic system works. Taking the analogy of theatre the book is basically divided into three main sections: the stage, 'stage directions' and script. The 'stage' part examines a number of areas of explosive economic growth and from them seeks to identify some of the characteristics of the new 'AG' ('After Gates') global economy. This first part ends with an examination of the failure of traditional economics – and economists – to make sense of the global economy.



In the second part of the book, Ohmae examines the major trends emerging on the global stage. He explores the development of the nation-state and the dynamics of what he calls region-state. He goes on to introduce the idea of platforms, such as the use of English, Windows, branding, and the U.S. dollar, as global means of communication, understanding, and commerce. Finally, he explores what parts of business have to change in line with the emerging economy. These include business systems and processes and products, people, and logistics. Within this second part of the book comes what is probably the central idea around which the rest of the book revolves. Thus, on page 115 we read:

“The world must start thinking in different scales. It should start to think smaller (in terms of regions), but it should simultaneously think bigger in terms of the global totality and amalgams of effective and progressive regions.”

From the TRIZ perspective, Ohmae is observing the resolution of a big/small contradiction being faced on the one hand by national governments, and on the other small companies. The resolution to the contradiction comes by a) re-defining the world as 'region-states' as opposed to nations – in other words nations should look to their sub-systems, and b) by recognising that in our borderless world, companies have to increasingly think globally when they are defining their customers are.

A 'region-state' in Ohmae's broad definition is likely to be a cluster of common-interest companies and skilled people of somewhere between 2 and 10 million people. Anything below this ranger and it is difficult to create a critical mass; anything above the ten million mark and it becomes difficult to manage. Using this definition, Ohmae convincingly argues

that nations like Ireland and Finland are currently so effective because they are of a size and have the vision to behave as a region-state. So, for example, when the Irish government made a strategic decision in the 1980s to become the 'e-hub for Europe', they created a vision that has led them to become the highly successful 'Emerald Tiger' they have today become. Likewise the Finnish government made a similar decision to specialise – obviously for them in the telecoms sector – once they hit an economic crisis following the fall of their neighbours in the Soviet Union.

The third 'script' part of the book then provides analysis of how these changes and trends ought to and will impact governments, corporations, and individuals. Here Ohmae looks at some of the regions that might be the economic dynamos shaping the world beyond the global stage. Some of these already appear obvious – Bangalore and Hyderabad for example are already highly effective 'region states', acting through the likes of companies like Wipro and Infosys as global magnets for the out-sourcing of IT services – while others (Tallinn in Estonia, Hainan Island off China, Vancouver/British Columbia and Ho Chi Minh to name four) are not so immediately obvious, and yet have great potential to become highly successful if they can successfully meet their upcoming challenges.

Key to their challenges, and likewise those of any company wishing to succeed in the new 'next global stage' is *specialisation* on something that you are uniquely good at, being willing to *adaptive* to change (which will continue to occur ever-more rapidly), and possessing a strong drive for innovation. On this latter subject, Ohmae concludes:

"Full commitment to the global economy needs to be accompanied by full commitment to innovation. Companies must commit to innovation as never before. This is a simple truth, but one that must be absorbed into corporate belief systems. Many companies not directly involved with technology pay lip service to innovation. It is a good thing, they all agree. They would like to do more of it, but either they do not know how or they are afraid to innovate. Innovation can lead them into uncomfortable zones."

The book makes for a highly compelling read, well worth the 5 or so hour investment it will take to make it from start to finish. Whether you are working in a corporation or for a government or non-government agency, this book has something new to say about the way the world is changing and what the rules of the new local-and-global region-state game might look like.

Conference Report – AuxetNet Industry Day, Salford

Regular readers will have heard us prattling on about auxetic materials for some time now. Irregular readers may not know that an auxetic material is one that exhibits properties consistent with a negative Poisson's Ratio. An auxetic material, in other words, is a smart material that expands when it ought to contract and vice-versa. The UK is one of the world's leaders in the development and exploitation of these materials. This industry day was an opportunity for all of the different research groups to come together and to communicate the sorts of things they have been doing over the past couple of years. The aims of the event, as published before the event were:

Aims of The Showcase

- to promote increased awareness of auxetic materials within industry
- to highlight the potential for applications and commercialisation opportunities
- to provide networking opportunities related to commercialisation of auxetic materials
- to provide a unique opportunity to meet with and hear from the established UK experts in the field
- to provide the latest information from key funders for research and development activities into advanced materials

The event programme gave the 40 or so participants a broad range of topics to think about. The event schedule looked something like this:

10.00	Registration and coffee	
10.20	Welcome and Introduction	Graham Hudson, CEO Auxetic Technologies Ltd
Auxetics and the UK capability		
10.30	Overview of auxetics	Professor Ken Evans, University of Exeter
11.00	The Auxetic Materials Network - <i>AuxetNet</i>	Dr Kim Alderson (lead contact), University of Bolton
11.20	Questions	
11.30	Break – Tea and coffee	
Towards commercialisation		
11.45	ICI	Dr Andrew Burgess, Strategic Technology Group, ICI plc
12.05	Auxetix Ltd	Dr Patrick Hook, Auxetix Ltd
12.25	Auxetic Technologies Ltd	Graham Hudson, Auxetic Technologies Ltd
12.45	Questions	
12.55	Lunch and exhibition	
Addressing the strategic needs		
14.00	UK Materials Strategy and the Role of Smart Materials	Dr Alan Hooper, QinetiQ Ltd
14.30	EPSRC funding opportunities for advanced materials research	Dr Nathan Davies, EPSRC
14.50	European Commission Framework Programme 6 project – CHISMACOMB	Dr Fabrizio Scarpa (coordinator), University of Bristol
15.10	DTI Technology Programme project - Reactive Structural Materials with Auxetic Inclusions	Professor Andy Alderson (lead contact), University of Bolton
15.30	Round table discussion and feedback	
16.15	Tea and coffee and Close	

Interesting to note while looking through the agenda was the emergence of two commercial organizations spun out of the two leading auxetic research universities in the country. This is a good sign that the often long and difficult transition from lab-scale work to production is now well underway. In actual fact, it would appear that the main remaining hurdle to a first successful commercial application of an auxetic material rests purely now with the ability to produce in sufficient quantities to make it economically viable. Probably the closest to realizing this ambition is Auxetix Ltd – who have recently commissioned an almost-production-level facility in Devon. A good candidate for a launch product seems to be their dental floss concept. Auxetic dental floss? Think about it. A floss material that increases its diameter when the user stretches it – perfect for either releasing a cleaning agent, or for making sure we clean all of the gaps between our teeth.

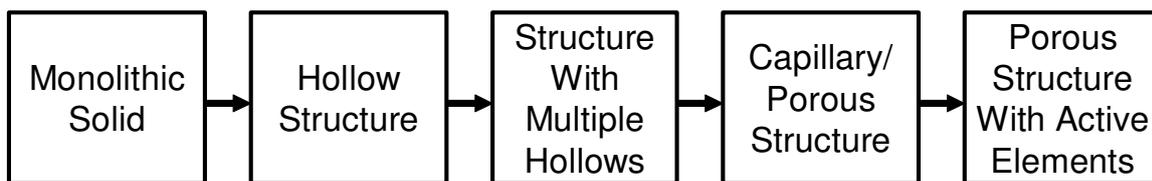
For those interested in finding out more, check out the AuxetNet website at <http://www.bolton.ac.uk/auxnet/profiles/> or look out for the conference on auxetic and anomalous materials to be held in Exeter in September.

The future is bright; the future is auxetic.

Investments – Foamed Concrete

Also known as the Lightweight Concrete Method (LCM) or Aerated Lightweight Concrete or Cellular Lightweight Concrete, foam concrete was first developed over 60 years ago. Since then, it has been on the international market for more than 20 years. Despite having now been used in the building industry for well over one hundred thousand apartments and houses, as well as schools, hospitals, municipal and commercial buildings in over 40 different countries, knowledge and use of the material continues to be largely hidden from the majority of potential users in the building industry. Recent research and performance characterization in Malaysia looks set to change this picture and launch foam concretes into the mainstream.

As predicted by the TRIZ 'Space Segmentation' trend (Figure below), foam concrete represents a highly predictable step towards a more ideal building material.



Examination of some of the benefits of the form proven during the Malaysian research reads like a comprehensive review of our 'reasons for jumps'. Here are some of the quoted benefits of LCM:

Weight reduction - foam concrete density ranges from 250 to 1,800 kg/m³, as compare to 2,400 kg/m³ for conventional concrete. Therefore, the weight of a structure built of foam concrete would undoubtedly be reduced significantly. The Malaysian developed manufacture processes further allow builders to manufacture to very precise specifications of strength and density. Reduction in dead weights contributes substantially to downstream savings in reinforcing steels in foundations. The dimensions and therefore, the overall quantity of steel reinforcement in LCM can be reduced by as much as 50%. Savings are also substantial in transportation, crane-and man-handling related activities as well as in raw materials, as no gravel is required to produce LCM but only sand, cement, water and air, with the resulting mortar/paste subsequently embedded in the foam. Casting very slender walls can optimize the amount of concrete used, and some of our consumers had produced walls as thin as 50 mm thick. The high flow ability of LCM makes vibration unnecessary, and thus requires no prescription of vibrating equipment/accessories.

Thermal insulation - foam concrete with a density of 1,200 kg/m³, for instance, can produce a monolithic wall 5 times thinner and require 10 times lesser raw material (by weight) and possesses 5 times superior insulation properties compared to that of conventional concrete. The amplitude-ratio and phase-displacement of a 15 cm thick wall with a density of 1,100 kg/m³ causes the outside temperature of a building to take between 10-12 hours to reach inside. Such a duration, which is much longer than that of conventional concrete wall, results in the foam concrete being naturally air-conditioning.

Sound insulation - LCM is a perfect impact and air-borne sound absorbing concrete and hence, highly suitable for party walls and floor screeds / foundations.

Fire rating - in 1,100 kg/m³ density LCM, a 13 to 14 cm thick wall has a fire endurance of 5 hours. The same degree of endurance is achievable with a 400 kg/m³ density LCM of

only 10 cm thick. LCM is non-combustible and the air-embedded in LCM attributes to the high fire-rating.

Compressive Strength - an average compressive strength of 2.86 MPa has been achieved on a 650 kg/m³ density LCM cubes following 28 days of standard water-cure. Tests done to date on other densities revealed that 28-day strength exceeding 18 MPa is achievable depending on the density of the mix. Studies also show that compressive strength of above 20 MPa is obtainable with the readily achieved addition of short fibers and steel mesh reinforcements. Taking material away, in other words, does not necessarily correlate to any reduction in strength. Indeed, in many cases the compressive strength of LCM is better than that of a non-foamed concrete.

Moisture resistance – perhaps surprisingly, thanks to the choice of foam, LCMs have better moisture repulsion properties than a conventional concrete.

Life span - foam concrete has a life span of 100 years. Previous investigation has shown that sectioned blocks of foam concrete cast 10 years ago indicated only 75 percent of the cement hydrated. It is expected that the strength would continue to increase with continuing hydration. The use of LCM in many cases makes additional man-made products like clay bricks and other insulation materials out-dated.

Easy application - no special skill is required in applying the system. It is fully adoptable or at least adaptable into existing concrete or prefabrication plants, adding only the LCM Foam Generator to produce and discharge foam of a precise dose into the mixer. LCM may later be pumped using conventional concrete pumps.

Flowability - due to the absence of gravel and the ball-bearing effect of the foam, LCM possesses a high degree of flow ability. No vibration is thus required and LCM completely fills all gaps and voids in the concrete or mould, fully embedding any hoses, tubes, frames for windows and doors. This rapid mixing capability and high fluidity of LCM facilitates speedy casting of building elements. With the application of vertical molds to cast complete houses in place, omission of vibrating equipment results in the entire walls and ceiling/roof of a building being filled in one step. Openings (or the actual frames) for doors and windows, and ductings and conduits for sanitary and electrical services can be cast in place and firmly embedded in the foam concrete.

Workability – LCMs are easily nailed, planed, drilled and sawn and can be applied with all traditional surface finishes - paint, tiles, bituminous membrane, carpets etc.

The Malaysian developed foam concrete is a mixture of cement, fine sand, water and a special foam, which once harden results in a strong, lightweight concrete containing millions of evenly distributed, consistently sized air bubbles or cells. The foaming agent in is based on a protein-hydrolysis and is bio-degradable. It causes no chemical reaction with the surrounding matrix but serves solely as wrapping material for the air to be encapsulated in the concrete (mortar). The density of foam concrete is determined by the amount of foam added to the basic cement, sand and water mixture.

Application-wise, the Malaysian team has thus far demonstrated successful deployments of the foam concrete in a diverse range of building projects, including:

- " cast in-place for a unit of low cost terrace houses and bungalows.
- " in lightweight bricks or blocks for high-rise buildings.
- " in panels and partition walls of various dimensions either pre-cast or poured in place.
- " in all types of insulation works, including cavity walls.
- " in roofing and ceiling panels.

- " in sound proofing application.
- " in pre-cast industrial and domestic building panels, both internal and external.
- " in pre-cast / in-place exterior wall facades for all sizes of buildings.
- " in foundations for roads and sidewalks.
- " in sub-surface for sport arenas, e.g. tennis courts.
- " in infill sections between beams of suspended floors.
- " aircraft arresting beds.
- " crash barriers.
- " explosion-resistant structure.
- " highway sound barriers.
- " floating barge, jetties, walkways, fish cages and floating homes, and
- " slope protection.



As conventional concrete and prefabrication plants may be used to produce LCM, the only investment that would be necessary is in the inexpensive foam generator and the foaming agent, and the latter contributes to only about 10% of the overall cost of LCM.



The Malaysian LCM is being exported to 6 countries namely Singapore, Thailand, Vietnam, Indonesia, Taiwan and China. The development team hopes to expand its use further to other continents in due course. According to us, the ultimate exploitation potential has really only just started. There is much more to come. Watch this space.

Interested readers may care to check out www.casthome.com/home.html for more details.

Biology – Carrion Crow

While we can't claim that every carrion crow has learned the trick, a number of crows on a university campus in Japan have learned a cunning ploy to help them to open up walnut shells. Carrion crows and humans line up at the roadside, patiently waiting for the traffic to halt. When the lights change, the birds hop in front of the cars and place walnuts, which they picked from the adjoining trees, on the road. After the lights turn green again, the birds fly away and vehicles drive over the nuts, cracking them open. Finally, when it's time to cross again, the crows join the pedestrians and pick up their meal.



If the cars miss the nuts, the birds sometimes hop back and put them somewhere else on the road. Or they sit on electricity wires and drop them in front of vehicles.

Biologists already knew the corvid family— crows, ravens, rooks, magpies and jackdaws—to be among the smartest of all birds. But this remarkable piece of behaviour, featuring in the final program of “Life of Birds”, would seem to be a particularly acute demonstration of bird intelligence. The crows in Japan have only been cracking nuts this way since about 1990. They have since been seen doing it in California. Researchers believe they probably noticed cars driving over nuts fallen from a walnut tree overhanging a road.

While we remain confident that they did not come across the solution by using the TRIZ Contradiction Matrix, it is interesting to note that the conflict solved by the crows is highly consistent with the recommendations made by the Matrix. The core conflict here is between the bird's desire to feed, and their inability to generate sufficient force to get the foodstuff out of its protective casing. We might map this conflict pair as follows:

Improving Factor	Worsening Factor	Principles
Productivity (44)	Force/Torque (15)	10 15 12 22 40
the bird wants to feed, but the useful foodstuff is encased in a shell requiring an opening force that is too great		35 28 36

The inclusion of Principles 12 ('If an object or system requires or is exposed to tension or compression forces, redesign the object's environment so the forces are eliminated or are balanced by the surrounding environment') or 22 ('Add a second harmful object or action to neutralize or eliminate the effects of an existing harmful object or action') or 28, Mechanics Substitution, should give us a direct line to the fact that in order to solve the problem, we need to find an additional source of energy ('field') from somewhere. For the Japanese carrion crows, the weight of a car provides the field. Other avians have identified other, different, external resources to solve what is effectively the same productivity-versus-force conflict.

The crows already knew about dropping clams from a height on the seashore to break them open, but found this did not work for walnuts because of their soft green outer shell.

Subscription 080:

Other birds do this, although not with quite the same precision. In the Dardia Mountains of Greece, for example, eagles can be seen carrying tortoises up to a great height (i.e. gravity becomes the external field resource) and dropping them on to rocks below. Certain gulls use the same gravity trick when they wish to extract food from shellfish.

News

Turkey

We are happy to announce our recent partnership with the ABC consulting company based in Istanbul. Director, Yekta Ozozer is probably the leading creativity expert operating in the country. He is the author of one of the best selling creativity books in Turkish and includes many of the country's biggest companies on his client list. We are very happy to be collaborating on a large creativity culture deployment with one such company, and are planning to translate books and software into Turkish in due course.

Innovation Day

We were both proud and honoured when we were invited to present alongside such luminaries as Edward DeBono and James Dyson at the forthcoming Innovation Day at Dublin City University. The equivalent event last year attracted over 500 delegates. This year's event will take place at the university on 29 March. Check out our calendar page for more details.

UK Telephone and Fax Numbers

Well, try as we did, according to British Telecom it was impossible to retain our usual telephone and fax number when we moved into our new UK office. By the time you read this, hopefully all the links on the website will be updated accordingly. In case you don't spend all of your time linking to the site, the relevant new details are as follows:

Telephone - +44 1275 337500

Fax - +44 1275 337509

We look forward to hearing from you. Incidentally, despite the inconvenience of the change, the added advantage is that we have a VOIP capability and hopefully a far more efficient call-forwarding system.