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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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Function Hierarchies And The Rule Of Three

One of the most useful management texts of the last two decades has been 'The Rule Of Three' by Jagdish Sheth and Rajendra Sisodia. As with all of these kinds of heuristic-based books – in this case, 'every industry converges to three main players' – one of the jobs of our research team is to try and find exceptions to those heuristics. Because Sheth and Sisodia did such a good job, we still haven't found anything that really stacks up as what we might classify as an exception. We've seen places like Australia where there are lots of duopolies and thought we'd find exceptions (interestingly, several we thought were are now exhibiting signs that customers demand a third player), and we've also seen specialist B2B industry sectors where the absence of the required three players has prompted B2B customers to actively introduce second and third players in order to achieve the competitive bidding they deem to be vital to their overall competitiveness.

For those that don't know the book, the main idea is that there are two basic ways for an organization to earn a decent return on their invested assets: a) be a small market share, niche-playing market or product specialist, or, b) be one of three large, full-line generalists. Anywhere between these two extremes, enterprises find it difficult to generate sufficient profits and as such find themselves in what Sheth and Sisodia called 'the ditch'. Figure 1 attempts to summarise the basic Rule Of Three model:

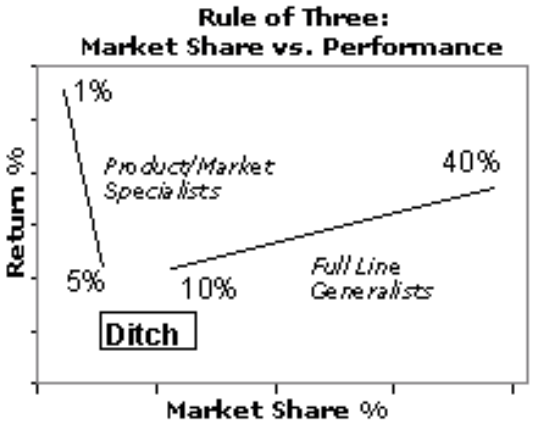


Figure 1: 'The Rule Of Three' Specialist Versus Generalist

A few weeks ago, I was running a strategic session with a group of executives in a large global conglomerate operation. Several of the leaders in the room, when prompted to think about how the Rule Of Three might come to affect their future business, mused that, when they looked at the industry they were in, nearly all of the traditionally big players were finding themselves slipping further and further down the slope and in to the ditch.

Was this merely a sign of a depressed economy, several of the executives asked, or evidence that they'd found a serious exception to the Rule?

Sure enough, in bad economic times, it becomes increasingly difficult for *any* player to earn the margins they'd managed to achieve during buoyant economic times. Typically what happens in such recessionary times is that the third biggest player is the one most likely to slip in to the ditch, but – per our discussion in January about the relative innovation strategies of the big three players – being the most innovative of the big three, they're generally able to innovate themselves out of the ditch eventually to maintain the Rule.

That said, there seemed to be something else happening in the markets being discussed by the executives. When the Big Three has evolved from being national to continental to global and still the three big players find themselves in the ditch, something else must be happening.

The answer to the conundrum appeared when we started to combine The Rule Of Three with some of the heuristics emerging from the world of TRIZ. First up the idea that, as systems migrate closer and closer to their Ideal Final Result, sub-systems disappear and the functions they deliver migrate to a higher level in the function hierarchy.

Windshield wipers are a sub-system of a bigger system called ‘windshield’. The function of the wipers is to keep the windshield clear of obstructions. The moment the windshield is able to perform this function ‘by itself’, the need for the wiper sub-system disappears. The windshield is higher up the function hierarchy, and therefore gets to eventually displace everything below it. Wipers will, in other words, never replace windshields, but windshields will definitely one day become self-cleaning. In the same way the windshield itself will disappear once its function is able to be delivered by another system higher up the hierarchy called automobile.

Arranging knowledge by function has long been a central finding of all of the TRIZ research. The functions that we wish to achieve as humans remain very stable over time, therefore, the theory goes, if you want to build a stable model of how the future will evolve, it is a really useful idea to understand the hierarchy of functions in, around and above the functions that the system you are responsible for resides.

Figure 2 illustrates a typical function hierarchy model. Actually its one for a many-layered hierarchy, at the top of which sits a building within the built environment. Architects have some of the most difficult design challenges of any profession because they are responsible for so many interacting layers. A house needs walls, walls need coatings, coatings need means of applying the coating, and so on – Figure 2:

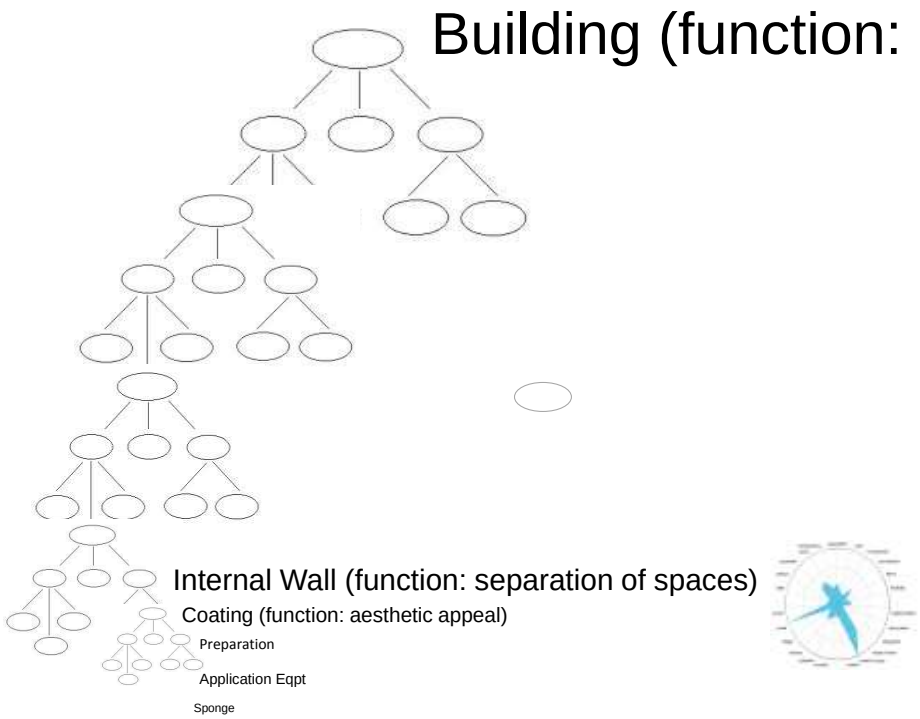


Figure 2: Partial Function Hierarchy For A Building

Each layer in the hierarchy and each sub-system or component within each layer may then be thought of in terms of an Evolution Potential radar plot: the Rule of Three players in each part of the hierarchy are expected to be evolving their solutions to exploit the untapped potential.

The problem for a player towards the bottom of the hierarchy is that as the players higher up evolve their solutions, their untapped potential increasingly begins to take on the functions that your system is there to deliver.

A coating manufacturer earns their way in life because they deliver an aesthetic function to the walls on which they're applied. The world wants there to be three coatings manufacturers in order to create competition.

A wall manufacturer earns their way in life because the deliver (amongst others) a space separation function within the structural walls inside which they are placed. The world wants there to be three wall manufacturers in order to create competition.

In order to remain competitive, the wall manufacturers need to evolve the solutions they deliver to customers such that they deliver more benefits, less cost and less harm. When it comes to delivering more benefit, if one manufacturer can create a wall with built-in aesthetic properties then they gain an advantage over the other manufacturers. And, more importantly in our context here, they get to sell their walls for a higher price because by taking the aesthetic function on themselves, they are able to draw on the value that the coating people previously delivered.

In this way, when all of the coating players find themselves sinking in to the ditch, it is because other – higher in the hierarchy – players are evolving their own solutions and looking to 'steal' the value from the coatings people. The Rule Of Three is still relevant, but it now applies only to the players that are in the process of 'stealing' the value delivered by the coating. Which may be the wall producers, but may also be anyone else that decides they are in a position to deliver the aesthetic function of the coating. Like for example the players producing the illumination.

This is an important connection to make. Any coating manufacturer worth their salt knows that the wall manufacturer is a potential threat to future business. Few, however, would necessarily make the connection to companies making LEDs. Those that fail to make the right connections are the ones that don't understand the importance of constructing hierarchy models based on Function.

Then, as Function inexorably rises up the hierarchy, so too will the Rule Of Three.

Case Studies: The Real Reasons People Buy Candles

Paul Howarth, Darrell Mann

Here is another case study in our irregular series looking at the realities associated with the J.P. Morgan quote, ‘people do things for two reasons: a good reason and a real reason.’ Our focus is on a recent project looking at the candle market. Our start point was an attempt to try and understand an apparent discrepancy: why do some mass-produced, big brand, candles sell for a significantly higher price than others?

By way of example, one of the three candle brands illustrated in Figure 1 typically retails for about double the price of the other two. It is also rarely if ever seen on ‘special offer’, whereas the other two often find themselves in a series of margin-stripping two-for-one or bulk purchase heavy discounting arms races.

Figure 1: Spot The Expensive Candle

When it comes to trying to understand why three products, each with ostensibly the same tangible performance as one another, should have such different sales characteristics, we increasingly revert to using our Pansensic ‘science of intangibles’ capability. The purpose of these tools, especially as presented in this kind of published article, is not necessarily to provide the definitive insight for marketing candles, but rather to provide some initial clues and insights into potential solution directions.

Most organizations understand the importance of soliciting feedback and listening to the ‘voice of the customer’, unfortunately very few know how to get to the unspoken nuances. Partly because they use methods and techniques that aren’t adequate for the job at hand, but also, often more seriously, because when we are trying to elicit ‘real reason’ information from people it is often unpleasant, difficult, insulting, or just plain embarrassing to talk about. The internet, meanwhile, has lead to an explosion of valuable online customer comments which, although there are still inevitable biases, at least the interviewer-bias part has been removed. Pansensics is about scraping, analysing and making sense of these data sources, recognizing that it is still necessary to ‘read between the lines’ in terms of extracting the unspoken truths coming from our limbic brains rather than the bias that emerges from the rationalizing pre-frontal cortex.

The approach involves finding and scraping customer narrative from internet forums and blogs, which represent real customer experiences, opinions, views, likes, dislikes and emotions. We can then compare the analysis of customer narrative with the analysis of the website and other promotional materials of the organizations providing products designed to serve those customers. Any differences between these two sets of input then represent

opportunities to improve communications. Or, more specifically in this case, to hopefully help us to understand the answer to our candle pricing conundrum.

For this case study we scraped a multitude of online resources:

For consumers and candle aficionados:

http://uscandle.co.wordpress.com
http://makeroomforcupcakeblogspot.co.uk
http://theinteriorsaddict.com
https://www.experienceproject.com/groups/lovecandles/8759/Forum

For the providers:

www.airwick.co.uk
www.glade.com
http://yankeecandle.com

For the three companies, we also transcribed TV advertisement scripts in order to add that input to the scrape.

When scraping these kinds of online or scripted sources, Pansensics is designed to identify and then map the intangible disconnect between the customer and the communication material. It does so by comparing the narrative using various combinations of a variety of sensor tools, some of which have now benefited from over 12 years of validation:

1. Psychological/psychosocial profiling tools, designed to access the pre-rational, real reason people do things.
    a. Mental gears — Identifies the (Gravesian) mindset of the cohort
    b. Jupiter µ — Connects to the deep, root metaphors people use
    c. Archetype journey — Identifies the archetypal traits based on life's
    d. Champion business — Identifies the vital companions of life and

2. Sentiment analysis
    a. Emotional range — Picks out the extremes of emotional content
    b. Emotional state — Identifies the emotional state of the narrative

3. Systems opportunity tools
    a. Opportunity meet customer needs — Identifies opportunities to improve innovate and
    b. Universal Ontology — A 72 point systems model for complex system problem solving

What follows are the results from the most significant of the analyses we conducted:

A) Mental Gears

Any readers familiar with any of our TrenDNA work will know that the thinking style patterns uncovered by psychologist Clare Graves forms a central element of the 'DNA' of market trends and consumer behaviour drivers. Consequently it was one of the first scraping tools we built.

Figure 2 illustrates the results of the main comparisons gleaned through the data scrape: which Mental Gears is company literature connecting to versus the Mental Gear levels of

consumers. The profile at the top of the figure provides the profile of consumers, while the profiles at the bottom show the results from the company literature analysis. In simple terms, what the figure tells us is that consumers are strongly in the 'Order' mode of thinking when candles are the topic of conversation. Both the Yankee and Glade communications seem to do a pretty good job of matching their messaging to this mindset. Airwick communications, on the other hand, offer a narrative that is much more in tune with the 'Scientific' mode of thinking – i.e. very likely the mindset of the Marketing team that constructed the copy.

If we were going to try and make a judgement as to which of the three candle manufacturers was selling at the high price, based on this analysis alone, we would very likely conclude that it was not AirWick.

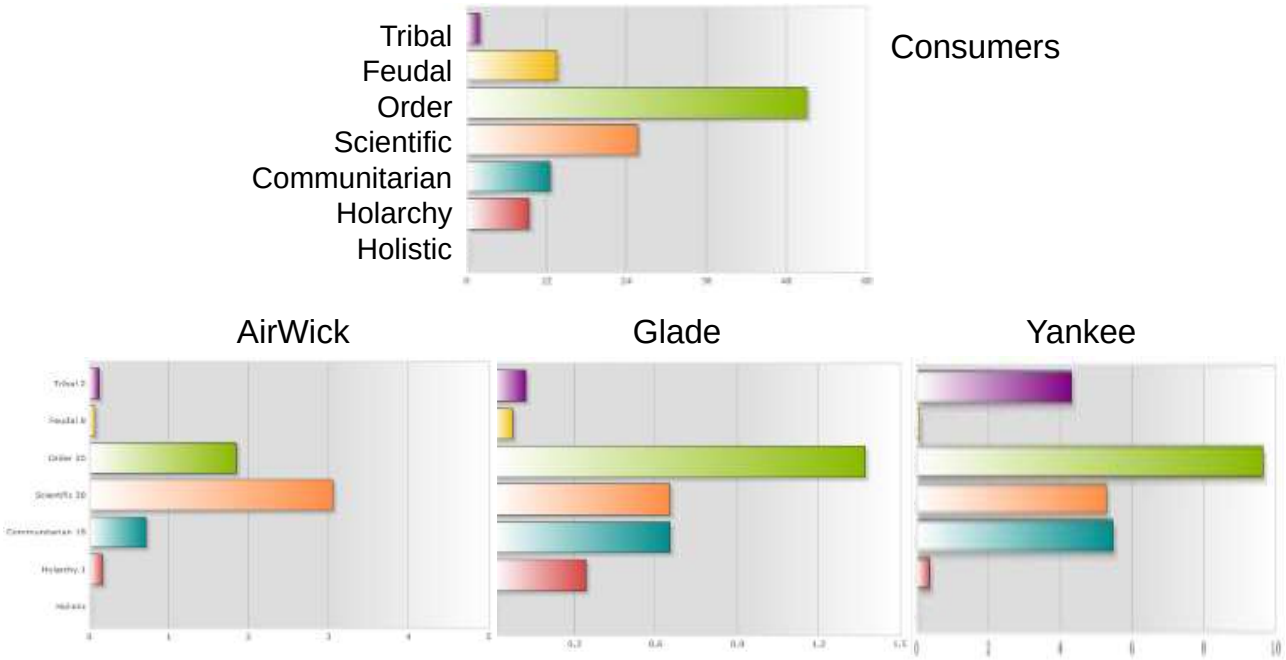


Figure 2: Mental Gear Comparison: Company Literature Versus Consumers

For the other two companies, the advantage is less clear. Glade do a better job of connecting to the Holarchy mindset. Neither particularly pick up on the Feudal consumer, but then again, this is an often very difficult group to sell to given their strong desire to not be told what to do. The consistent best way to get a Feudal person (think small child in their 'terrible-twos' period) is to get them out of the Feudal mode and into their earlier Tribal mode. In which case, Yankee would appear to be right on the money.

B) Jupiter μ

Figure 3 shows a comparison between AirWick and consumers using the root-metaphor analysis method first described in Reference 1. It too seems to confirm that there is a poor degree of alignment between the metaphors consumers are using and the ones that the AirWick Marketing team are using. If we read the root metaphors at face value, Airwick seems to be tapping in to the transformation metaphor – e.g. from their advertising copy, 'these candles take your home to a more luxurious place' – whereas it is almost completely absent from what the candle bloggers are saying. Candle bloggers, on the evidence of the scraped sources at least, are focused on the 'union' and 'inside' metaphors. Which might best be interpreted to mean that candles are objects that are all about connections, togetherness and 'being a part of the tribe'. Airwick seems to capture

the ‘inside’ aspect of the story (‘designed to infuse your whole room’), but does less well on the dominant ‘Union’ theme.

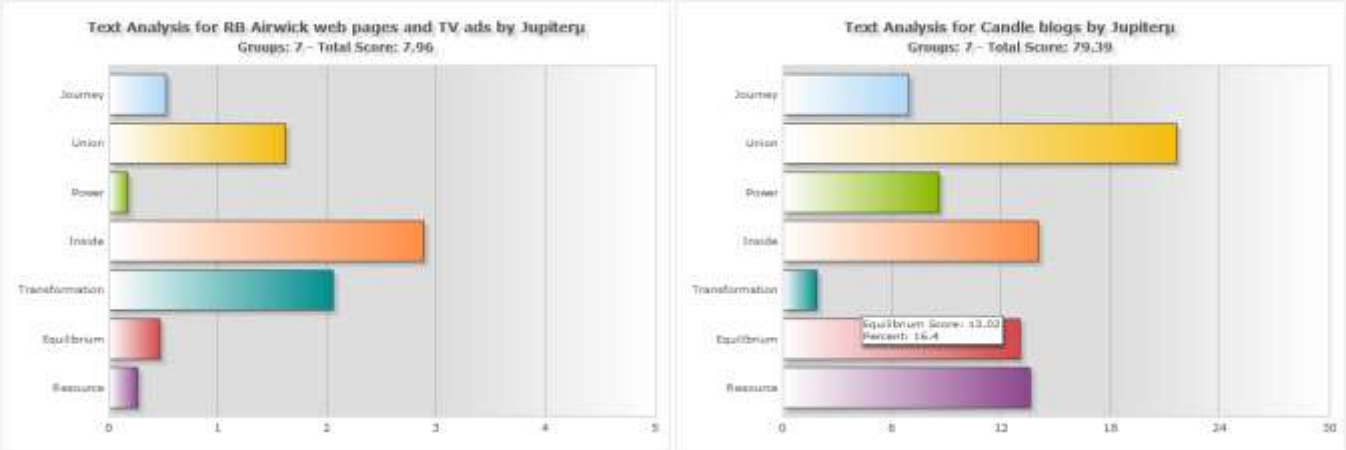


Figure 3: JupiterMu Analysis: Airwick Versus Consumers

Figure 4 illustrates the equivalent JupiterMu scrape for the Glade and Yankee literature. If we had to choose who the high selling price candle maker was based on this new piece of evidence, the odds are very definitely swung in the favour of Yankee.

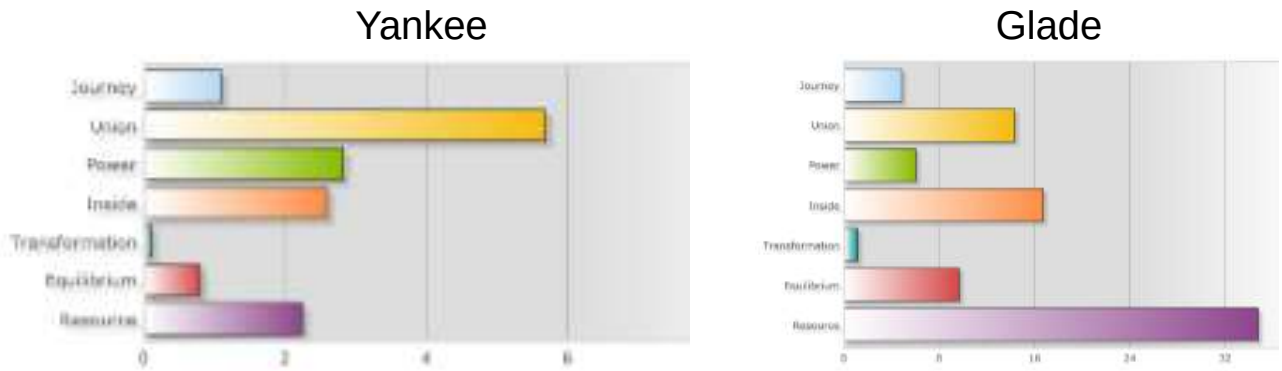


Figure 4: JupiterMu Analysis: Yankee And Glade

C) Archetypes

One of our more recent additions to the canon of scraping tools, the Archetypes tool is based first and foremost on the work of Allan Hunter and his study or archetypes in literature and the lessons literature seeks to teach us about emotional maturity (Reference 2). Figure 5 plots the results of the various different scrapes:

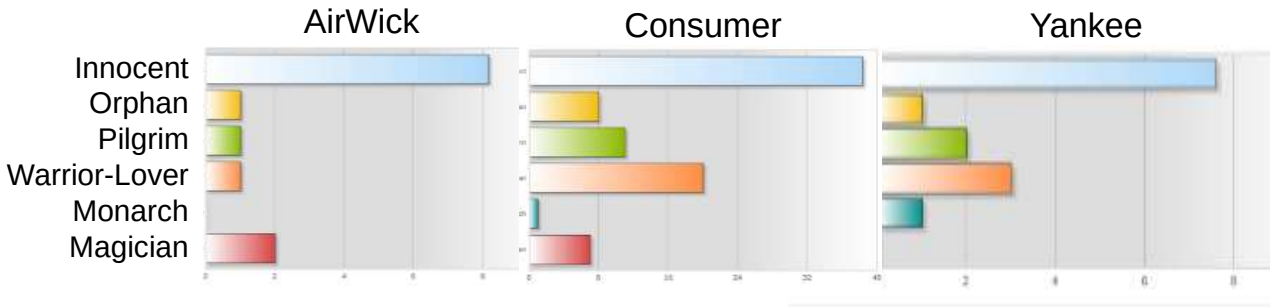


Figure 5: Archetypes Analysis: AirWick Versus Consumer Versus Yankee
(insufficient information to plot Glade scores)

Again, Yankee seems to achieve the best match between the messages they put out and what consumers are saying, matching both of the top two archetypes that consumers connect to. Both Yankee and AirWick pick up on the high level of ‘Innocence’ that consumers experience when talking about candles. Candles in this innocence sense connect us to our primal, innocent past, homely, comforting, security and warmth. The second highest consumer archetype connection to candles is the ‘Warrior-Lover’ archetype. The most likely connection here being the romantic, joining symbolism that is often attached to candles.

D) Emotional State

This scraping tool is one of the most recent, and also one of the conceptually simplest of the tools. It basically looks for the types of emotional language that people use when they are talking about a given subject. Figure 6 illustrates what is hopefully a self-evident analysis of what emotions candle bloggers are expressing when they write about their candles:

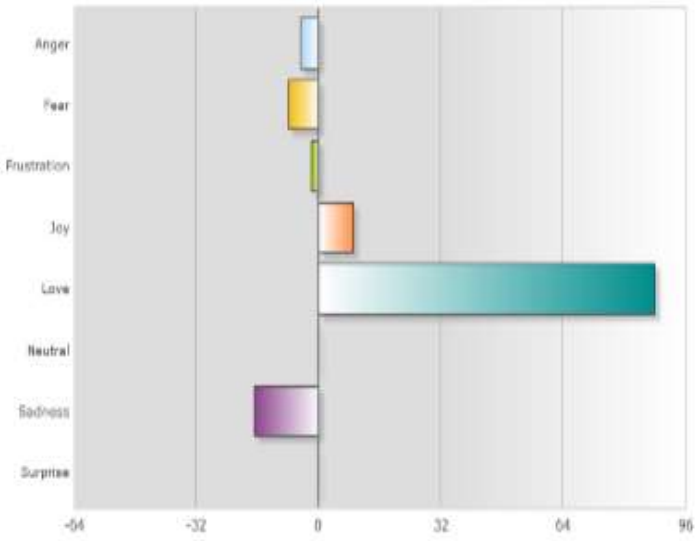


Figure 6: Candle Blogger Emotional States

And in Figure 7, what the candle providers are saying:

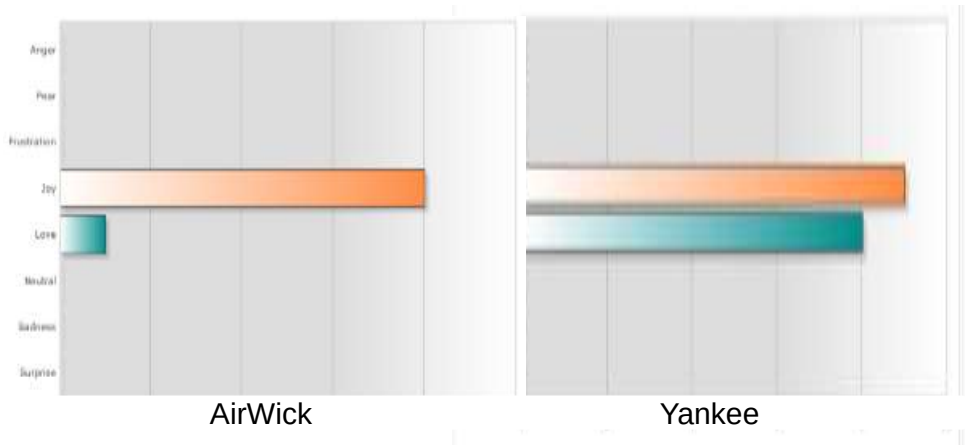


Figure 7: Archetypes Analysis: AirWick Versus Consumer Versus Yankee
(insufficient information to plot Glade scores)

By a big margin, the main emotion being expressed by candle bloggers is ‘Love’. This emotion is largely absent in the AirWick promotional material, largely being substituted by a message largely connected to ‘Joy’. Currently Airwick attribute 90% of the positive

emotional connection to Joy but only 10% to Love. For candle bloggers it is the exact inverse 10% Joy 90% Love. The two emotions are, of course, closely connected to one another. Close but not the same. Yankee seem to understand both the difference and the need to connect better to the 'Love' emotion. Here's their tag-line:

YANKEE CANDLE
the world's best loved candle

The red-lettering and hand written font is theirs.

Conclusions

Both Airwick and Glade's communication material focuses on the tangible benefits candles bring to the home, refreshing, changing, creating, renewing, and the joy of relaxing, soothing, luxury, through the sense of smell. Whilst these are undoubtedly "good reasons" to buy candles they are not the real reason people buy them. Neither company, according to the PanSensic analysis reported here, have really understood those 'reading between the lines' real reasons. Yankee, on the other hand, either by luck or judgment have achieved a far better match between what can be read between their lines and what consumers have said between theirs.

Perhaps not surprisingly, to answer the pricing question posed at the start of the article, Yankee is the candle that manages to command a price two times that of the other two products investigated during this brief study.

While it is difficult to suggest that the whole reason for their success is the fact that they seem to connect better to the 'real' reasons consumers connect to candles, we feel that the clues provided by this brief study are in some way significant. Love and romance can be a delicate personal subject, especially for the coy British. The key to communication materials is connecting to and subtly evoking the emotion of love.

It is not entirely clear that either Glade or Airwick could suddenly start shifting their messaging to better connect to the 'love' and 'union' themes that have emerged as the two strongest drivers of consumer behavior. Partly because it may be perceived that Yankee already 'own' the territory, but also very likely that either organization will be perceived as inauthentic: big organizations and 'love' tend not to make for an immediate correlation in the minds of many consumers. But then again that doesn't or shouldn't stop them from incorporating images that do a better job of suggesting love and union:

Figure 8: 'Love' And 'Union' Relevant Candle Images?

References

1) Mann, D.L., Howarth, P., 'Jupiter$^{\mu}$: Closing The Say/Do Gap', White Paper Series, www.systematic-innovaiton.com
2) Hunter, A.G., 'Stories We Need to Know: Reading Your Life Path in Literature', Findhorn Press, 2008.

Not So Funny Inventive Principles – 16, Slightly Less, Slightly More

TRIZ Inventive Principle 16 tells users, '*If 100 percent of an objective is hard to achieve using a given solution method then, by using 'slightly less' or 'slightly more' of the same method, the problem may be considerably easier to solve*.' Another interpretation of that basic instruction might be read as, 'being close but not quite there can open up some interesting possibilities'.

Gary Larson had the right basic idea in one of my all-time favourite of his cartoons, Life On Cloud Eight:

McDonald's perhaps had a similar understanding of Principle 16 when they put up this sign:

Quite a few potential synergies to be had there. Particularly if the price of beef continues to rise. Although, another chain might just have found the solution to that problem:

Vegetarianism anyone?

Maybe a trip to this place?

Anything to beat those pesky Beatles. Eight days, huh? Pah.
Not sure this one works quite as well as an advertising slogan, although it certainly seems to fit some kind of interpretation of Principle 16 again:

If I ever had kids, I now know exactly where I'd be looking to send them. Especially if I was thinking that knowing Swedish would one day be an important skill. Or something like that.

Finally, I'm not sure this isn't closer to Principle 13 than 16. But then again even if it is, it hopefully sends an important message that slight changes can create a wholly other-way-around outcome:

The fact that I like this one so much, probably explains why, in reality, I should stick to TRIZ and never have kids.

Patent of the Month – Material Property Identification System

Our patent of the month this month takes us on a rare journey to both Iowa and the world of inventions concerning better ways to measure things. The University of Iowa is the place in question, with US8,442,780 being granted to a pair of inventors at the institution on May 14.

Here's what the invention disclosure reveals about the measurement problem solved by the invention:

Elastic properties of materials used in many fields are often critical to the design, operation, or safety of the materials. In the field of manufacturing, the elastic properties of manufactured materials and their components often must meet defined specifications which are essential to the utility and safety of the manufactured products. In the medical field, elastic properties of biological tissues are important for tissue function. In the field of construction, the elastic properties of construction materials including foundation soils are important to the design criteria and safety considerations for engineered structures, roads, dams, excavations, and earthworks. In all these fields, it is useful and often essential to have an efficient, reliable means to obtain elastic properties of the materials in question. For medical applications, it is often desirable that the method be non-destructive and be based on in vivo diagnostic data.

Current techniques used to measure the properties of material sheets suffer from two deficiencies. First, currently measurement techniques are usually invasive and destructive and therefore not ideal for in vivo measurements. Second, existing techniques only measure overall (average) properties over the material specimen, thus failing to account for the heterogeneous distribution of properties.

Here's how we might best map those two core conflicts on to the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Ability to Detect/Measure (49)

WORSENING PARAMETERS YOU HAVE SELECTED:

Safety/Vulnerability (38)

SUGGESTED INVENTIVE PRINCIPLES:

24, 2, 10, 26, 9, 12, 13

And here's how the inventors solved the problem:

The present invention proposes a pointwise identification method that permits a pointwise characterization of the heterogeneous properties in nonlinear membranes. The key difference compared to the usual optimization methods lies in membrane stress analysis--the membrane inverse elastostatic method--which enables stress prediction without invoking the material property in question. Consistent with the usual experimental practice, material parameters are characterized directly from pointwise stress-strain data, in contrast to an indirect estimation from, for example, displacement response.

Which, if that all sounds like a bit of a mouthful, is a pretty good illustration of Inventive Principle 9, Prior Counteraction, in action. Or, put another way, is all about solving difficult measurement problems by doing some difficult mathematical modelling starting with first principles: make the maths do the work rather than building a progressively more sophisticated and therefore expensive physical measurement means.

For those that might be mathematically minded, the invention disclosure is something of an algebraic wonderland. For a slightly more benign version of the mathematics, you might be better advised taking a look at lead inventor, Professor Jia Lu's website:

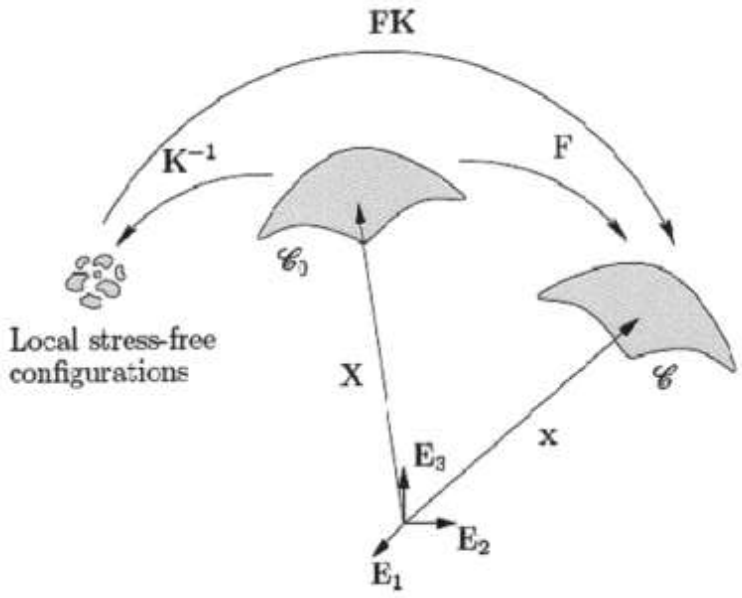
http://www.engineering.uiowa.edu/~jialu/html/research.html#isogeometric

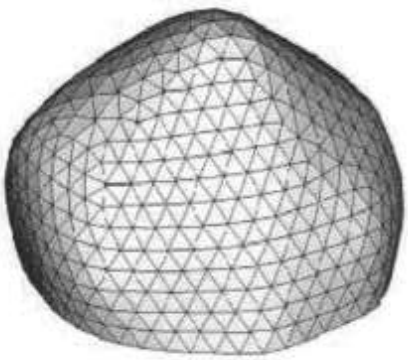
Finally, if you're still shrugging your shoulders a little bit, confused at why this whole thing might be even vaguely interesting, here's the invention's main focus:

Cerebral aneurysms are focal dilatations of the intracranial arterial wall that usually develop in or near the circle of Willis or cerebral arterial circle. Non-complicated cerebral aneurysms are typically thin-walled. Knowledge of aneurysm wall property is fundamental to understanding rupture risk. Their diameters range from a few to a few tens of millimeters while the wall thicknesses range from tens to hundreds of micrometers. In their service environment, these lesions are best described as elastic membranes subjected to transmural pressure and hemodynamic shear stress. While the long term growth and remodeling are likely modulated by the lumen shear stress, the sudden bleed or rupture is believed to be caused by the pressure induced wall stress. Rupture likely occurs at the spot where the wall stress exceeds the wall strength. Historically, the size has been used as an indicator for evaluating rupture risk; recently it is believed that shape may provide a more reliable prediction.

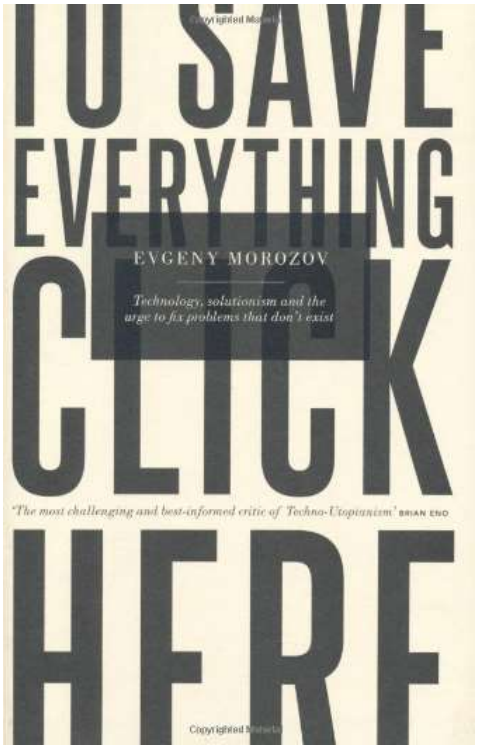
Our bigger hope is that the method has a number of other opportunities for exploitation – anywhere, in fact, where there is a concern about failure prediction in thin-walled structures.

The big idea: mathematical models beat physical systems when it comes to making best use of available resources. Principle 9 rules okay.





Best of the Month – To Save Everything, Click Here



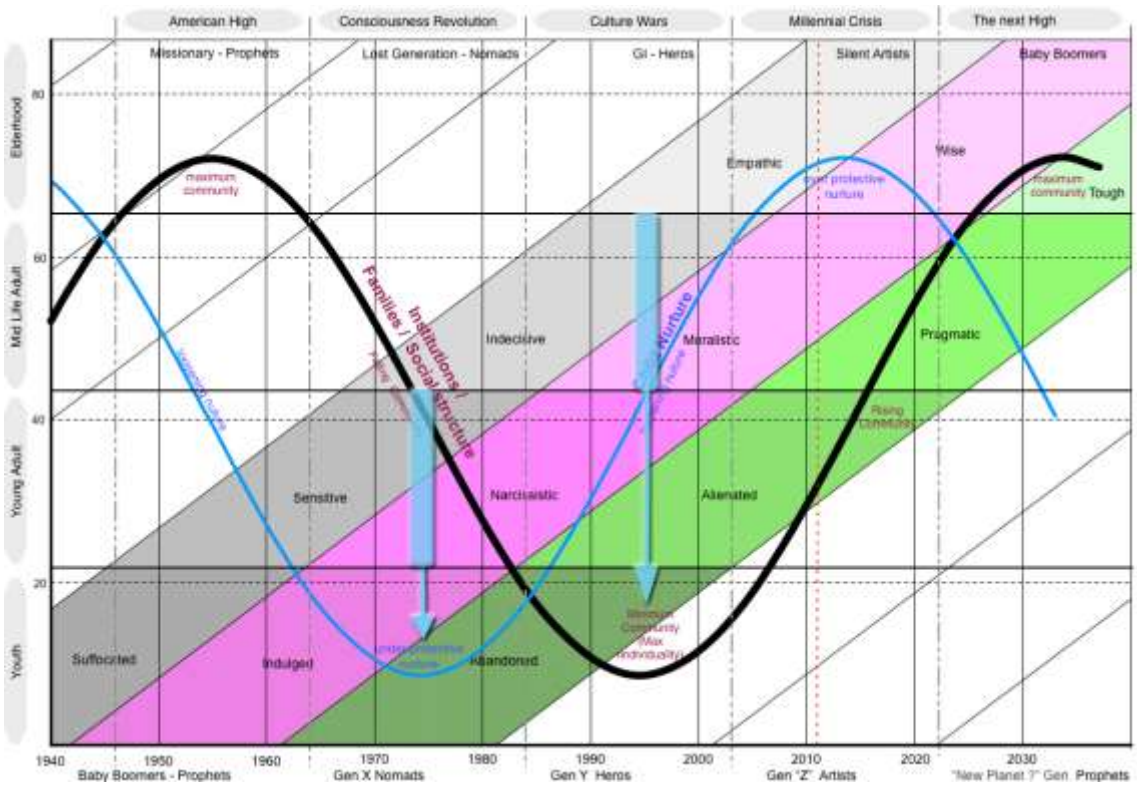
"It's not only that many problems are not suited to the quick-and-easy solutionist tool kit. It'd also that what many solutionists presume to be 'problems' in need of solving are not problems at all; a deeper investigation into the very nature of these 'problems' would reveal that the inefficiency, ambiguity, and opacity -- whether in politics or everyday life -- that the newly empowered geeks and solutionists are rallying against are not in any sense problematic. Quite the opposite: these vices are often virtues in disguise. That, thanks to innovative technologies, the modern-day solutionist has an easy way to eliminate them does not make them any less virtuous."

So says author Evgeny Morozov in what I suspect will be this year's call for techno-sanity (see Jaron Lanier for last year's anti-'progress' manifesto), in our easy choice for Best of the Month this month. If there's the faint whiff of a societal shift away from the increasingly nanny-ish, over-protecting, over-bearing, under-smart West – we should be expecting one any time soon (see figure over page) – then let's all pray 'To Save Everything, Click Here' gets to be remembered as one of the signal moments in triggering the shift.

At over 430 pages, this gets to be a pretty long call to sanity. That said, the pages seem to fly by, and there's always a cool, insightful bit just around the corner wherever you are. Morozov is a true star when it comes to the pithy identification of a trend or pattern of behaviour. Also comes a fearless ability to challenge a lot of things that have become taken for granted:

Hence, Newsflash: the internet doesn't exist. If you think there is just one thing called "the Internet" with a single logic and set of values – rather than a variety of different networked technologies, each with its own character and challenges – and that the rest of the world must be reshaped around it, then you are an "Internet-centrist". If you think the messiness

and inefficiency of political and cultural life are problems that should be fixed using technology, then you are a "solutionist". And if you think that the age of Twitter and online videos of sneezing cats is so unlike anything that has gone before that we must tear up the rule-book of civilisation, then you are an "epochalist". Such coinages are one of the drive-by amusements of reading Morozov, who, since his first book, *The Net Delusion*, has become one of our most penetrating and brilliantly sardonic critics of techno-utopianism.



Among Morozov's targets this time around are Amazon chief Jeff Bezos, with his "populist rage against institutions" (except his own); LinkedIn supremo Reid Hoffman, who has perpetrated a book-shaped product entitled *The Start-Up of You*; Google's Eric Schmidt, who believes that an algorithm could one day tell you what is the "Best music from Lady Gaga"; Microsoft engineer Gordon Bell, lifelogger extraordinaire and exemplary lunatic of the mindset that holds that Truth, in the form of perfect data recall, is the absolute social value; and the games-will-save-the-world theorist Jane McGonigal, whose work Morozov likens to "a bad parody of Mitt Romney".

But Morozov's attacks go deeper than a righteous ridicule – he also interrogates the intellectual foundations of the cybertheorists, and finds that, often, they have cherry-picked ideas from the scholarly literature that are at best highly controversial in their own fields. His readings in this vein of Clay Shirky, Steven Johnson, David Weinberger and numerous other cyberintellectuals are suavely devastating.

We must, Morozov argues forcefully, place today's arguments in a broader context. "To talk about gamification" – the management-theory fad that seeks to apply videogame-style motivations and rewards to real-world practices – "without also discussing BF Skinner's behaviourism," he writes, is "misguided". Here the Belarus-born author also justifiably plays an autobiographical trump card: "As someone who grew up in the final years of the Soviet Union, even I remember the penchant that Soviet managers had for gamification: students were shipped to the fields to harvest wheat or potatoes, and since the motivation was lacking, they too were assigned points and badges."

The cyberhustlers are constantly declaring Year Zero and demanding that society be reformed according to the demands of "the Internet". But their understanding of the institutions they dream of seeing torn down – politics, the media, and now even university education – is superficial, as is their understanding of "the Internet" itself, whose secretive, privately-owned corporations are nothing like as "open" as their cheerleaders insist everything else must henceforth be. The important and admirably fufilled purpose of Morozov's book, then, is to argue, as he finally sums up: "that there are good reasons not to run our politics as a start-up … that there are good reasons to value subjective but high-quality criticism, even if it doesn't stem from the 'wisdom of crowds' [… and] that numbers often tell us less than we think and quantification as such might actually thwart reforms."

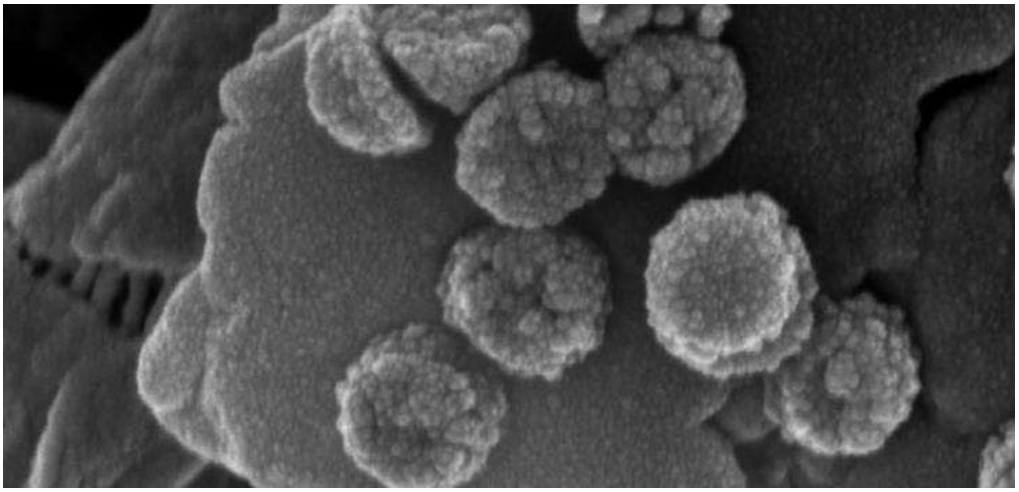
Morozov, like other anti-Utopians, calls for "algorithmic auditors". (Already, he points out, a single Californian company determines automatically what will count as hate speech and obscenity in the comment systems of thousands of websites.) More imaginatively, he also points out many possible consequences of the social engineers' techno-fixes. In so many words, unlike many of his peers, Morozov clearly understands the concept of contradictions and (the key TrenDNA insight) its not the trends themselves that determine the future, but the relationship between them. "Would self-driving cars," he wonders pointedly, "result in inferior public transportation as more people took up driving?" If you can measure and upload your health, diet and fitness data to be "shared" with insurance companies, then you'll get cheaper insurance, but wait, says Morozov, such individual decisions don't take place in a vacuum: "If I choose to track and publicise my health, and you choose not to, then sooner or later your decision to do nothing might be seen as tacit acknowledgment that you have something to hide." These are, then, social and political problems, and ones that the mantra of individual choice cyborgised through shiny new technologies will often answer in ways that harm the already vulnerable.

Morozov, ultimately, is a man with an uncanny knack of being able to see beyond merely extrapolating trends. He’s no Luddite. Merely a man who understands consequences and the impact they have on how the future evolves. Here are his parting words:

"Technology is not the enemy; our enemy is the romantic and revolutionary problem solver who resides within. We can do nothing to tame that little creature, but we can do a lot to tame its favorite weapon: "`the Internet.' Let's do it while we can - it would be deeply ironic if humanity were to die in the crossfire as its problem solvers attempted to transport that very humanity to a trouble-free world."

If you’re up for reading 432 pages, this might just turn out to be the best thing you read all year.

Investments – Nano-Scavengers



Among its many talents, silver is an antibiotic. Titanium dioxide is known to glom on to certain heavy metals and pollutants. Other materials do the same for salt. In recent years, environmental engineers have sought to disinfect, depollute, and desalinate contaminated water using nano-scale particles of these active materials. Engineers call them nano-scavengers. The hitch from a technical standpoint is that it is nearly impossible to reclaim the nano-scavengers once in the water.

In a paper published online May 14 in the journal *Nature Communications*, an interdisciplinary team of engineers at Stanford University announced it has developed a new type of nano-scavenger with a synthetic core that is ultra-responsive to magnetism, allowing the easy and efficient recovery of virtually every one of the nano-scale purifiers.

"In contaminated water, nano-scavengers float around, randomly bumping into and killing bacteria or attaching themselves to the molecular pollutants they are after," said Shan Wang, the study's senior author and a professor of material science and engineering and jointly of electrical engineering. "When the contaminants are either stuck to the nano-scavenger or dead, the magnet is turned on and the particles vanish."

Ultra-responsive to magnetism

The use of magnetism to recover nano-scavengers is not new. There are commercial technologies today that have fashioned nano-scavengers with a core of magnetic iron oxide surrounded by an active material, but these ingenious methods are less than perfect. Iron oxide is not absolutely responsive to magnetism and too many nano-scavengers remain in the water for it to be considered safe for human use.

The Stanford advance replaces the iron oxide with a synthetic material. The Stanford core is, in reality, not a single material, but a disk of several layers -- magnetic outer layers of the synthetic material sandwiched on either side of a titanium center, but with a twist. "The magnetic moments of the two outer layers are opposed. The direction of the magnetic force in the top layer and the bottom layer point in opposite directions, effectively cancelling the magnetic properties of the material," said Mingliang Zhang, a doctoral candidate in material science and engineering and co-first author of the study.

In their natural state, the new nano-scavengers are not magnetic and would not be attracted to another magnetic material. When the composite discs are exposed to a strong

magnetic field, however, the magnetism of the two opposing fields turn into alignment, not just becoming magnetic but compounding the magnetic effect.

Side-by-side tests

In doing so, the nano-scavengers become ultra-responsive to magnetism, far more so than the base iron oxide used in today's technologies. The Stanford team has dubbed its advance with the oxymoronic name: "synthetic antiferromagnetic cores." The prefix anti- in this case means in opposite direction, not non-magnetic.

With a successful core created, the researchers then cap it with silver or titanium dioxide or another reactive material depending upon the contaminant they are targeting. In live tests using synthetic-core, silver-capped nano-scavengers immersed in water tainted with *E. coli* bacteria, using a silver dosage of just 17 parts per million, the Stanford team was able to kill 99.9% of the bacteria in just 20 minutes. Better yet, they removed virtually all of the nano-scavengers in just five minutes of exposure to a permanent magnet.

Side-by-side tests of the effectiveness of the same magnet on iron oxide core nano-scavengers show a quick collection of about 20 percent of the nano-scavengers in the same five minutes, but then the effect plateaus. By minute 20, nearly eight-in-ten iron oxide core nano-scavengers remain in the water.

The one-pot solution

Having demonstrated a working prototype, the team is now building various iterations of their nano-scavengers with different reactive exteriors to target specific pollutants, as well as a new class of slightly larger nano-scavengers that might bear discrete bands of several different reactants.

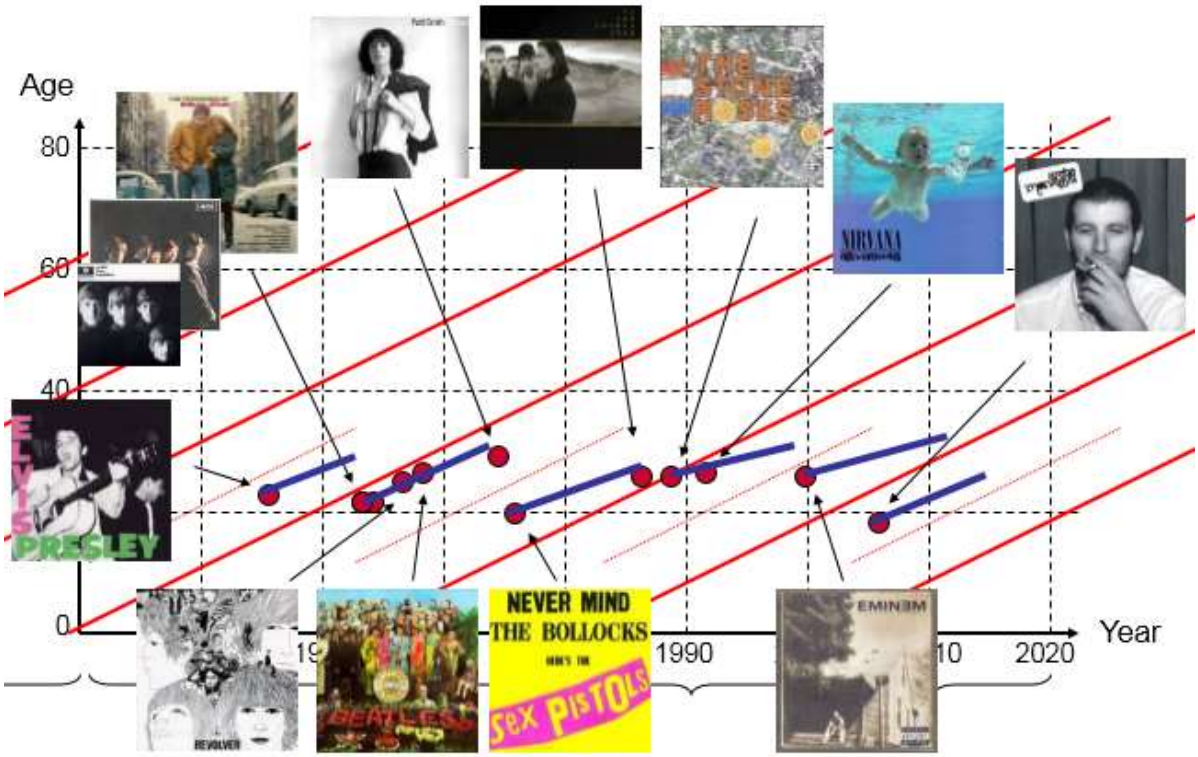
"Our hope is to one day create a 'one-pot solution' that tackles water afflicted by a diverse mixture of contaminants. A purification technology like that could be very useful in recycling water in developing nations where water quality or in arid climates where water quantity are of critical importance," added Xing Xie, a doctoral candidate in civil and environmental engineering and co-first author of the paper.

Full story at:

Mingliang Zhang, Xing Xie, Mary Tang, Craig S. Criddle, Yi Cui, Shan X. Wang. Magnetically ultraresponsive nanoscavengers for next-generation water purification systems. *Nature Communications*, 2013; 4: 1866 DOI: 10.1038/ncomms2892

Generational Cycles – Half-Cycle Musicians

One of the most requested slides in our deck of generation-related material is the one showing the half-cycle pattern of change in the popular music industry:



One thing we know from interviewing people during TrenDNA client projects over the years is that the principle reason popular music evolves in these half-generation cycles is because when we grow up there seems to be a relatively short (half generation long) window to which music is particularly important. Ask someone what their favourite film is and there is almost no correlation between their age and the age of the film they choose. Ask someone their favourite band or artist, on the other hand, and there's a very high likelihood they're going to offer up a suggestion that will correlate very closely to the artists they liked during the period in their lives covering the mid/late teens to their mid/late twenties. Popular music is largely about freedom from what your parents liked, friendship bonds and, perhaps most important of all, attracting members of the opposite sex.

The artists that we liked during this puberty-to-settling-down 10-12 year long period in our lives tend to stay with us for the rest of our lives. That's why artists like Bob Dylan, Paul McCartney and U2 still get to fill stadiums when they tour.

What we thought we'd do here is to look at how we might begin to place the major artists over the last 60 years into the various half-generations that have existed across those years.

The easiest way to tell what generation someone is from is to ask them their age. Failing that, the next best is to ask them about their favourite music. Here's what their answer is likely to reveal:

	Popular ('singles') Artists/Genres	**'Serious' ('album') Artists**
Boomer 1	Elvis, (Motown), Ray Charles, Sam Cooke, Dave Clark Five, Cliff Richard/Shadows, Dusty Springfield, Herman's Hermits, Buddy Holly, Everly Brothers, Johnny Cash, Bill Haley, Jerry Lee Lewis, Little Richard, Chuck Berry, (rock'n'roll)	Beatles, Rolling Stones, Beach Boys, Doors, Simon & Garfunkel, Bob Dylan, Joan Baez, Byrds, Who, Kinks, Hendrix, Janis Joplin, Love, Creedence Clearwater Revival, Otis Redding, Aretha Franklin, Velvet Underground
Boomer 2	('glam'), Abba, Bay City Rollers, David Cassidy, Osmonds, TRex, Slade, Wizzard	Eagles, Fleetwood Mac, Elton John, Led Zeppelin, Pink Floyd, Yes, Genesis, Black Sabbath, Bruce Springsteen, Lynyrd Skynyrd, James Taylor, Leonard Cohen, Randy Newman, Frank Zappa, Linda Ronstadt, Steely Dan, Little Feat, Joni Mitchell, Crosby Stills Nash, Neil Young, Foreigner, Boston, Billy Joel, Rod Stewart, David Bowie, Roxy Music, Lou Reed, Jackson Browne, Tom Waits, Stevie Wonder
genX 1	Michael Jackson ('king of pop'), Madonna, (Disco), Donna Summer, Blondie, Duran Duran, ('New Romantic'), Madness, (ska/2-Tone), (reggae), The Police, (New Country), B-52s	Sex Pistols, Clash, Ramones, Buzzcocks, U2, Echo & The Bunnymen, Elvis Costello, Simple Minds, REM, Smiths, Cure, Joy Division, Kate Bush, Prince, Waterboys, Talking Heads, Television, Indigo Girls, 10,000 Maniacs, Motorhead, Metallica, Guns'n'Roses, Iron Maiden, Lyle Lovett, Bob Marley
genX 2	Hip-Hop, Techno, Rap, Eminem, Take That, Spice Girls, ('girl power'), ('Britpop'), (House/Rave), (Grunge), Kylie Minogue, Stock-Aitken-Waterman	Radiohead, Nirvana, Stone Roses, Happy Mondays, Primal Scream, Oasis, Blur, Pearl Jam, Strokes, Massive Attack, Beta Band
genY 1	Ibiza/Ministry Of Sound, Britney Spears, Christina Aguilera, Justin Timberlake, Dizzee Rascal, Will Young, Lilly Allen, Pink	Coldplay, Keane, Amy Winehouse, Arctic Monkeys, Kings Of Leon, John Mayer, Killers, Muse
genY 2	X-Factor artists, Beyonce, Rihanna, Lady Gaga, Jessie J	Adele, Mumford & Sons, Laura Marling, Florence & The Machine, Emeli Sande
(post 9/11) 1	('K-Pop'), One Direction, Justin Bieber, Taylor Swift	None so far (heading our way in the next 4 years – you have been warned!)

Biology – Pom Pom Crab (*Lybia Tessalatta*)

The Hawaiian Pom-Pom Crab is the cheerleader of the oceans. The “pom poms” that it carries are actually sea anemones which grow on the crab’s claws. The Pom-Pom Crab and Anemone represent a beautiful example of mutualism in the animal kingdom – two or more species that find mutual advantages in teaming up and working together

The Pom-Pom Crab uses the anemones as a defense mechanism, waving his claws in the air wildly if a predator approaches so that the sting from the anemone will drive the other creature away. The anemones, on the other hand (no pun intended!), benefit by having the leftovers of any food the crab eats, plus, because they’re constantly on the move and being waved around, they get a much greater access to the microscopic particles that forms the staple part of their diet.

Here’s how we might map the pom pom crab’s basic life contradiction on to the Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Safety/Vulnerability (38)

WORSENING PARAMETERS YOU HAVE SELECTED:

System Complexity (45)

SUGGESTED INVENTIVE PRINCIPLES:

5, 31, 10, 27, 30, 40

And here’s the equivalent problem for the anemone:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Productivity (44)

WORSENING PARAMETERS YOU HAVE SELECTED:

Speed (14)

SUGGESTED INVENTIVE PRINCIPLES:

35, 3, 24, 5, 4, 12, 13, 19

Note how Principle 5, Merging, is high on the list of solutions for both of them. We might thus think of mutualism as being about one thing merging with another to solve the contradictions of both.

Short Thort

The real insight comes from what lies between:

"Creative activity could be described as a type of learning process where teacher and pupil are located in the same individual."
Arthur Koestler

"No stream rises higher than its source.
What ever man might build could never express or reflect more than he was.
He could record neither more nor less than he had learned of life when the buildings were built."
Frank Lloyd Wright

News

UK TRIZ Forum #5
Just when we thought it wasn't going to happen, turns out it is. This year's smallest TRIZ event will take place in our Clevedon HQ on 1 November, right after the European TRIZ Association conference in Paris. With a following wind, we will be having Dr Ellen Domb and Tim Brewer from the US presenting papers. Call for papers and more details on the website, hopefully by the time you read this.

Australia
Following May's exhilarating trip, it looks like Darrell will be back in Melbourne, Sydney and environs during the last week of July and first week of August. Quite likely with short stop-offs in Malaysia on the way there and back.

SI Certification – Level 3
Likely the last Level 3 workshop of the year will go ahead on 9-10 July. At Clevedon HQ.

India
Darrell's next trip will occur during the week 1-6 July. Most of the available time is allocated to in-house workshops, but there are still one or two available diary slots for anyone interested.

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

- Utilities – strategic study project
- Utilities – PanSensic dashboard building project
- Construction – ICMM assessment & journey design
- Medical Devices – workshop series
- Automotive – SI Certification programme
- Financial Services – PanSensic customer segment analysis & product design
- Government – GenerationDNA workshop series
- Process – IP bullet-proofing
- FMCG – Packaging innovation project
- FMCG – Invent-to-order IP generation project
- Medical Devices – Spin-out business plan formulation