Systematic Innovation

e-zine

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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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Inevitables, Mappables & First Signs Of Madness

They often say the first sign of madness is repeating the same thing over and over again and expecting a different result. Anyone that understands anything at all about complex systems knows how meaningless the aphorism can often be. All we need to do is go look at the vast majority of failed organisations around the planet that previously earned their living by doing *precisely* the same thing over and over again. That said, there are a range of different degrees of uncertainty relating to whether it will happen to us and the organisations we work for. The further we edge through complexity towards chaos, the more likely doing the same thing over and over will kill us. Conversely, the simpler the world we live in is, the less likely the possibility that doing the same thing will be harmful. Knowing where you sit along that simple-complex-chaos spectrum is a really good idea for any innovation project team.

A good sign that you're at the 'chaos' end is that the number of project failures you experience is high. In most parts of the FMCG world right now, for example, around 95% of new products are deemed to be failures. Given this level of dysfunction, one might expect the industry to take a deeper look at the way it sets about doing things in the hope of finding a better way. According to our experiences, the seeds of failure are actually sown before the first project Gantt chart has been constructed. Nearly all FMCG organisations have a version of an innovation process looking something like the cartoon shown in Figure 1:

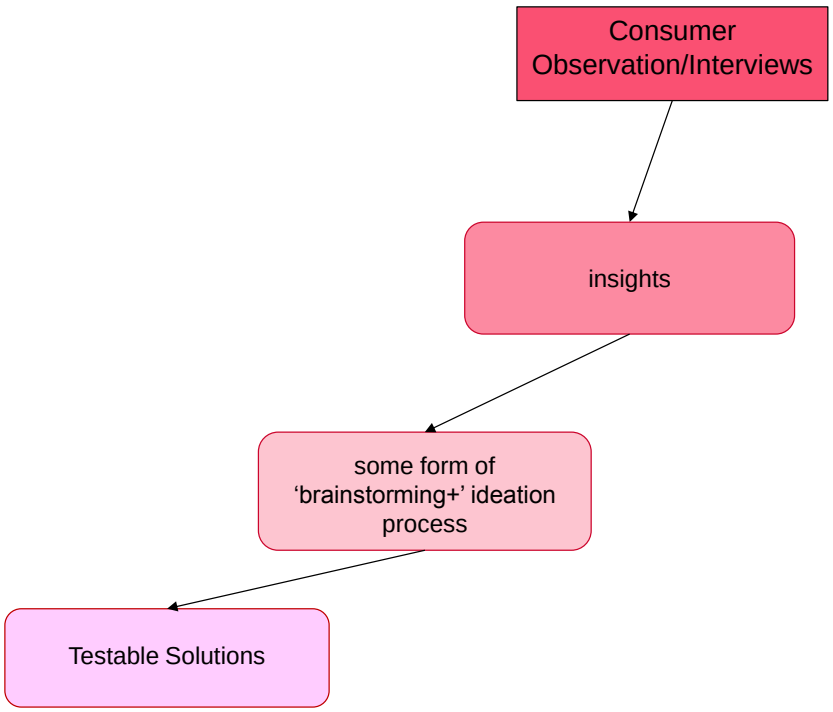


Figure 1: Typical FMCG New Product Creation Process

Different organisations have different names for what they're doing, but the overall basic concept rests on the need to acquire some kind of 'insight' from the consumer. Getting to the insight generally speaking involves talking to or observing consumers, and getting from the insight to the 'solution' generally speaking involves some kind of Post-It note party. All in all, a terrific example of every complex problem having a simple wrong

answer. But yet, somehow, the process has become some kind of expected norm. Teams have their KPIs written around this process. Project checklists demand a certain number of consumers have to be engaged. Stage gates require all the check boxes to have been ticked. Never mind first signs of madness, what we have here is something significantly worse. Its busy fools. Or, worse still, it's a giant corporate arse-covering exercise. Meaning that, when the project almost inevitably fails – 95% failure rate, right? – the team can shrug their shoulders when the brand manager inquisition comes, and say, 'we did everything we were supposed to do'. If you didn't laugh, you'd probably be busy chewing through the straps of your strait-jacket right now.

Paradoxically (naturally!), the unspoken assumption at the start of one of these processes is that everything is unknown. That we're lost in the dark and need to go and talk to someone in order to give us some kind – *any* kind – of clue what to do. In effect we're acknowledging the complexities of the world, and the unknow-ability of the future. The paradox being that this is the precise opposite of the view we've had when we decided to run a process that we know doesn't work most of the time.

Anyone with any kind of TRIZ knowledge will know that there is much about the future that is not only know-able it is nigh on inevitable. Another paradox: in TRIZ-World, the long term future is considerably easier to predict than the near term. The near term future is easily distorted by social, political and other people-related foibles. Things don't always become 'more ideal' in the short term. But, when we step back and look at the longer term, we know that they very clearly do. The long term future trajectory of any product or service is that it will deliver more of the benefits customers want, and less of the costs and other harmful things they don't want. It will, in TRIZ words, evolve in the direction of increasing ideality. The long term evolution of, say, music reproduction systems will show that reproduction quality improves, costs come down, size comes down, weight comes down, life goes up, and so on. That there might have been a temporary fad for enormous ghetto-blasters in the 1980s will no doubt be forgotten when historians zoom-out and look at the bigger picture.

Thinking about the spectrum of simple-through-to-chaotic, there would seem to be three different ways of dividing the world of new product creation. Firstly there are things – like the long term urge towards increased ideality – that we could classify as 'inevitables'. Next to them come another group of things that, while they are complex (in the mathematical sense), they are in some way 'mappable'. And then, finally, swinging out further in the direction of chaos, are the 'unknowns'.

Figure 2 is an attempt to describe a new-product creation process incorporating tools and approaches we typically use when thinking about these three inevitable, mappable and unknown domains. The overall philosophy underpinning the process is similar to that presented in the TrenDNA methodology: the various tools representing different viewing lenses on a given situation, each of which ought to be able to offer up some clues as to what the product development team should do. As one might expect, the 'inevitable' lenses will tend to give clearer clues than those coming from the 'unknowns' category. The ultimate point – relative to what FMCG-world development teams normally do – is that we can generate a whole bunch of really strong clues from the inevitable and mappable perspectives before we've made any attempt to go and speak to or observe any potential customer at all. These are the lenses, in other words, that are going to help us to remove an awful lot of the risks and uncertainties of the creative process before we have to contemplate spending large sums of money. In the final analysis, of course, there are still the 'unknowns' to worry about, but even there, according to us, there are a whole bunch of methods of uncovering insight that allow teams to do a far more effective job at a

considerably reduced cost. Let's have a look at each of the three overall groups of tools in a bit more detail:

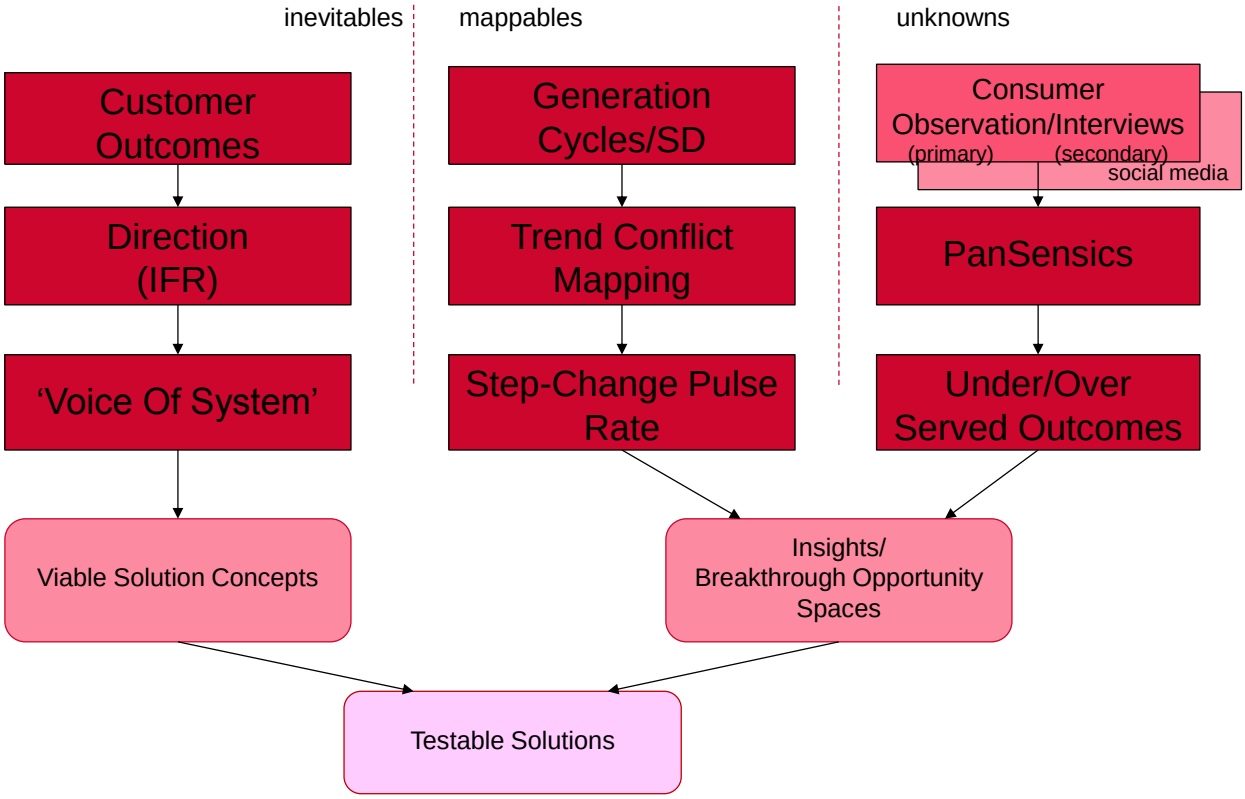


Figure 2: Systematic Innovation Version Of FMCG New Product Creation Process

Inevitables

In large part, the inevitable aspects of any new product (or service) come from three different lenses: firstly, looking at a challenge from the perspective of the intended customer(s) comes an exploration of the outcomes they are looking for. This usually means constructing one of our Outcome Maps (2x2 matrix – tangible/intangible & me/we) for each of the different target customer types. Next up is the aforementioned evolution trend towards increasing ideality, which, when looking in more detail might involve building an Attribute Conflict Map and one of our IFR 'strategy cone' pictures. The third inevitable then shifts the world viewing lens to the 'Voice of the System'. This is the lens that tells us that any current product possesses untapped evolution potential and that if we look at this untapped potential in relation to each of the relevant TRIZ/SI Trends of Evolution, we ought to be able to generate a whole suite of ideas relating to how we can expect a product and it's sub-systems to evolve in the future. This is the part where we find ourselves doing a lot of the ideation 'heavy-lifting' in that the Trends are providing us with a clear roadmap of future success. So much so that the only thing we're missing having generated a suite of future direction ideas is any knowledge about which are more or less likely to be valued by customers. The last part of the 'inevitables' tools, finally, is the generation of 'viable solution concepts'. Which we typically do by matching the Voice of Customer outputs obtained from the Outcome and Attribute Conflict Maps with the Voice Of System outputs obtained from the Trend analyses. We're still missing a bunch of information about prioritization of the resulting concepts, but we can nevertheless be pretty confident we already have a list of directions that will have a good chance of finding a place in the market 'at some point' in the future.

Mappables
The 'Inevitables' tools give us a pretty good indication of all the possible future directions that a system might evolve to become. What we still don't know are the 'which?' and 'when?' answers. The Mappables category of viewing lenses are thus designed to help us to begin answering those questions. Again, we use three different lenses. The first two come directly from TrenDNA – one involving a look at the likely impact of generational cycles on how customer expectations might be expected to change over time, and the other – the biggest TrenDNA exercise usually – involving the construction of a Trend Conflict Map. The big idea underpinning the construction of this Map is that the main things determining which product evolution directions will be most valued by customers come from resolving the conflicts they experience. It's not the market trends that determine innovation direction, in other words, it's the interactions *between* those trends. Finally, the other thing we can look to calculate with a fair degree of accuracy is what we refer to as the 'pulse rate' of an industry sector. It is simply an assessment of the rate at which an industry (or product family) is making step-change jumps. We say 'simply' because, when you have 4 million step-change datapoints, it's relatively easy to look through the data to pick out how often jumps are happening within any chosen market segment or region. We've previously published a number of articles on 'innovation timing' describing how we do this job.

Unknowns
Okay, so having been through the Inevitables and Mappables, we're still left with some remaining uncertainties about what a market might or might not want. How much money a consumer might be prepared to pay for our beautiful new product idea. Or how best to present it to them. In reality, the 'optimization' questions. We've now reached a point where some actual experimental data will be needed if we are to progress in an efficient manner. We use the expression 'efficient' here because what we're increasingly seeing in some markets (consumer electronics and ICT for example) where the most effective strategy at this point, is to just get on and make prototypes and launch them onto the market. If your R&D processes are sufficiently evolved then this is not such a bad strategy: get 'something' on the market, rapidly learn from early adopting customers, and then iterate and evolve the product accordingly. In some industries, on the other hand, this approach is either rejected as 'unscientific', or, more usually, unaffordable. 'Lean R&D' still needs some customer data. The usual problem, having made this decision to go and obtain some real data, is that customers are notoriously unpredictable in their behaviours. They will very clearly tell us one thing, and then five minutes later behave in a manner completely inconsistent with what they've just said. In our process, we have two main responses to this problem. The first is to divide the customer world into 'primary' (we will interact with them directly) and 'secondary' (we will interact with them indirectly) sources. Primary sources tend to be expensive; secondary sources are cheaper, but traditionally more difficult to access. Thankfully the advent of social media scraping tools has made the job of capturing the opinions and behaviours of enormous numbers of customers highly practical… if – and it is a big if – you know what you're looking for. Social media scraping probably exemplifies the ultimate manifestation of 'garbage-in-garbage-out' at this point in time. So-called 'Big Data' has thus far highlighted little more than an ability to mis-interpret just about everything it touches. Which is where the 'science of reading between the lines' comes in – in general terms, meaning the science of finding ways to capture what's happening in people's limbic brain rather than their pre-frontal cortex. Which means, in our case at least, the growing suite of measurement instruments found in the PanSensics kitbag. The culmination of the work done to understand actual intended customers in this 'unknown' category of tools has become, again 'for us', the Frustration Map – a way of

quantifying and presenting which aspects of their relationship with a product are the greatest sources of frustration. Figure 3 shows a typical Frustration Map:

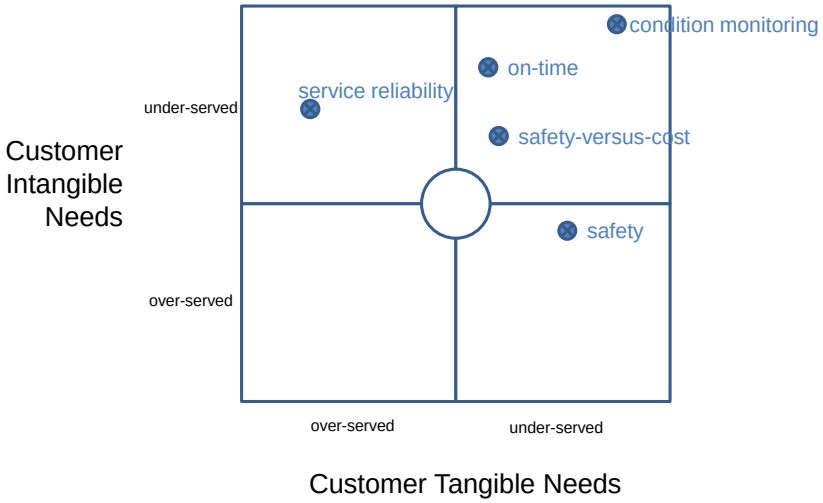


Figure 3: Frustration Map

Having created this map, and combining what it's trying to tell us with the clues obtained from the inevitable and mappable elements of the new product opportunity story, we're now in a position to assemble some testable solutions. Hopefully at a significantly lower cost and higher fidelity manner than we would previously have done in the 'assume everything is unknown' world of FMCG new-product development.

There may well still be a fourth category of things to worry about above and beyond our inevitable, mappables and unknowns, a category we might chose to call 'unknowable'. This is a category that in effect says, we could spend the rest of our lives measuring and analyzing and still be no wiser. When we hit the edge of this category, the only thing we can sensibly do is get something out into the market and listen carefully to how people respond to it. When we reach this worldview, we tend to defer to the strategy of US Air Force pilot John Boyd and his Observe-Orient-Decide-Act model. Boyd, too, recognized that in complex-bordering-chaotic situations, the winners were basically the ones that could learn and adapt the fastest. In innovation terms, what Boyd was basically talking about was a process something like the one shown in Figure 4:

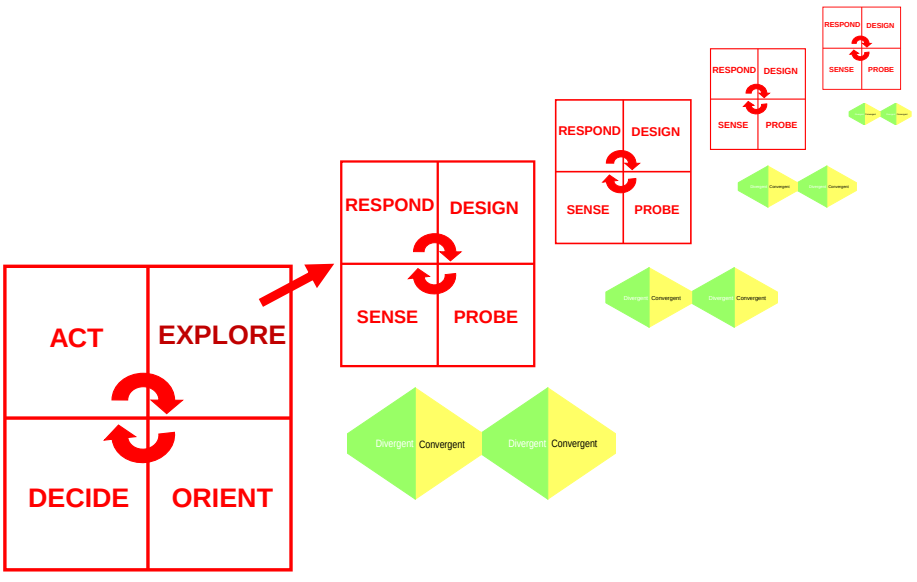


Figure 4: Design-Probe-Sense-Respond Cycles Within New Product Exploration

All in all, the main intention of segmenting the world into these different categories is to try and help organisations, and particularly the product development teams they contain, to break out of the madness of spending lots of money on a 'process' they know doesn't work. Lots of things about the future are indeed unknown or unknowable, but that doesn't mean we should ignore all the stuff that is inevitable or mappable. Ignoring common sense ways of improving the way we do things perhaps counts as the second source of madness.

There's always 'the next problem' of course, and in this case we have a strong suspicion this second source of madness has something to do with plausible deniability and people preferring to stay inside their comfort zones. After all, for the vast majority of FMCG product developers, it's not their money that pours down the drain when yet another project fails to deliver, so why should they worry? It's a tough one, but maybe the next article – even though it has nothing whatever to do with FMCG – holds a clue or two…

Case Studies: Evidence Shmevidence

"Self-reform is the only kind that works"
Mason Cooley

If the aerospace industry matched the current safety performance of the NHS there would be 190,000 air accidents every quarter in the UK… or 2000 a day. The cost of compensating passengers (even assuming that there are no fatalities in any of the accidents) would be just over 9 trillion pounds a year based on current rates. The industry would be shut down in less than a week.

The aerospace industry safety track record in terms of accidents is 99.99999% (the industry calls this 'seven 9s'). The industry has achieved this impressive track record through a longstanding tradition of learning from things that go wrong. Every plane that takes off is the beneficiary of the learnings obtained from every other plane that ever took off before it.

If the healthcare sector just managed to replicate that characteristic, it would represent a major step forward. And yet somehow it never quite seems to happen.

One of the oft used explanations is that things can only be implemented when there is sufficient 'clinical evidence'. In theory at least this is very similar to what the aerospace industry insists upon: Do a bunch of heavily documented trials, learn from them and disseminate the findings so that everyone else can learn from the experience.

So much for theory. I've worked in and around the healthcare sector on and off for the last decade now, and I'm sick and tired of healthcare professionals playing the clinical evidence card whenever something 'new' rears its head. Not because I don't believe in the concept – I spent 15 years in the aerospace industry so I know what 'evidence' really means – but because I don't believe the healthcare profession really believes in the clinical evidence concept at all. Especially if it turns out to be clinical evidence even hinting they need to change something relative to what they currently do.

The aerospace industry is highly competitive in all but one regard. Safety. The industry has learned that by sharing safety information, everyone learns faster, and everyone benefits when the overall safety performance of the industry increases. They provide an archetypal example of the 'rising tide lifting all ships' aphorism.

Sadly, despite the Hippocratic Oath ('first do no harm' remember), the healthcare sector seems to contain competing factions that do not possess an equivalent unity of purpose. What this means is that when one part of the sector is made aware of some clinical evidence that might have negative implications for them, their first instinct is to try and create some contradicting 'evidence'. Wilful blindness has become the knee-jerk response of the system. Closely followed by plausible deniability. Together they make for a potent one-two knockout punch that has the tendency to kill even the most obvious 'no-brainer' changes.

We've reached a point now where even the most cursory amount of meta-research on the subject will quickly reveal all the clinical evidence anyone would ever need to show the 'clinical evidence' card to be a hollow sham.

Wishart & Roylance, Warren & Marshall, Alice Stewart are all good places to start, but my favourite example comes from the work of clinician Atul Gawande (Reference 1), a general and endocrine surgeon at Brigham and Women's Hospital in the US.

Dr Gawande did a very smart thing a few years ago, and looked outside the healthcare sector for some solutions to the problem of improving safety in the operating room. Even more wisely, he looked to the aerospace industry to see what they did.

One of the surprising outcomes of his search was that a big contributor to aircraft safety was the check-list that every pilot completes before any flight. Maybe, Gawande surmised, introducing checklists in the healthcare system might also produce a safety benefit. So he did a bunch of trials, and in so doing proved that the increase in safety was quite remarkable. So he began writing papers describing more trials. And then a book. The upshot being the unequivocal finding that we could literally save tens of thousands of lives a year just by getting healthcare professionals to tick a few boxes on a checklist.

So guess what proportion of the NHS uses any kind of checklist? Virtually none.
How can that be? Common-sense tells us a check-list is a good idea, so does the decades of data from the aerospace industry, and so does the 'clinical evidence' from the healthcare industry itself.

Clearly something is going on here. And whichever way I look at it, it tells me that I and my team could spend the rest of our lives collecting 'clinical evidence' and it would have zero useful effect in the healthcare sector. It tells me that there is a deeper problem. Clinical evidence is the ever so convenient 'get out of jail free' card clinicians play whenever there's a danger they might have to admit they're not all-knowing and all-seeing. 'Ah, yes,' I've had one eminent clinician say to me, 'it might work in *that* hospital, but it wouldn't work *here*'. Now I know this guy is a pretty shrewd character. I'd also trust him with my life if it came to me needing his service. So what is it that's happening when we look below the surface for the real problem?

As is so often the case with this type of problem, the key to solving it involves recognising that if you ask for people's opinions they don't always tell the whole truth and nothing but the truth. Getting to the potentially embarrassing, uncomfortable reality of a situation requires an ability to 'read between the lines'. It's also about being able to make sense of the different opinions coming from different types of stakeholder. Ask a manager and you're likely to get a different answer to the one you'll obtain from a Ward Sister, which is likely to be different again to what you'll hear from a surgeon.

Figure 1 illustrates our findings from a 'reading between the lines' exercise to try and answer the question, 'healthcare professionals won't adopt checklists because…'

The data extracts information from Gawande's book, from nurse forum scrapes, by reading across comments made by pilots in the aerospace industry, and from us trying to put ourselves into the mind of the ultra-skeptical clinician. In each of those senses, the best we can say is that this is a piece of 'meta-research'. It certainly wouldn't meet any 'clinical evidence' criteria we might chose to expose it to. More on that issue later. Meanwhile, here's the table of 21 accumulated comments:

Identifier	Perception Description
1	it feels trivial
2	it is demeaning to my professional standing
3	we already have too many other things to do to contemplate adding something else
4	no time to create a bespoke checklist
5	no time to trial it here
6	using one implies i'm not competent
7	checklists remove all flexibility from the system
8	it becomes another weapon for management to use against us
9	it rapidly devolves to become an unthinking response
10	no-one to do the training required
11	no budget
12	someone would have to re-write our procedures
13	we'd end up with thousands of checklists, which would lead to more confusion
14	nowhere to store all of the completed checklists
15	who says a checklist is the best solution?
16	i've been doing this job for Xyears, i know what i'm doing
17	every operation is potentially different, if something goes wrong, the checklist will hinder
18	someone will need to be appointed to keep them updated
19	administration costs will go up
20	God doesn't use checklists
21	they represent a potential infection hazard in theatre

Figure 1: List Of Perceived Reasons Checklists Don't Get Adopted

Per the usual Perception Mapping convention, we then explored the connections between each of the statements using the usual 'leads to' method. Figure 2 illustrates the important parts of the resulting map:

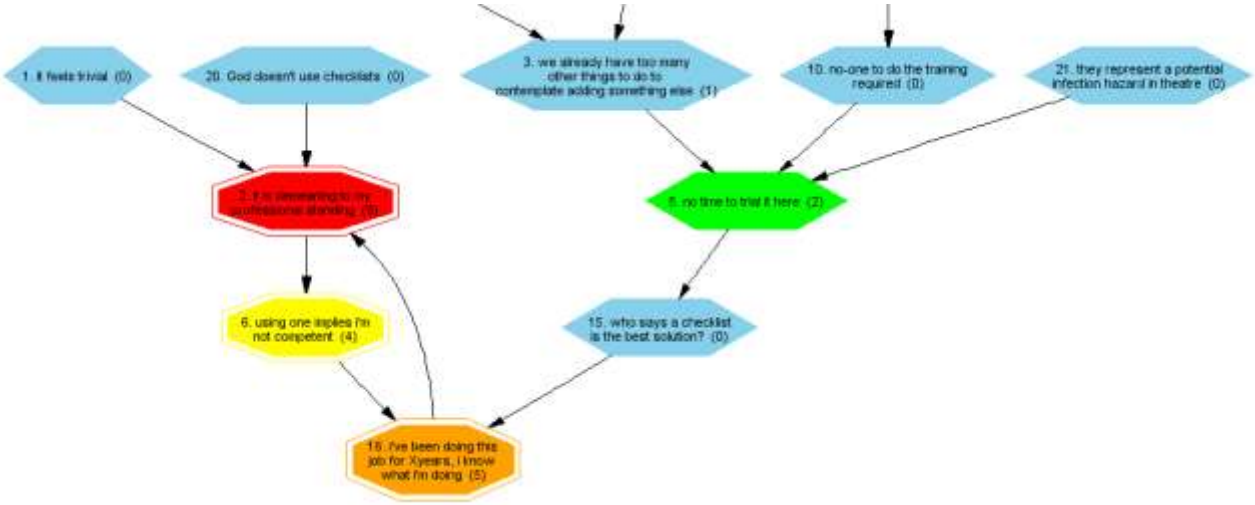


Figure 2: Critical Portions Of Perception Map

The map contains a single vicious-cycle, downward spiral indicative of the sort of problem that contains a single overall issue, and therefore is amenable to a single coherent solution. The vicious cycle centres around experience, professional reputation and the thought that using a checklist sends out the implication that there is a lack of competence.

The problem is, in other words, all about the intangible, emotional stuff. Evidence schmevidence.

That shouldn't prevent us from tackling the problem. Rather, it means we need to get beyond the 'good' reason stuff Gawande is advocating in his work, and into the 'real' reason stuff inside peoples' heads. Figure 3 illustrates how we mapped the 'real reason' problem described in the Figure 2 vicious cycle: we're trying to adopt checklists into the way things are done, and the reason they're not being adopted is an emotional reaction centring around a perception that using checklists implies a lack of competence:

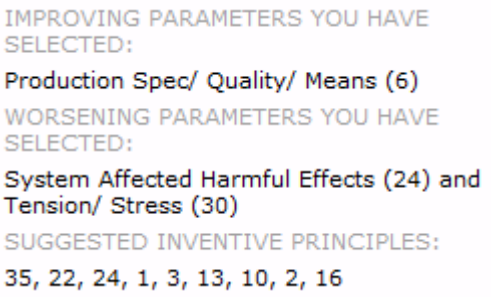


Figure 3: Mapping The 'Real' Problem Onto The Contradiction Matrix

The first suggestion from the list of Inventive Principles used by others that had successfully solved similar problems was Principle 35, Parameter Changes. Usually a cause for a groan because it is such a general and abstract provocation, but in this case, as soon as we read the description for Principle 35A we get, 'change an object's physical state (e.g. from physical to virtual). Which immediately triggered the idea of a virtual checklist.

Then we looked at Principle 2, Taking Out/Separation and came the thought that at least some of the perception of incompetence comes from the fact that everyone can see the checklist. What if everyone was seeing only what was relevant to them?

Taken together, in classic 'someone, somewhere already solved your problem' fashion, we found a company called Pristine Eyesight (Reference 2). A company that has just developed a Google Glass version of a checklist – Figure 4.

Figure 4: Pristine Eyesight Personal Checklist

While we don't think it's a solution that solves all of the 'real' problem, at the very least it offers a good foundation. If we say, for example, that clinicians have the same ABC needs that all of us have – the simultaneous need for Autonomy, Belonging & an ability to demonstrate Competence (Reference 3) – then an evolved Pristine Eyesight solution would allow a clinician to, unbeknownst to anyone else in an operating theatre, turn it on or off, adapt it to their needs (Autonomy), share the screen, or elements thereof, with others (Belonging), and hide what they're looking at from others (Competence).

At the very least, it represents at least the start of a solution that ticks all of the 'real' reason boxes. But what about the 'good' reason stuff? What about 'clinical evidence'? Well, here's the amazing thing: because it's a solution that ticks all of the intangible boxes, and is pretty cool, suddenly it gets the healthcare professionals on side. Rather than trying to argue why checklists are a bad thing, suddenly, everyone starts clamouring to be the early adopters that get to use the new system. Now we're really into evidence shmevidence territory… suddenly no-one is asking how much it costs, or what the ROI is (actually, saving just one error and its resulting compensation costs in just one operating theatre would pay for the whole system!), or 'I'm too busy to learn how to use it'. Suddenly it becomes a very aspirational piece of kit.

Which is where we might end the story, thinking we've done a good job. But then again, we're not like that. What about the other suggested Inventive Principles, we said, maybe they could make the idea even stronger. What could we segment? Or turn around the other way? Or do earlier? Hey, we thought, knowing that a lot of healthcare professionals operate with a Feudal mindset – one that means they're tendency is to do the opposite of what they've been told to do – how about telling clinicians they *can't* have the new system? Tell them you've done an analysis and concluded they're not the right people to be the early adopters. Suddenly, you've just created a wonderful 'pull' system. The more you tell the Feudal clinician they can't have something, the more they want it. And now you've really hit the heart of why 'clinical evidence' really is the hollow sham that it is. Evidence shmevidence indeed.

References

1) Gawande, A., 'The Checklist Manifesto: How To Get Things Right', Metropolitan Books, 2009.
2) http://pristine.io/products/eyesight/
3) Systematic Innovation E-Zine, 'Universal Intangibles', Issue 140, November 2013.

Funny? “The Uncomfortable”

From a recent issue of Wired:

“How can an object be incredibly, exquisitely, perfectly designed–and a colossal pain in the ass to use?

“That’s precisely what Katerina Kamprani shows us with “The Uncomfortable,” a collection of familiar household objects rendered aggravatingly unusable with a few simple adjustments. The ranks include open-toed rain boots, a pitcher that pours back into itself, and a button as thick as thumb.

“Kamprani, a designer and architect in Athens, creates the objects with 3D rendering software. Her first stubborn creation was a closet with doors that opened inward.

“The conceit is clever enough on its own, but Kamprani’s poetic execution is what makes the project so great. Each object stays largely faithful to the materials and forms of the original; typically there’s just one deft change that sends its utility flying out the window.

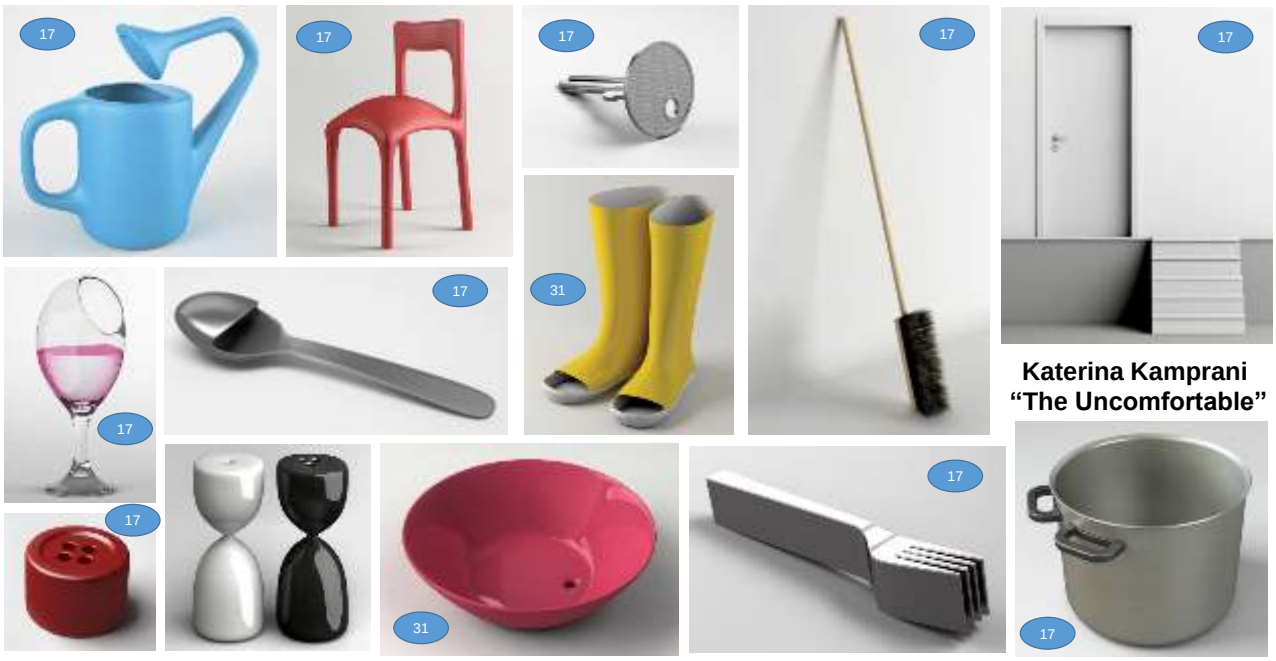
“Kamprani starts by recreating the steps it takes to use an object, isolating a single interaction to sabotage. She consults with friends and draws sketches, auditioning a variety of tweaks and transformations until she’s found just the right one. “I know an idea is good when it is so ridiculous I even surprise myself,” she says.

“In each case, there’s a real elegance to the inefficiency Kamprani conjures up. The humble Oreo is a triumph of cookie design, and we owe a debt of gratitude to its inventor. But it takes an equally incisive mind to see how thoroughly you can screw the whole thing up just by inverting the ingredients.

“You could say that Kamprani’s the best terrible designer anywhere on the planet. There is, however, one product she hasn’t been able to subvert. “I try and try and think again and again, but I still haven’t thought of an idea that will make me laugh,” she says.

“That elusive object for which the Eureka moment–or at least Kamprani’s bizarro brand of it–has never arrived? The light bulb…”

…Ms Kamprani’s problem, if that’s the right word for it, is she only knows three of the 40 Inventive Principles. The inverted Oreo is a Principle 13. Here are her other designs:



Katerina Kamprani
“The Uncomfortable”

Personally, if I was going to re-invent the light bulb Kamprani-style, I think I’d be brushing up on Principles 2 and 7. Although I tend to think Principle 13 ought to do the trick.

Patent of the Month - Lithium Super-Battery

We head to Dayton Ohio for our patent of the month this month, and a team of inventors from Nanotek Instruments Inc., one of the companies we keep a fairly regular eye on given the intriguing nature of some of the things they do. Their 5 August grant of US8,795,899 seems to be one of their very best. We get an early clue in the invention disclosure abstract:

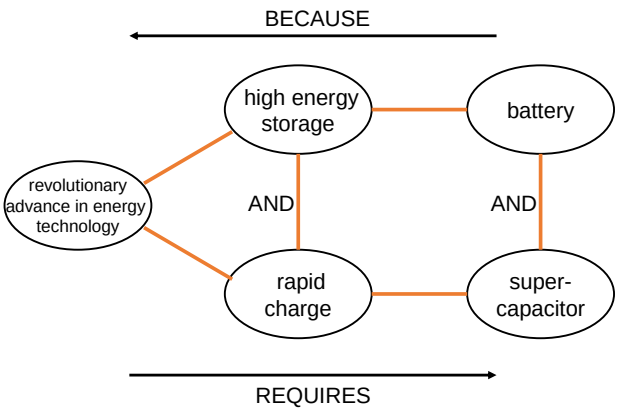
In a preferred embodiment, a lithium super-battery … exhibits a gravimetric energy about 5 times higher than conventional supercapacitors and a power density about 10 times higher than conventional lithium-ion batteries. This device has the best properties of both the lithium ion battery and the supercapacitor.

In addition to the order-of-magnitude step-change improvement claims, the text also hints at the basic underlying contradiction their invention has sought to challenge. Here's their summary comparison between the two sides of the contradiction:

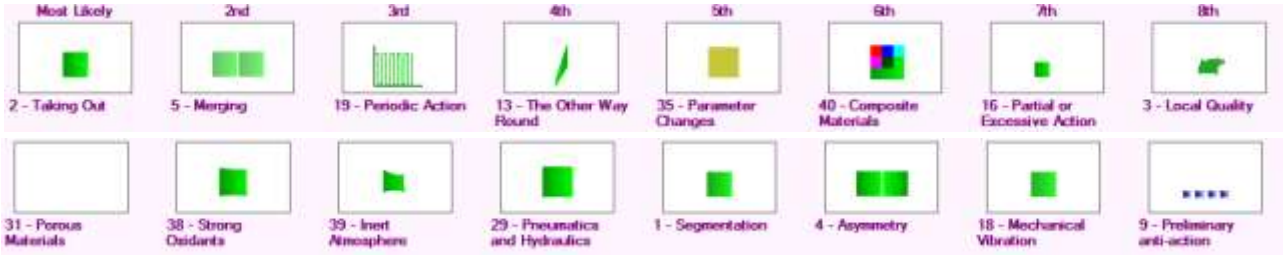
Comparison between supercapacitors and lithium-ion batteries.

Characteristics	Ultracapacitors or Supercapacitors	Lithium-Ion Batteries
Main Advantages	High power density; Long cycle life; Recharged in seconds; Relatively safe	Moderate power density; High energy density
Main Disadvantages	Low energy density	Safety concern; long recharge time
Energy Density	3-6 Wh/kg (conventional)	100-180 Wh/kg
Power Density	5,000-10,000 W/Kg	100-500 W/Kg
Deep Cycle Life	500,000-1,000,000	500-2000
Cycling Efficiency	>95%	<80%
Cell Voltage	2.7 V	3.6/3.7 V
Temperature Range	−50° C.-50° C.	−10° C.-50° C.
Discharge Time	Seconds	Minutes to hour
Recharge Time	Seconds	Hours

And here's our version of the deeper level conflicts at play:



And here's what happens when we map this picture into the Wizard tool in the Matrix+ software:



What the inventors have actually done to achieve the performance improvements they claim appears to involve a whole string of inventive steps. Here are some of the main ones, annotated to show the Inventive Principles they are representative of:

A lithium super-battery or lithium-exchanging battery device comprising a positive electrode, a negative electrode, a porous separator (Principle 31) *disposed between the two electrodes, and a lithium-containing electrolyte in physical contact with the two electrodes, wherein the positive electrode comprises a plurality of chemically functionalized* (Principle 38) *nano graphene platelets* (Principles 1 and 17) *or exfoliated graphite having a functional group that reversibly reacts with a lithium atom or ion wherein said nano graphene platelets or exfoliated graphite contain an oxygen amount of at least 1% by weight or have a platelet less than 10 nm in thickness or having no greater than 20 graphene planes.*

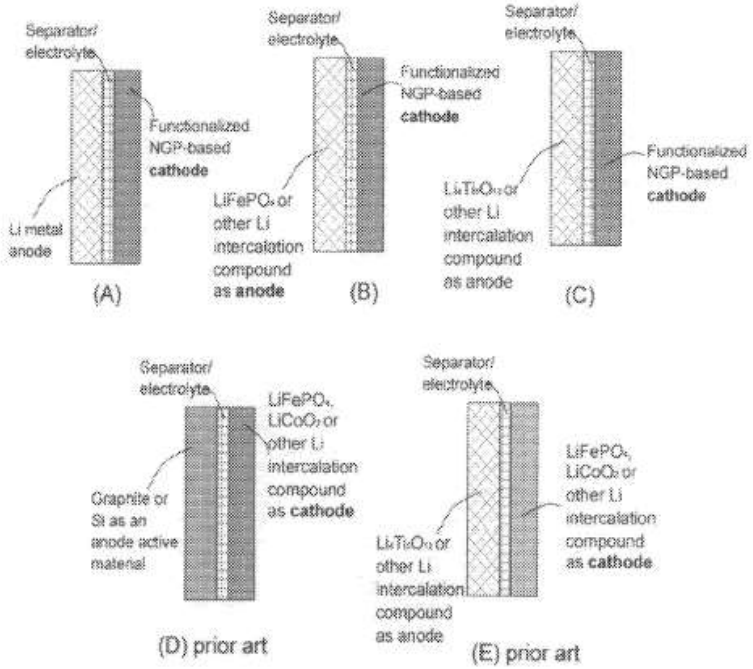
And in more detail:

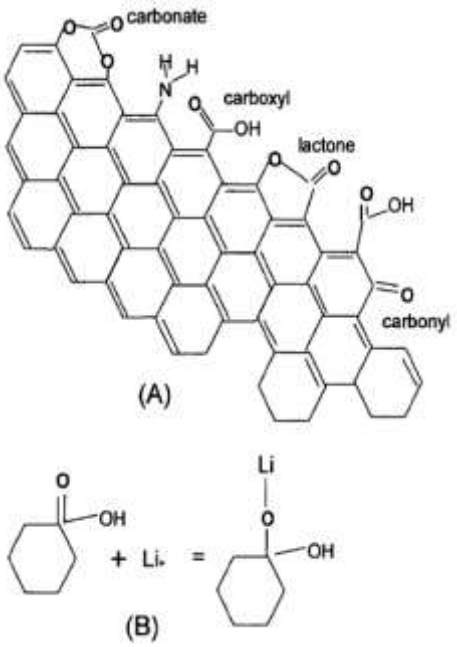
there exists an urgent need to develop a new class of highly conducting electrode materials having a functional group that is capable of forming a redox reaction with lithium ions. These materials must have an adequate amount of readily functionalizable sites to host a desired amount of useful functional groups. These materials must be mass-producible with low costs. These materials must be stable in a wide temperature range (e.g. -40.degree. C. to 60.degree. C., a commonly operating range for a battery). After an extensive and intensive research and development work, we have discovered a new type of electrode materials that meet this set of stringent technical and economical requirements.

This new type of materials includes chemically functionalized exfoliated graphite (or graphite worms composed of inter-connected graphite flakes) and the chemically functionalized nano graphene platelets (f-NGPs) that are isolated and separated (Principle 2) *graphite flakes containing a layer of graphene plane or a plurality of layers of graphene planes with a thickness less than 100 nm. These NGPs can be obtained by severing the interconnections between flakes in a graphite worm. In other words, an NGP is an individual basal plane of carbon atoms (a single-layer graphene sheet) or a stack of multiple graphene sheets. A single-layer graphene sheet is basically a 2-D hexagon lattice of sp.sup.2 carbon atoms covalently bonded along two plane directions. The sheet is essentially one carbon atom thick, which is smaller than 0.34 nm. In the presently invented lithium super-battery, the interconnected graphite flakes in a graphite worm and/or the separated/isolated NGPs have certain specific functional groups capable of reversibly and rapidly forming a redox pair with a lithium ion during the charge and discharge cycles of a battery cell* (Principle 19).

Both exfoliated graphite and NGPs are obtained from a precursor material, such as graphite particles, using a low-cost process. As one example of the production processes, natural graphite powder may be immersed in a mixture of sulfuric acid, nitric acid, and potassium permanganate at room temperature for 2-96 hours (Principle 38). *The resulting material is a graphite intercalation compound (GIC) or graphite oxide (GO). This material is then subjected to a thermal shock* (Principle 35) *(e.g., 1,000.degree. C. for 30-60 minutes) to obtain worm-like graphite structure commonly referred to as exfoliated graphite or graphite worms. A graphite worm is composed of*

many loosely interconnected graphite flakes with multiple pores that are of 1 nm to several microns in size. This is a weak and fluffy, 3-D material. Graphite worms may then be subjected to mechanical shearing (e.g., milling) or ultrasonication treatment (Principle 18) *to produce nano graphene platelets (NGPs) that are isolated, separated graphite structures typically composed of single graphene plane or multiple graphene planes.*





This one might just turn out to be a record breaker. In more ways than one.

Best of the Month – The Hour Between Dog And Wolf

"[the hour] between dog and wolf, that is, dusk, when the two can't be distinguished from each other, suggests a lot of things besides the time of day… the hour in which… every being comes into his own shadow, and thus something other than himself. The hour of metamorphoses, when people half hope, half fear that a dog will become a wolf. The hour that comes down to us from at least as far back as the Middle Ages, when country people believed that transformation might happen at any moment."
Jean Genet, Prisoner Of Love & Frontispiece to The Hour Between Dog & Wolf

We travel back to 2012 for our reading selection this month. John Coates, senior research fellow in neuroscience and finance at the University of Cambridge, offers a number of fascinating lessons from a booming new field, the biology of risk, in *The Hour between Dog and Wolf: Risk Taking, Gut Feelings, and the Biology of Boom and Bust*. He reveals how risk taking and stress transform our body chemistry, driving us to irrational exuberance or pessimism. He asserts that under some circumstances, the chemical surges can overwhelm us, and when that happens to traders and investors, they tend to suffer either euphoric overconfidence or extreme timidity. Coates contends that these extremes can destabilize the financial markets and wreak havoc on the wider economy.. Conversely, it is also reasonable to conclude that traders and investors may exhibit such timidity and excessive pessimism that they elect to remain on the sidelines despite appealing valuations during severe market declines. Taken together these two 'over-compensation' extremes have a destabilizing impact on asset prices and financial markets. They might just play a causal role, in other words, in the creation and subsequent bursting of market bubbles

Coates, who once headed a derivatives trading desk, focuses on the moment of Jekyll-and-Hyde transformation that traders pass through when under pressure. This moment of transformation, which the French have called "the hour between dog and wolf" since the Middle Ages, results from rising levels of testosterone that increase both one's self-confidence and, crucially, one's appetite for risk. For ezine readers familiar with our TrenDNA work with the findings of Dr Clare Graves, what the book is in effect describing is a shift in Mental Gear from wherever a person is 'normally', into the Red 'Feudal' Gear.

According to Coates, traders and investors become cocky and irrationally risk seeking when on a winning streak but tentative and risk averse when recovering from losses. Coates discusses the "winner effect," a model borrowed from the study of animal behavior, which offers an explanation of trader behavior during market bubbles. This model

suggests that winners in battle emerge with heightened levels of testosterone and the losers, with reduced levels. If the winners proceed to a further round of competition, they do so with already elevated testosterone, and this androgenic priming gives them an edge that helps them win again. As testosterone levels continue rising, self-confidence and risk taking segue into overconfidence and reckless behavior.

Coates argues that the winner effect is a plausible explanation for the chemical hit that traders receive, one that exaggerates a bull market and turns it into a bubble. And vice-versa: Coates discusses traders' susceptibility to "learned helplessness," a condition in which they completely lose faith in their ability to control their own fates. When intensity is replaced by resignation, withdrawal, and depression, chances are the individual has succumbed to learned helplessness. Painful failure leads to a rise in the levels of cortisol, the stress hormone that lowers the appetite for risk across the entire spectrum of decisions.

Researchers have identified three types of situations that signal a threat and elicit a massive physiological stress response — those characterized by novelty, uncertainty, or uncontrollability. Coates explores how traders can train their physiology in order to increase their mental and physical stamina, toughening themselves against the fatigue, anxiety, and psychiatric disorders that follow from chronic stress.

Sports scientists have made remarkable breakthroughs in designing such toughening regimes. They have found that the process of mental toughening bears similarities to that of physical toughening. One of the first discoveries was that when subjects were exposed to chronic (or unrelenting) stress, they began to suffer both physical illness and learned helplessness. However, exposure to acute (or short-lived) stress, even if repeated over and over, produced a tougher physiology and an increased immunity to the damaging effects of further stressors.

Sports scientists know that to build lean-muscle mass and expand aerobic capacity, athletes must endure a training process that shocks their muscles and taxes their cardiovascular systems, to the point of inflicting mild damage on tissues, punctuated with periods of rest and recovery (see also Nicholas Taleb's book, 'AntiFragile'). Alternating sequences of stress and recovery — when calibrated to exhaust (just barely) an athlete's resources and then replenish them — can expand the productive capacity of a broad range of cells in the athlete's body. Scientists studying mental toughening have found that a similar process of challenge and psychological loading, followed by recovery, can tune the brain and nervous system such that the subject can approach stressors with resilience and an optimal mix of hormones and nervous system activation.

Having described the basic problem, Coates proceeds to suggest potential solutions, contending that, for example, investment organizations can defuse the explosive mix of hormones and risk taking by promoting biological diversity — specifically, by hiring more women and older men. Men's testosterone levels rise until their mid-20s and then go into a slow decline that accelerates after the age of 50. At the same time, the levels of cortisol (the stress hormone) drift upward. As men age, they become less susceptible to the testosterone feedback loops that can cause normal risk taking to morph into risky behavior. If there's a weakness in the book, it's probably here in this Part. Anyone that recognizes the importance of conflict and contradiction will quickly spot a number of opportunities Coates appears blind to. But, hey, that's ultimately a minor gripe. This is a book that lives the truth of the statement, 'defining the right problem is half the solution'. And being halfway towards being able to solve this toughest of human psychology problems can be no bad thing.

Wow In Music – Can't Get You Out Of My Head

A long time ago now, we talked about the concept of 'paradessence' (Issue 41, August 2005). Paradessence is one of the invisible attributes that attracts us to the things we sense around us. It's all about inherent contradictions, and therefore 'wow'. Ice-cream's paradessence, by way of an iconic example, is its simultaneous child-like innocence and very-adult sensuality. The paradessence of Kylie Minogue's signature tune Can't Get You Out of My Head is one of those rare moments in pop: sleek and chic and stylish and damnably danceable, but with a darker element hidden in plain sight.

There's nothing second-hand about it: the restraint Kylie exercises in the vocal serves the music and the sentiment of the lyric well. As Guardian critic Dorian Lynskey suggested, it feels like the single-minded pull and sway of Kylie's obsession – "I can't get you out of my head/La la la/La la la la la", she repeats over and over – goes beyond simple lust. It could well be aimed at the forbidden fruit; a one-night stand, a cheat – real or imagined – on her full-time lover.

Despite the simplicity of its lyric, the darkness contained within the locked grooves and velveteen robo-disco of Can't Get You Out of My Head is very far removed from the upbeat bounce of Kylie's late 80s and 90s output, when she was mainly known for the pop fluff of songs like her 1988 debut single The Loco-Motion. A meta-paradessence maybe?

On early Stock, Aitken and Waterman forays such as I Should Be So Lucky, Kylie famously plays the wide-eyed ingénue with alacrity. There's no such optimistic looking to the future here: she knows this obsession she has with her mystery lover is unhealthy, and that ultimately it could destroy her if she allows it. But she can't get it (you) out of her head. It's a desire that is wholly dependent on her own self-control. So she performs her dance of seduction, while subcutaneously giving off signals that emphasise her unavailability (giving off an aura of 'purity' while performing in a plunging neckline). (Paradessence number 3.)

Some academics have suggested that the measure of restraint and unavailability that Kylie exhibits in the retro-futuristic video to Can't Get You Out of My Head is indicative of a wider dance of control that hyper-sexualised white female pop stars perform in the public arena.

In a 2005 essay entitled Naughty Girls and Red Blooded Women (Representations of Female Heterosexuality in Music Video), academics Diane Railton and Paul Weston compare and contrast the videos to Beyoncé's 2003 single Baby Boy and Can't Get You Out of My Head. The first, the pair suggest, is representative of a certain "natural" black female sexuality that traces back its pattern of raced representation to colonial times: the black female body portrayed as "primitive, feral, uncontrolled and uncontrollable" – indicative of a (pop music) culture that often prefers to portray the black woman as sexual predator.

In marked contrast, Kylie's performance is seen as "pure, restrained and controlled" – an idealised trope for white female sexuality that also has its roots in Victorian and colonial discourse. Both women perform a dance of seduction through their videos (and songs), but where Beyoncé "represents a universal availability", Kylie's availability "is always provisional, restricted, and contingent".

Written by Cathy Dennis and Rob Davis, Can't Get You Out of My Head was originally intended for S Club 7 – whose manager Simon Fuller rejected it. (Sophie Ellis-Bextor also turned it down, perhaps surprisingly. It seems perfect for her brand of lustrous manufactured pop.) The song was then passed along to Kylie's A&R exec: supposedly, Kylie agreed to record it after hearing just 20 seconds of the demo.

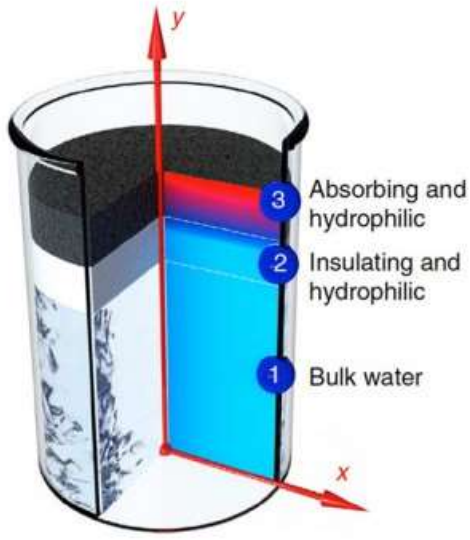
The single was immediately popular on its release in September 2001. It reached No 1 in around 40 countries, including Australia, and every European country, barring Finland – and has reportedly gone on to sell over 6m copies worldwide. It also denoted a cementing in the change in the marketing and public perception of Kylie, which began with the release of the sexually-charged video to Spinning Around in 2000: wherein she transformed from the homely girl-next-door, soap opera star Charlene – so loved by the Australian public – into a much more flirtatious, sophisticated persona.

Can't Get You Out of My Head predated the vast commercial and critical success of Daft Punk by several years. In many respects, it was one of the points where (as the BBC suggested) manufactured pop gained a new postmodern respectability. It marked a clear shift in attitude towards pop music among the "serious" rock critic fraternity: the idea that (manufactured, female) pop music might well be the equal of (organic, male) rock music after all, that each has their high points and their low. It didn't hurt that you could trace the (paradessence number 4) keyboard/drum ahead-behind the beat 'almost-syncopation' back to similar (male) critically-praised grooves from New Order and Kraftwerk: but this was as much about the refined, populist 70s disco of Rodgers and Edwards and Giorgio Moroder as anyone. And there's paradessence number five: suddenly it was okay for muso's to love a pop-princess. Kylie Rocks!

Investments – Solar Steam Generation

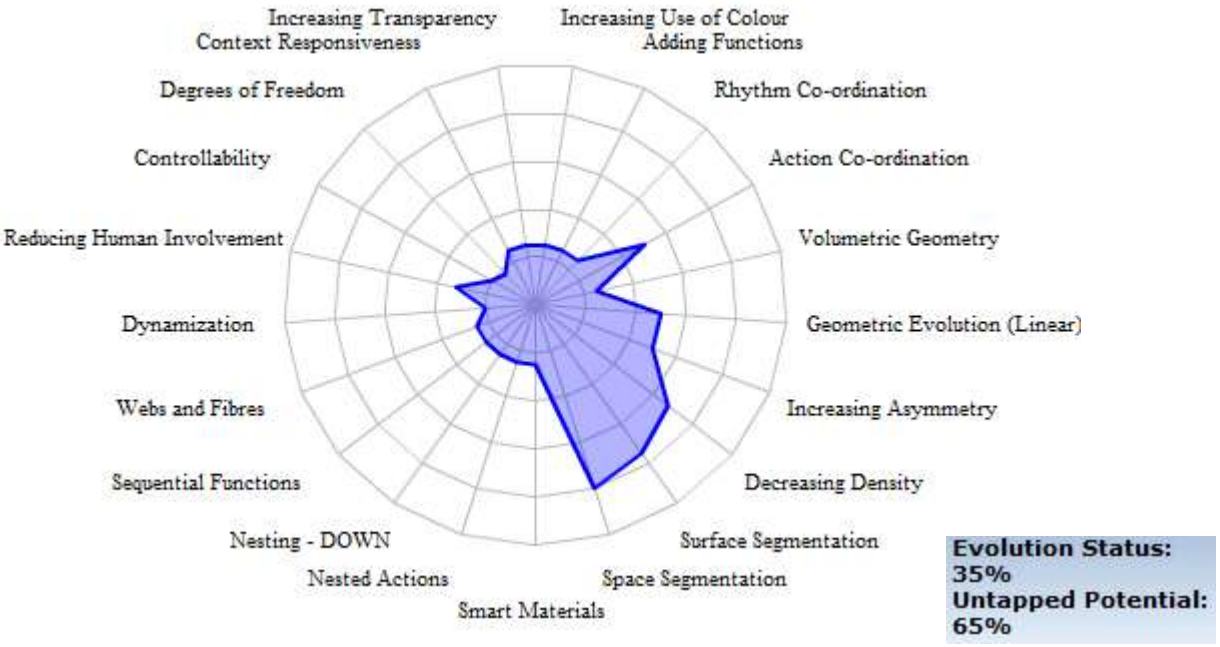
Bearing in mind we need to convert less than 0.1% of the sun's energy hitting the Earth in order to power the whole of humanity's needs, it feels inevitable that we should be looking to the sun for our long-term needs. There are a host of different energy conversion candidates making the rounds at the moment, above and beyond the PV solutions that have just about reached a critical mass in several parts of the world. While electrical energy is a really good way to direct the conversion, not all solar energy capture devices need to make electricity directly. For example, steam generated from solar energy be used for a whole range of industrial processes. Including, something that could be especially useful in remote regions, desalination, sanitation and equipment sterilization. Now a new technique looks to be the most efficient way yet created to use solar energy to generate steam.

A new material, developed by MIT mechanical engineer Hadi Ghasemi, consists of a thin double-layered disc. The bottom layer consists of spongy carbon foam that doubles up as a flotation device and a thermal insulator that prevents solar energy from dissipating into the fluid underneath. The top, active, layer consists of flakes of graphite that were exfoliated using a microwave. The microwave causes the graphite to bubble up "just like popcorn" according to Gang Chen, another researcher involved with the work.



As sun heats the graphite, it creates a pressure difference that pulls water up through the foam pores, like a sponge. When the water hits the graphite hot spot, it turns into steam. The scientists report that this inexpensive system reaches 85 percent efficiency in converting the solar energy into steam. The study was published in journal Nature Communications this month. [Hadi Ghasemi et al, Solar steam generation by heat localization: http://www.nature.com/ncomms/2014/140721/ncomms5449/full/ncomms5449.html]

The researchers hope to up the efficiency further with different materials or an improved design. According to us, there is lots of untapped potential:



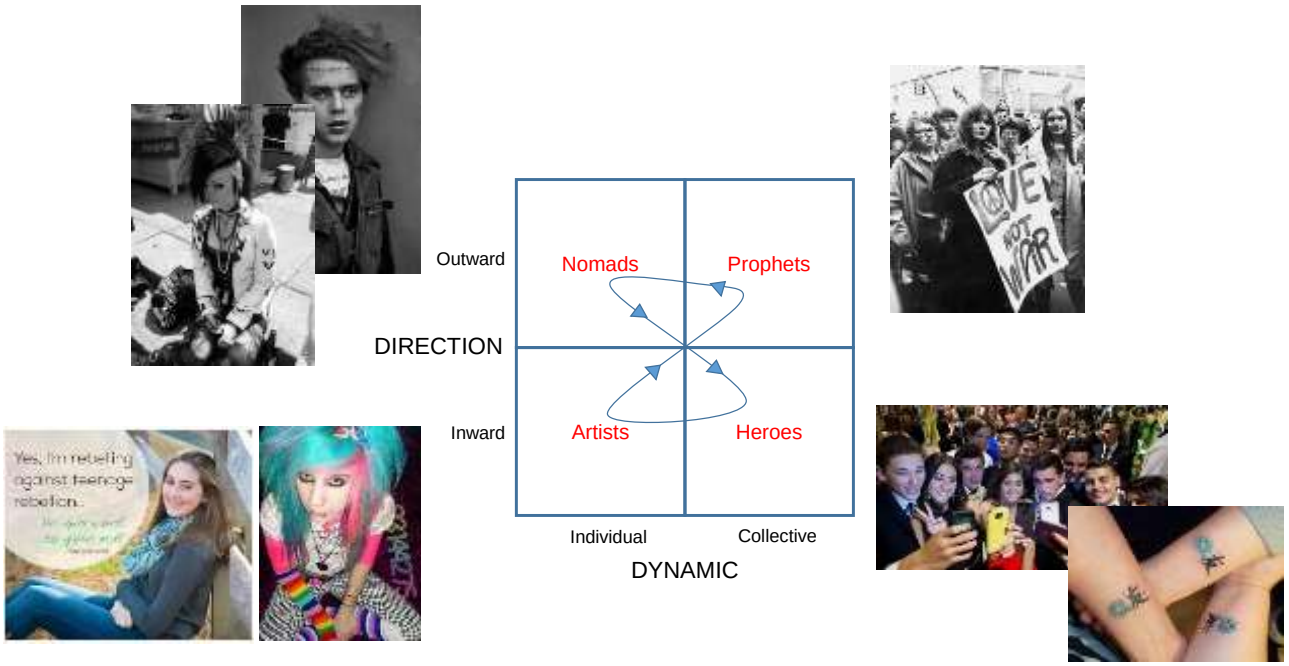
Generational Cycles – Teenage Rebellion

As any parent that has been through the experience of living with their teenage kids will attest, somehow the thirteenth candle on the birthday cake can often seem to trigger the arrival of a hormonally-challenged monster into the house. Bewildering and unpleasant as the experience might be, our teen years serve as a rite of passage for all of us as we make the transition from child to adult. The inevitable rebellion is all about breaking away from parental influence to become a 'free' and independent, functioning adult. While the rebellion might be thought of as a 'universal', if we look at the four different generational archetypes, we can observe some quite striking differences:

Archetype	Overall Parent Characteristic	Overall Teenager Characteristic	Typical Behaviours
Prophets	Sensitive	Indulged	Contempt for apparent weakness of parent, especially in relation to society and failure to make things better. Parents rapidly become 'irrelevant' as collective action takes hold. Prophet teens make placards and march.
Nomads	Narcissistic	Abandoned	How do you rebel against a parent that isn't listening? After attempts to shock by taking on some extreme appearances, the best way to have an effect is not going on protest marches, staying home and becoming a 'slacker'. Nomad 'freedom' is barely a teen transition at all – most Nomad kids were practically feral before the teen years arrived.
Heroes	Alienated	Protected	Out of all of the different parent-child combinations, the Heroes have the strongest with their parents, albeit more on a peer-to-peer bond of equals. How to rebel against your best friend? Especially when they think tattoos and piercings, and getting drunk all the time are okay a) why bother, b) by doing it on-line. With friends. Ultimately, 'freedom' for Hero teens is the freedom to stay at home and have mum and dad look after you forever. (Note: Nomad parents with Hero kids who are driving them mad right now: 'the unpleasantness is very temporary!')

Artists	Heroic	Suffocated	Having been isolated from anything that is potentially dangerous or 'over-exciting', when the Artist teen first escapes from the shackles, they tend to go nuts. Unlike the Heroes that came before them where parents in effect encouraged the rebellion, the poor old Artist rebellion is very swiftly squashed and deemed 'unacceptable'. Both by parents and society at large, mainly through the media. Artist rebellion is 'aborted rebellion' at least as far as its external visibility is concerned. Real Artist rebellion is going on inside their heads: 'one day…'

There's also an intriguing pattern of transitions between these four different archetypes that becomes apparent when we construct a simple 2x2 matrix with axes looking at the direction and dynamic of the rebellion that takes place:



Prophets and Nomad teens tend to be quite outwardly focused – their rebellion, in other words, becomes as much a rebellion against the societal order than it is about their parents. The Heroes and Artists, conversely, tend to direct their rebellion inwardly. The GenY (Hero) propensity, for example, to devote their teen years to posting 'selfie's to all their friends is an archetypal example of a collective action that is in reality quite narcissistic: 'look at me!'. For the Artists, the 'inward' focus is quite literally inward in that it tends to be quite cerebral in nature.

Looking at the dynamic dimension, Nomads and Artists tend towards individual action – they're the loners of the world! – while the Prophet and Hero teens are much more likely to rebel as a peer group. See, for example, the number of tribal-tattoos amongst the GenY Heroes.

And so goes the merry-go-round.

Biology – Owl Wing

Owls are known as silent predators of the night, capable of flying just inches from their prey without being detected. The quietness of their flight is owed to the anatomy of their wing feathers, which have a leading edge that reduces turbulence. Turbulence typically creates a “gushing” noise when released in large forces. But the leading edge of the owl’s feathers break up this large turbulence into smaller, micro-turbulences that reduce the amount of noise.

This leading edge is filled with different structures (hooks and bows) that create a stiff, serrated edge of various lengths. As air flows over and through a feather, these varied lengths and structures cause the air to be distributed into smaller vortices that disperse at different times into different directions (oscillations), breaking up an otherwise single, large air force. These smaller vortices oscillate at a higher frequency, creating a pitch that is above the hearing capabilities of most prey, as well as humans.

If not for the feather’s serrated edges, there would be only one, large air vortex formed at the trailing edge of the feather’s airflow. This large vortex would produce, in turn, a large force on the feather. That force would increase turbulence across the owl’s entire wingspan and, ultimately, produce more noise.

In addition to the serrated edges, the owl’s feathers are coated in a velvety upper surface and a soft, downy surface on the lower portion. The owl’s legs are also coated in this soft down. This layer of softer plumage is believed to absorb more of the micro-turbulences created from air flowing over the leading edge of the feathers. However, the exact mechanism of sound absorption by this down layer is still under preliminary study:

"Barn owl wings differ from those of other birds and aircraft... The distal wing of barn owls resembles a slightly cambered plate...over which the airflow normally tends to separate, especially at low-speed flight... Serrations at the leading edge prevent a separation and increase the lift by generating a turbulent boundary layer over the airfoil upper surface... The turbulent boundary layer delays leading- and trailing-edge flow separation to higher angles of attack...similarly as shown in experiments at higher Reynold’s numbers.

As mentioned above, previous researchers showed that serrations influence the noise generation only at steep angles of attack. One explanation might be that in cruise flight

conditions the stagnation point at the leading edge results in a relative low air flow through the serrations due to the low air stream velocity. At sharp angles of attack, however, serrations comb through the air like a plough through a field. By their bending and orientation, serrations induce tiny vortices running over the dorsal wing surface. This phenomenon increases the lift and reduces the noise of barn owl wings during flapping flight and striking, which is extremely useful for the owl."

"Serrated vanes separated the trailing vortex concentrating on the vane into some small-scale vortices. These small trailing vortexes crashed into the shell at different times, parts and directions, which could make the strong interference in continuous strikes of high frequency and low amplitude. As the speed in the direction of motion of dispersed trailing vortex was uncertain, the viscous dissipation effect was enhanced further in the course of the campaign, and the intensity of concentrated vortex was weakened. That made the alternating aerodynamic loads acting on vanes decrease, thus reducing the vortex noise".

"Serrated feathers on the front edges of owl wings funnel air smoothly over the wings, reducing the noise of rushing air. Each wing has a scarflike, fringed back edge that prevents the abrupt air-pressure changes--and noise--produced by rigid wings." (Courtesy of the Biomimicry Guild)

And if you think that's amazing, here's what happens when we map the owl's noise-reducing solution onto the Contradiction Matrix, the basic conflict being the one between noise and speed of flight:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Noise (29)

WORSENING PARAMETERS YOU HAVE SELECTED:

Speed (14)

SUGGESTED INVENTIVE PRINCIPLES:

3, 1, 14, 31, 39, 24, 4

Local Quality ('serrations', 'hooks and bows', 'velvety upper surface, and soft downy surface'), Segmentation (breaking large vortex into small vortices), Curvature (rotary motion – 'bending'), Calmed Atmospheres ('viscous dissipation'), Asymmetry ('various lengths')… it's almost like Owl's wrote the book.

Short Thort

"For Sale: baby shoes, never worn."
is a beautiful, extreme example of less-is-more in story-telling.
History tells us it was written by Ernest Hemingway.
Hemingway's purported authorship usually centers upon him doing so as the result of a wager between him and other writers: While lunching with friends at a restaurant, Hemingway bets the table ten dollars each that he can craft an entire story in six words. After the pot is assembled, Hemingway writes the six words on a napkin, passes it around the table, and collects his winnings.

Any story has to possess three things:
1) A context
2) A system ("two substances plus a field" minimum)
3) A contradiction

Achieving all three in six words is quite a feat.
The best six-word stories will make use of short-cut words.
Words that speak a thousand pictures.
First kisses.
Last suppers.
Party dresses.

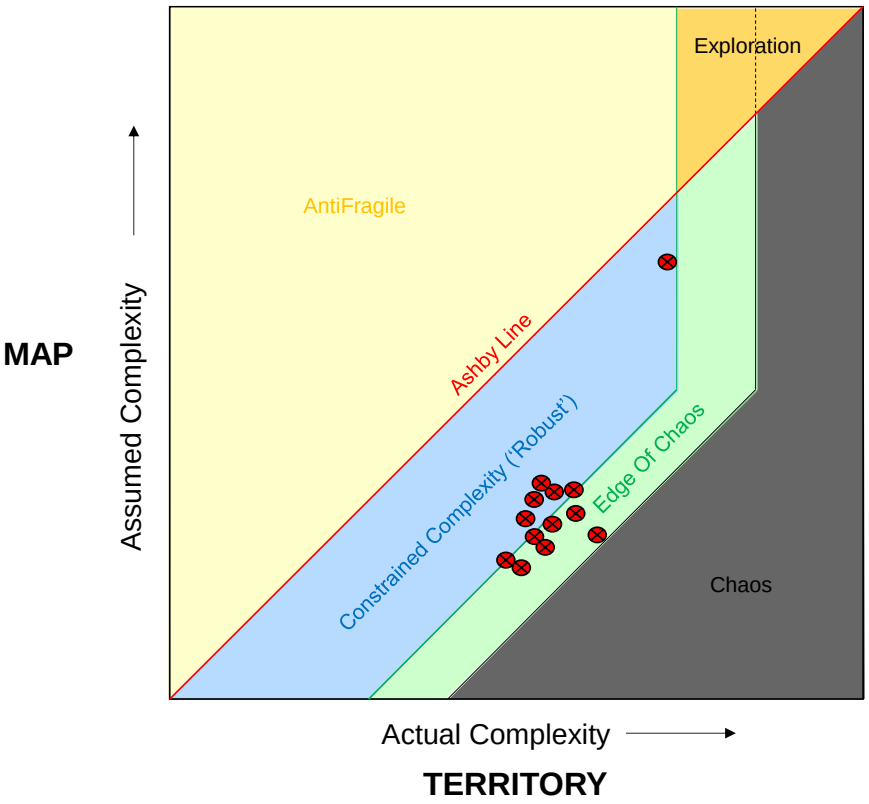
What if every innovation project had its six word story.
What might yours be?

News

Ambient Assisted Living Forum
Darrell will be presenting a keynote address at this year's AAL Forum event in September. The event takes place in Bucharest this year. More details: http://www.aalforum.eu/

Future Solutions in Australian Healthcare
The Energesse White Paper was officially launched at the Future of Medicare conference this month. Feedback has been good and we have had about 30% of the audience contact us for a copy. Anyone interested can download a copy here:
http://www.energesse.com/whitepaper/

Complexity Landscape
The latest addition to the PanSensic toolkit is an instrument to help organisations measure the perceived and actual levels of complexity in their business. The big idea is to then be able to help leadership teams to devise change strategies appropriate to the prevailing capabilities and needs. Anyone interested will find a link to the White Paper on the SI website. In the meantime, here's a sneak preview of the main display screen for the tool:



Hands-On Systematic Innovation
Anyone that was tempted to pay the £550 asking price for a copy of Hands-On Systematic Innovation as featured on Amazon, may be pleased to know that the new batch of re-prints of both the Technical and Business & Management editions are now back in stock. We now have a much more reliable (he said!) printer, so hopefully the 'out of stock' problem won't arise again. Apologies for any inconvenience caused.

New Projects
This month's new projects from around the Network:

- Transport – PanSensic-driven opportunity-finding project
- Financial Services – PanSensic Real-Voice-Of-Customer Study
- Financial Services – PanSensic Project
- Music – PanSensic problem-solving project
- Process – Invent-To-Order Projects
- Healthcare – 'Learned Helplessness' Analysis Study
- Energy – Due-diligence Project