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

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.

Readers' comments and inputs are always welcome.

Send them to darrell.mann@systematic-innovation.com

Theory Of Inventive Problem Solving Versus Theory Of Inventive Problem Finding

If we look back at why TRIZ was named the way it was, a good part of the answer is that what Altshuller and his co-researchers were doing was carving a niche that no-one else in the world had found. Lots of people around the world were working on tools and strategies that helped people to define problems, but almost no-one was codifying strategies for generating successful solutions. And certainly no-one else was making any kind of attempt to be comprehensive in mapping solution possibilities. I guess that it's not until you've looked at a few hundred thousand patents that you start to realize just how much re-inventing of the wheel actually takes place around the world across different disciplines and industries. So clearly one of the things that makes TRIZ so powerful is that it does offer users this 'comprehensive' (recognizing that we're still testing that enormous assumption every day of the week in our research activities) array of solution generation options.

That being said it continues to feel very strange that the spread of TRIZ in whatever form can still feel painfully slow. At least in some parts of the world. How is it that we have the biggest study of creativity and innovation ever conducted and still some people are reluctant to do anything with it?

Before using this question as an excuse to launch into yet another discussion on the subject of 'people don't use TRIZ because...' the purpose of this article is rather to explore what might just turn out to be a fundamentally important idea. An idea in fact that we've been exploring and testing in workshops for the last year. Now seems like the time where we have enough experience to open up the discussion more generally.

We start that discussion with a picture we show often at the start or at the end of many of the workshops we do. That figure is the classic Deming 'intentional' versus 'actual' cartoon based on the Plan-Do-Study-Act cycle. On the left hand side picture is the idea, based on the equal area of the four boxes, that we should spend as much time planning as doing as studying as acting. And on the right comes the idea that most of us are far happier 'doing' than planning, studying or acting on what we found. And even then, the 'acting' task usually consists of the realization that more often than not we've been working on the wrong problem and therefore end up running firefighting operations.

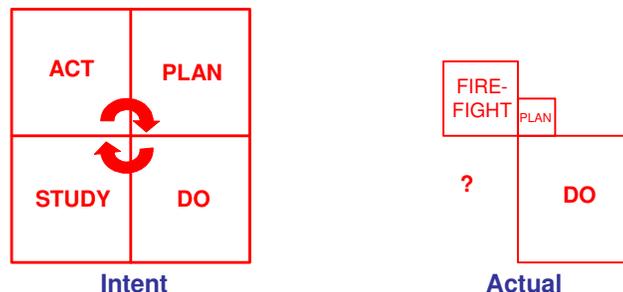


Figure 1: Plan-Do-Study-Act Time Split – Intent Versus Actual

We use this picture in order, usually, to get people thinking about why it is that most of us are so much happier doing the doing than doing the planning. There are many answers to the question, but frequently recurring themes include the idea that we like doing because

we look busy and we feel busy. When we're doing we feel like we're making progress, and making progress is very definitely attractive from a psychological stand-point. Planning, on the other hand, does not possess these characteristics. We don't look busy, we don't feel busy, and, worst of all, we may discover something that will cause us to go backwards rather than forwards. And going backwards is especially unattractive.

What we also say when we're talking through this picture is that the 'planning' task is where we're doing the problem definition work, and that the 'doing' is then about the solution finding activity. Next we say how, even though nobody is likely to spend any more time planning than they currently do, TRIZ will help us to 'find a better problem' than we would otherwise.

After that comment, typically, we get sucked into talking about how great TRIZ is at generating solutions. Indeed, delegates on workshops quite rightly insist that this is where the bulk of the workshop time is spent. 'We love the solution generation job, and you're giving us a bunch of new ways to generate solutions' is the unspoken but universally consistent theme.

So, what's wrong with this? Well, one of the problems is that the importance of finding the right problem can very easily get lost. Admittedly, TRIZ teaches people that finding the contradictions is a great way of finding the good problems. And that thinking about 'ideal' is also a great way of getting people out of the box and asking bigger questions. But I think that people still tend to put these ideas on one side and focus their time and energy on learning the Principles and the Trends and the Standards. We let this happen because a) forcing people to define problems for two days is a great way of getting them to never want to see you again, and (more importantly), b) it is often far, far easier to work out what problem you solved after you have the solution than to agonize over what problem should we be working on, so by focusing on solution generation tools you maximize the likelihood that a breakthrough idea or five will emerge.

But then – and here's what we've been thinking about and testing for the last year – why is it that we don't see more people using the tools and more successes out there in the market?

Here's what we've found. It seems to be particularly true for managers and software engineers, but is also true more often than not for engineers and scientists:

- most people love the solution generation part of the process.
- this is also what they think they're already pretty good at
- by giving people tools to 'generate more solutions more systematically' you are actually saying to people 'now you can do the thing you love doing more quickly'
- potential implication: now you won't need to spend nearly as long doing the part you love doing than you used to
- you're also saying 'you're now using the knowledge of three million other great problem solvers'
- potential implication: you're not so great after all

In other words, by emphasizing that TRIZ is great at doing all the parts of the creativity job that people love doing, it is highly likely that, even though we would never dream of doing it intentionally, we are actually sub-consciously making it sound very threatening.

Blinding Flash Of The Obvious #245

If you are ever in the situation where you think this might be happening, pick up Principle 13 and make a 180 degree u-turn. (Also, if you don't think it's happening, you're probably

wrong.) How to make a 180 degree turn? Simply focus on the parts of the process that our brain doesn't like doing. I.e. turn the story into the Theory of Inventive Problem *Finding*. Help people to find the 'right contradiction' or define what 'ideal' looks like, and then leave them to get on with finding the solution themselves.

Five times out of ten in the technical arena, and closer to eight in business, people will find good solutions without resorting to 'cheating' by looking at the Matrix or Principles or Trends. That's what we've been finding at least. Ouch! Make that double ouch.

Getting people outside their box by thinking about a problem they, in all likelihood, hadn't thought about before is more often than not the only spark they will need to get their positive attention, engage the creative idea generating parts of their brain (the bits they love using, remember) and get them delivering useful solutions.

A very nice strategy used in Syntectics in situations like the one we are talking about here is, once you've identified a good problem, get people to think about the problem and state their responses starting with the phrase '*what you do is...*' A really simple idea, but also a very powerful one because the only way to think once those four words have been said is pro-actively having a go at solving the problem.

Great to know that all the wonderful Principles, etc are there as back-up, but greater to know that by posing a good problem and asking people to solve it is giving a task that we all instinctively love doing. A gram of intrinsic motivation is worth a kilogram of solution generation tools. No matter how good those tools are.

How ironic that TRIZ's biggest strength – the extraordinarily powerful solution generation stuff – may turn out to be its biggest handicap.

More On Innovation Timing: The Fickle Consumer

Undoubtedly one of the most difficult of the innovation challenges is understanding when is the right time to launch a new product or service onto the market. The challenge is particularly great when we are dealing with innovations that directly interact with consumers. We have published a number of papers and articles on this topic in the past (see for example Reference 1 – an attempt to bring together several pieces of research). This article is an attempt to dig a little deeper into the ‘voice of the consumer’ and market demand aspects of the story.

By way of a start point, consider the two singers shown in Figure 1. One you’re likely to have heard of and the other you are not.

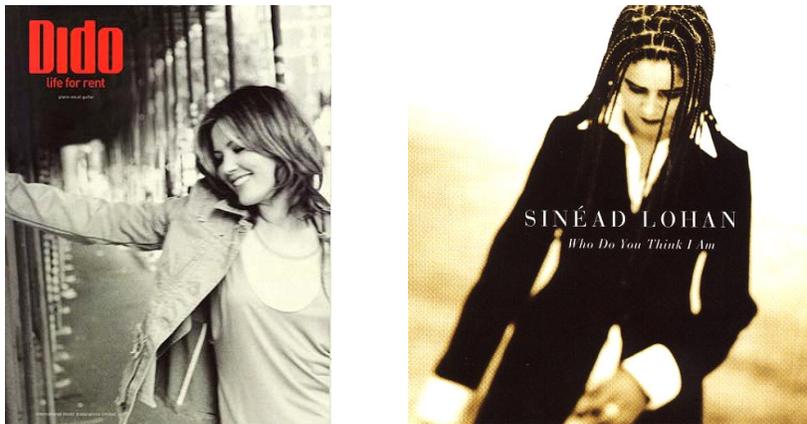


Figure 1: Two Recording Artists: Dido and Sinéad Lohan

You’re likely to have heard of Dido even if you’re not so interested in Western popular music because she’s sold over 24 million albums, has won a wide range of awards, including a Grammy, and when she tours she sells out big stadiums. Sinéad Lohan on the other hand, unless you live in Ireland and follow the music scene quite closely, you are unlikely to have heard of. Poor old Sinéad sells her albums in the tens of thousands, and tours in small clubs. Ironically, listening to both singers swiftly reveals that both have very very similar singing voices. And similar phrasing. And similar themes. Musical purists would tend to argue that in actual fact Sinéad is the more talented of the two. Add to this equation the additional facts that both are about the same age, both released debut albums in exactly the same year (1995), and that both debuts largely disappeared without trace, it seems more than a little unfair that the outcomes are now so different. How can two such similar start points end up in two utterly different outcomes? Could it possibly be that Sinéad Lohan chose to release her second album in 1998, while Dido chose to wait until 1999?

This is precisely the sort of question that highlights the enormous difficulties of getting the innovation timing right. Apart from dumb luck, what could possibly have lead to the conclusion that 1999 was a better year for these two female singer-songwriters to release an album than 1998?

To answer that question means we need to explore some consumer trend patterns in a fair amount of detail. According to our research, the best start point for such an analysis is

the four-phase generational cycle findings of US historians, William Strauss and Neil Howe (Reference 2). We've discussed some of their work previously (e.g. Reference 3). The deeper we dig into their findings, the more it all seems to act as the right platform upon which to build all of the other factors that come together to influence the innovation timing question.

By way of a demonstration of what we mean and what we're doing, Figure 2 illustrates a basic grid we can use to plot consumer phenomena. Basically the figure plots calendar time along the x-axis, and age up the y-axis. The diagonal red lines then show the approximate generations identified by Strauss and Howe. So, if you were born between about 1963 and 1982, you are what we now know as 'Generation X'. At least if you were born in Europe or the US (we're still researching whether the pattern holds true in other parts of the world). If you were born at the beginning of this generation, in 1963, then the diagonal red line that begins at 1963 on the x-axis shows your life trajectory. Track the line along to the year 2007 and your age up the y-axis is 44.

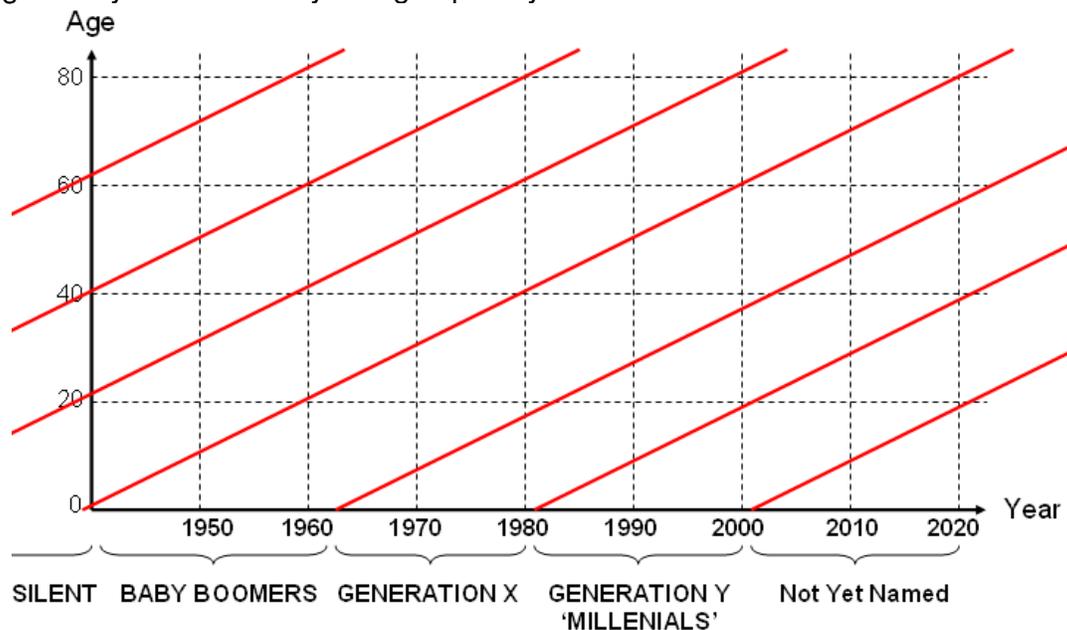


Figure 2: Calendar Years Versus Age Grid And Generation Trajectories

Once we have this basic grid, the next job is to begin plotting important cultural events and milestones relative to the topic we are interested in. In the case of Dido and Sinéad Lohan, the topic is popular music, and so what we need to do is look for important popular music milestones. By milestones, we mean events that signaled some kind of a shift in culture. A classic example of the kind of thing we are looking for would be the work of the Beatles. In fact the Beatles made several culturally significant records, from their debut album in 1962 (the start of 'Beatlemania'), to Revolver in 1965 (the start of their transition to 'serious musicians') to Sgt Pepper in 1967 (the cultural shift that saw popular music transformed into serious 'art'). We can plot these three albums onto the year-age grid by, first, mapping their release date on the x-axis, and then the average ages of John Lennon and Paul McCartney (the two creative forces behind the band at the time) up the y-axis. The result of doing this is illustrated in Figure 3.

Both Lennon and McCartney were born in the early 1940s, putting them at the start of what became the Baby Boomer generation. The three dots denoting the position of the

three albums on the grid describe a diagonal line running parallel with the red generation diagonals, thus showing how they were getting older as calendar time moved on.

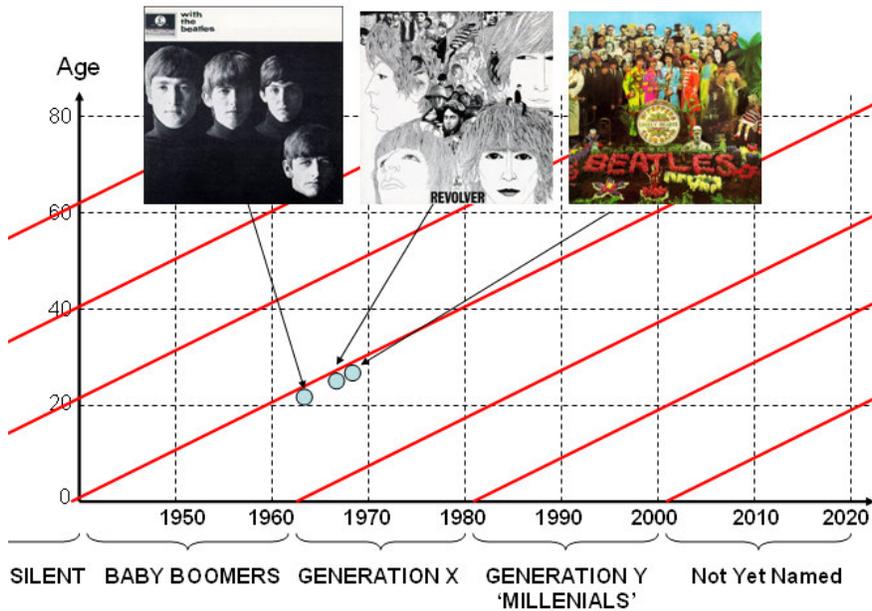


Figure 3: Beatle-Related Popular Music Milestones

We can take this basic idea several steps further by looking for other similarly influential popular music milestones and plotting when they were released and how old the principal artists involved were at the time. Like Elvis Presley, Bob Dylan, The Rolling Stones, The Sex Pistols, U2, Nirvana and Eminem. The result looks something like the picture illustrated in Figure 4:

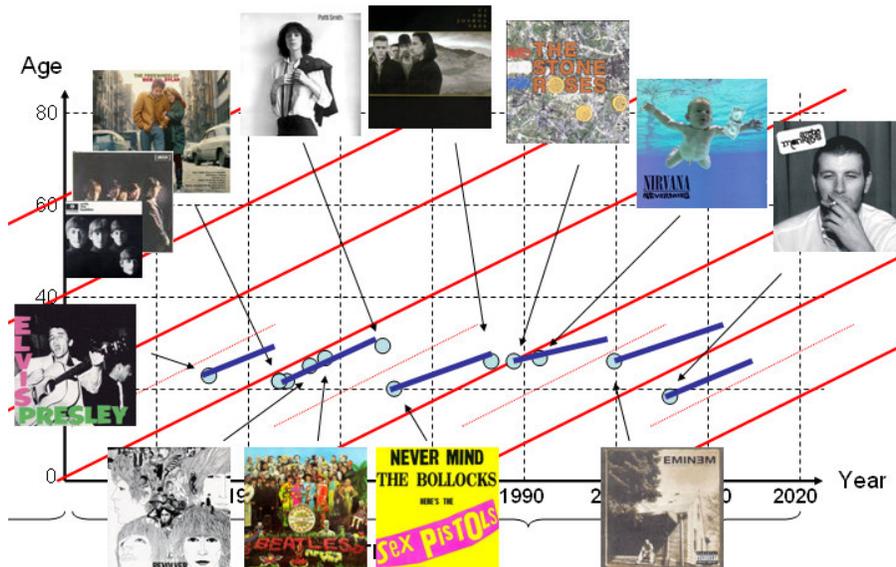


Figure 4: Cultural Patterns In Popular Music

What the picture shows is a series of significant shifts in types of music with, in each case, the release of a particularly important album provoking the shift. The release of the Sex Pistols album in 1977 represents a classic example – a sea-change from bloated, drug-

taking, indulgent rock-stars to back-to-the-streets, anyone-can-do-it, safety-pin-through-nose punks. It is perhaps too early to say for sure whether the release of the Arctic Monkeys debut at the end of 2005 represents another paradigm shift. The fact that it was the fastest selling debut album ever in the UK, and the fact that the band emerged without any record company support or promotion (in fact they were one of the first bands to benefit from the MySpace phenomenon) perhaps indicates that it is. The patterns observable from the last fifty years would also seem to support the argument that another paradigm shift was certainly due.

What the figure shows in this regard – and we have taken great care to only draw conclusions after we plotted the data – is that significant shifts take place in the popular music scene about every half generation.

With this in mind, let us now go back to the Sinéad versus Dido problem. What might the Figure 4 map have to say about this story? Well, two things. The first is that, at the age they were, releasing an album in 1998 versus 1999 put the two women on either side of one of the phase shift boundaries. A 1998 album put Sinéad Lohan at the end of one cycle, whereas a 1999 album put Dido into the start of the next cycle.

Secondly comes the fact that, by being featured on Eminem's breakthrough album, and that Eminem's emergence signaled the start of the new phase, Dido was able to tap directly into that new phase.

Could it be that simple?

To be honest, although the argument looks compelling, one case like this does not make a robust and reproducible method for predicting what will and will not be successful in the future.

We think, though, that there is enough evidence in this case and the several hundred others we've been looking at to suggest there is something important happening in these generational cycle shifts. Let us end this article by showing another example. This time the phenomenon that is J.K. Rowling and the Harry Potter series of books. Another cultural paradigm shift that, when we plot the story onto our grid begins to demonstrate not only why the books have been so enormously successful, but also why the last in the series due out in a couple of months time is quite right to be the last.

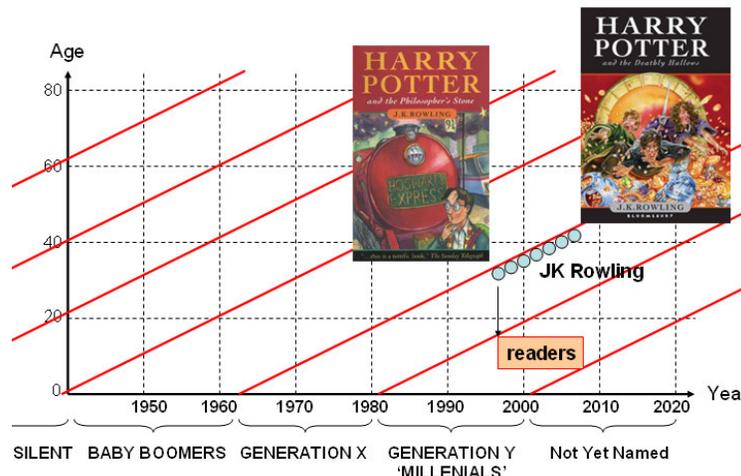


Figure 5: J.K Rowling And Harry Potter

We need to add two new thoughts to make sense of this picture. The first is that, unlike in popular music where it is usually musicians making music for an audience with a similar age, in children's literature, the author is writing for a younger age group. The time between the first Harry Potter book and the upcoming seventh lands smack bang in the middle of the Generation Y youth market. Secondly, referring back to Strauss and Howe and their description of the characteristics of the different generations, very clearly places Generation Y as a 'hero' generation looking for 'heroes'.

Okay, so now we've shown you two cases. No doubt we'll show more in future months since we currently have close to a dozen people busy mapping other culturally significant events and products for us. From Star Wars to the new Mini, celebrity chefs to iPod, the initial results appear to us to be quite mind-blowing.

Ultimately, as with so many things, the only way to convince all of the people all of the time is to get them plotting their own maps. Which is a polite way of inviting all of our readers to join in the research.

Anyone interested should, in the first instance, get in touch with Darrell. Or, if you want to experiment first and speak later, you will find a Powerpoint version of the basic grid template on our Free Downloads page.

We think you'll be surprised by what you find, and that you'll see like we have that what we have here is a vital important piece in the innovation timing challenge.

References

- 1) Mann, D.L., 'On Innovation Timing', paper presented at ETRIA TRIZ Future Conference, Graz, October 2005.
- 2) Strauss, W., Howe, N., 'The Fourth Turning: An American Prophecy', Broadway Books, New York, 1997.
- 3) Systematic Innovation E-Zine, 'Hero-Artist-Prophet-Nomad Cycles And Discontinuous Business Trends', Issue 45, December 2005.

Humour – Open 24 Hours

Spotted on a recent trip to a local mall. Contradiction anyone?



Patent of the Month – Medication Delivery Method

Patent of the month this month takes us into the medical devices sector, specifically the drug delivery arena:

United States Patent
Phipps , et al.

7,212,853
May 1, 2007

Electrotransport agent delivery method and apparatus

Abstract

An electrotransport agent delivery device (10) for delivering a therapeutic agent through intact skin, and a method of operating same, is provided. The device applies a pulsing electrotransport current wherein current pulses have a magnitude above a critical level (I.sub.c) at which the skin is transformed into a higher electrotransport delivery efficiency (E) state. Most preferably the length of the applied current pulses is at least 5 msec and preferably at least 10 msec.

Inventors: **Phipps; J. Bradley** (Sunnyvale, CA), **Lattin; Gary A.** (Nemo, SD), **Haak; Ronald P.** (Palo Alto, CA), **Theeuwes; Felix** (Los Altos Hills, CA), **Gupta; Suneel K.** (Sunnyvale, CA)

Assignee: **Alza Corporation** (Mountain View, CA)

For those readers that may not have come across them before, patent assignee, Alza Corporation are a company with a long list of medication delivery innovations behind them. They also seem to have a pretty good record of commercializing what they've done.

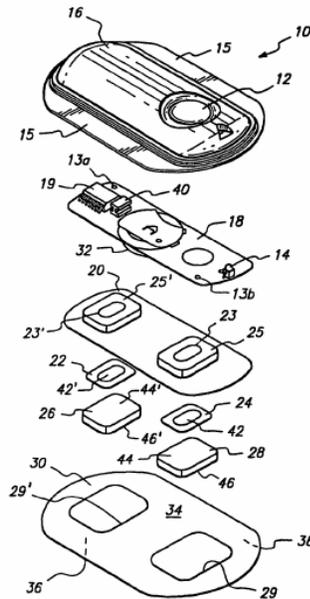
The electrotransport agent delivery device that forms the subject of this new patent doesn't appear to have reached that stage yet, but whether it has or whether it hasn't we think it has a lot of potential, and not just in the drug delivery role.

The invention is essentially built firstly on the prior art discovery that the application of electric current through skin causes the electrical resistance of the skin to decrease, and the new discovery that when in this state, the ability of the skin to absorb medications is considerably enhanced. Not only this, but that if the electric current is pulsed, the absorption properties of the skin remain enhanced not just for the duration of the pulses, but for some period after.

The inventors have also discovered that the relationship between current density and medication absorption capability goes non-linearly advantageous above a certain current level. From the disclosure:

This invention arises because of the discovery that electrotransport delivery efficiency is highly dependent (i.e., it is non-constant) at current densities in the range of about 0 to about 30 .mu.A/cm.sup.2, is moderately dependent upon current density in the range of about 40 to about 70 .mu.A/cm.sup.2 and is relatively independent of current density at current densities in excess of about 70 .mu.A/cm.sup.2. This unexpected change in efficiency (in theory, efficiency is not predicted to change with increasing current density) permits transdermal electrotransport delivery of drug with significantly enhanced efficiency.

Although the patent claims focus primarily on this finding, the disclosure reveals how the inventors propose physically implementing their discovery:



In no doubt over-simplified terms what we have here is a sophisticated (i.e. charge delivering) patch. Which looks and sounds very elegant from where we sit.

It also looks elegant from the perspective of other potential applications beyond medication delivery. We'll leave it to your imagination to think about what else might we want the human skin to absorb better than it currently does.

We'll also leave you with a hopefully useful connection back to TRIZ and how we might map the problem solved by the invention onto the Contradiction Matrix. The conflict being challenged concerns the desire to improve medication absorption, and what traditionally prevents this absorption is firstly how much area we have available over which the absorption can take place, and the fact that our skin is there to act as a barrier to prevent ingress of foreign materials. Here's how we might map this problem onto the Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:
Amount of Substance (10) and Productivity (44)

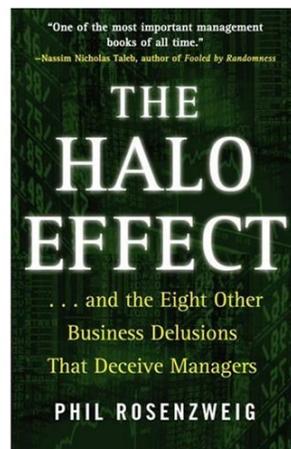
WORSENING PARAMETERS YOU HAVE SELECTED:
Area of Stationary Object (6) and Compatibility/Connectivity (33)

SUGGESTED INVENTIVE PRINCIPLES:
2, 4, 17, 35, 24, 13, 30, 10, 14, 31, 21, 40, 18, 7, 3, 28, 1

Well, perhaps the first thing to notice here is how long the list of potential Principles is. Get beyond that surprise though, and very encouraging to note that all of the strategies deployed in the invention – thin films (30), electrical fields (28), going above a threshold current level (35) and incorporating pulsation (18) – are all present in that list of recommendations.

Best of the Month – The Halo Effect

Everything you know is wrong. Well, not quite everything, but if you are a frequent reader of management texts, *The Halo Effect* looks set to shatter a few of your beliefs about the science. A definite candidate for our book of the year award, the book is pretty much essential reading for anyone interested in the work that we do. We might go so far as to suggest that it is essential pre-reading for any of the management work we have published. Superb evidence to back up our throwaway comment that the put 90% of all the management books we look at straight in the trash. The basic premise of the book is that an awfully large proportion of the management literature is built on foundations of sand. The 'sand' in this case coming in the form of the Halo Effect that makes up the title. In simple terms, the Halo Effect says that when companies are doing well there is a tendency to assume that everything the company is doing is the right thing. Taken alongside the eight other delusions that spring from this one, the implication is that a lot of conclusions that are made about what determines business success are incomplete at best and downright erroneous at worst. By comprehensively rubbishing management classics like *In Search Of Excellence*, *Built To Last* and *Good To Great*, the author provides compelling evidence that these 'classics', like many others, fall closer to the 'worse' end of the spectrum than the better. Given that these three books have collectively sold over 10 million copies and have acted as the spur for a slew of follow-on imitators, the clear message is that the management science is actually anything but.



The book presents a number of compelling case studies in order to make its point. Chapters on ABB – fallen idol of 90s European business – Cisco and Lego provide clear demonstrations of the Halo Effect in action. When things are going well for the three companies, they can seemingly do no wrong in the eyes of the financial markets and press; business awards come in abundance and CEOs are feted as masters of the universe. Then, when things (inevitably) take some kind of a downturn, suddenly the Halo evaporates, and CEOs find themselves out of work, and the company becomes subject of biting criticism.

We smile at this, because in our research, we are actively looking for business DNA and not market performance. Market data is fickle and very easily subject to manipulation. Finding contradictions and how companies solved them is not. The Halo Effect provides ample evidence to support our philosophy.

One of the most fascinating recurring themes of the case studies presented in the book, for example, show how companies are first praised for 'being focused' ('sticking to the

knitting') when times are good, only to then be criticized for 'not diversifying' when the figures turn bad. Or vice versa; companies praised for 'spotting the opportunities' when a diversification plan causes an upturn in the figures, later find themselves being criticized for 'straying' from core business when things turn pear-shaped. Those familiar with TRIZ will recognize this diversification-focus dilemma as the increasing-decreasing complexity trend pattern in action. Without knowing the cycle and where your business is in that cycle represents a sure-fire way of watching Halo's appear and disappear. Increasing-decreasing complexity represents a strand of business DNA that can only be uncovered by digging beneath the published figures.

While failing to see this pattern himself, author Phil Rosenzweig does at least dig deeper to uncover a series of other traps that previous management researchers and business leaders have fallen into. The book builds around nine such traps – or 'delusions' – in all. In summary they are:

Delusion 1 – The Halo Effect

The tendency to look at a company's overall performance and make attributions about its culture, leadership, values and other metrics. A key aspect of the delusion is the fact that businesses and commentators mistakenly attribute what a company has done in the past to what will happen in the future.

Delusion 2 – The Delusion of Correlation and Causality

Two things may be correlated, but we may not know which one causes which. This is a very common delusion (not just in management circles). Does employee satisfaction lead to high performance or is it the other way around? Or are both causally linked to something else? Outside researchers can rarely know, and, due to the inherent complexities, few insiders can realistically hope to know either.

Delusion 3 – The Delusion Of Single Explanations

Many studies show that a particular factor – strong company culture or customer focus or great leadership – leads to improved performance. But since many of these factors are highly correlated, the effect of each one is almost always less than suggested.

Delusion 4 – The Delusion Of Connecting The Winning Dots

If we pick a number of successful companies and search for what they have in common, we'll never isolate the reasons for their success, because we have no way of comparing them with less successful companies.

Delusion 5 – The Delusion Of Rigorous Research

If the data aren't of good quality, it doesn't matter how much we have gathered or how sophisticated our research methods appear to be. When discussing this delusion, Jim Collins' work comes in for some fairly uncomfortable scrutiny.

Delusion 6 – The Delusion Of Lasting Success

Almost all high-performing companies regress over time. The promise of a blueprint for lasting success is attractive but not realistic.

Delusion 7 – The Delusion of Absolute Performance

Company performance is relative not absolute. A company can improve and fall further behind its rivals at the same time.

Delusion 8 – The Delusion Of The Wrong End OF The Stick

It may be true that successful companies often pursued a highly focused strategy, but that doesn't mean highly focused strategies often lead to success.

Delusion 9 – The Delusion Of Organizational Physics

Company performance doesn't obey immutable laws of nature and can't be predicted with the accuracy of science – despite our desire for certainty and order. In complex systems, in the immortal words of W.E.Deming, the most important numbers are unknown and unknowable.

All in all, a thundering tsunami of a read. Let the end of the management consultant begin right here. Essential.

Workshop Report – Qatar Foundation – Doha

By Jabir Walji and Yekta Özözer

The spread of TRIZ through the Middle East continues. We were very fortunate to be approached by the Qatar Foundation some months ago to discuss the opportunities and best strategy for deploying the Systematic Innovation methodology in the region. The process of testing the water began last month when our consultant trainers Jabir Walji and Yekta Özözer have been with approximately 20 participants of Qatar Foundation, particularly from its Strategic Planning Department for 3 days.

Brief Info on Qatar Foundation (QF):

QF aims to facilitate the process of Qatar people and the region pacing up with the changing world and hence to transform Qatar's education, health and research system into a more advanced and innovative one. For this, QF has been helping country to progress through below three main areas, where its organisation has been segmented accordingly:

- 1) Education
- 2) Science and Research
- 3) Community and Health

QF supports network of centers and partnerships with country's major institutions, with the principle that a nation's greatest natural resource is its people. In this sense, the start of Systematic Innovation methodology's implementation in QF is highly critical and plays a key role, as it will consequitively be reflected to whole Qatar society, through particularly its school and/or community education system, as well as its scientific institutions. Briefly, any advance step within QF, will then be augmented in Qatar society.

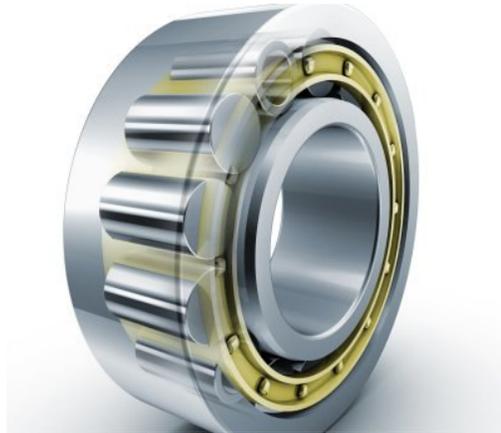
Our consultant trainers Jabir Walji and Yekta Özözer have conducted Systematic Innovation workshops in English at QF facilities on **April 30th, May 1st and 2nd** in Doha/Qatar. The results were highly promising and participants have internalised the methodology. They all found the concept highly balanced in every direction, very analytical and deploying "not only a person's full capacity, but also many industries' collective knowledge". They emphasized their admiration for the SI concept, particularly for its distilling wisdom, knowledge, experience and solutions from various fields in a highly systematic and concise way. They also expressed their desire to further increase SI's employment throughout the Foundation and in Qatar society.

We are highly delighted with the participants' willingness to learn the subjects and efforts to apply them into their businesses.

Investments – Tube Roller Bearing

Not that we're trying to claim any kind of credit, but we did predict it about 7 years ago in a paper we wrote for a fluid power conference. The subject was predicting the future of bearings. One of the 'obvious' connections we made was with the Space Segmentation trend, and the predictable jump from solid to hollow balls and rollers. Rollers, not surprisingly turn out to be easier to hollow than spheres.

And so, at this year's Hanover Fair, Schaeffler Group Industrial, with its brands INA and FAG, presented its development project that will extend the application range of cylindrical roller bearings.



The FAG tube roller bearing is suitable for applications where low radial loading can lead to bearing slippage, resulting in possible bearing damage. The new solution has a roller set, three of the standard cylindrical rollers have been replaced by tube rollers. These rollers have a larger diameter, which produces a slight preload in the bearing. In this way the tube rollers drive the roller set under low load conditions.

Roller set slippage and any resulting damage is now avoided. If the bearing is subjected to higher radial loads, the tube rollers retract elastically and the forces are spread onto the rolling elements in the load zone.

Compared with axially preloaded tube roller solutions, the new bearings are said to permit simplified designs and easier installation. Since their abutment dimensions have remained unchanged, they are also interchangeable with standard cylindrical roller bearings.

Biology – Silver Ant

Survival of the fittest is a primary driver in biological system evolution. Success as a species is often about finding ecological niches where you are able to out-compete other life-forms. Imagine you live in the Sahara desert and are trying to carve out such a niche for yourself. First off, you picked a pretty good place to start because not too many other life-forms are able to survive the difficult temperature environment. In fact a large majority of those that do survive in the Saharan environment tend to live underground as much as possible during the day and only emerge when the sun has disappeared. Imagine the potential advantages then of 'prey' type life-forms if they could operate and do what they need to do when their predators are unable. This is exactly the evolutionary niche exploited by the silver ant.

It has found a way to be able to live and operate above the surface even when the sun is at its strongest and the lizards that prey on it are unable to expose themselves. The very simple solution involves the use of reflective materials; no problem operating in the sun if you are able to reflect the majority of the incoming energy of the sun's rays:



The silver ant shown in the picture almost looks like it has been spray painted silver. Or at least the main body parts have. This makes sense as these are the parts containing all of the delicate, temperature sensitive, organs. The legs are closer to the normal black colour indicating that a) they don't need to be reflective in order to operate satisfactorily, and, b) it takes more resource to make a silver skin than a black one.

Nature hasn't learned this 'use reflection' strategy in many other places, and so we're far more likely to see this used as a design choice in human engineered structures. Think of satellites and other space hardware, for example, and you will very quickly notice how reflectors are an integral part of the thermal management system design. Not surprisingly, therefore, when we look up the conflict solved by the silver ant in the Contradiction Matrix, we will find that the recommendations are highly consistent.

There are several ways to formulate the conflict, but as far as the specific silver ant situation is concerned, the improving parameter is temperature. The ant needs to be able to maintain its temperature below a certain threshold level. What prevents other life-forms from achieving this aim is that the amount of energy arriving from the sun's rays is set at a very high level. Here's what happens when we plug that pair into the Matrix:

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IMPROVING PARAMETERS YOU HAVE
SELECTED:
Temperature (22)
WORSENING PARAMETERS YOU HAVE
SELECTED:
Energy used by Stationary Object (17)
SUGGESTED INVENTIVE PRINCIPLES:
35, 3, 19, 32, 36, 5, 9

The direct link to the use of reflective materials comes via the mention of Principle 32, Colour Change. Also interesting to note is the presence of Principle 3, Local Quality; a nod in this case to the idea that we don't need to put the reflective materials everywhere.

Perhaps the most surprising Principle in the list is Principle 36, Phase Transition. The published literature doesn't say anything about whether the silver ant uses this mechanism (our suspicion is that with water being such a precious commodity in the desert that it does not), it is very clear that phase transition is a very commonly used thermal management strategy in many other biological systems. Sweating in so many words.

Meanwhile, the main lesson to be drawn from our friend the silver ant is that Principle 32 has some real engineering value to it. We've tried to make this explicit in our version of the Inventive Principles by including a 32D sub-principle – 'change the emissivity properties of an object subject to radiant heating'.

Short Thort



*If you show someone their future they have no future.
If you take away the mystery you take away hope.*

Philip Dick, 'Paycheck'

Closely followed by:

I have to go back. I have to destroy that machine.

News

Jordan Business Articles

We are just publishing the second of a series of twelve articles on innovation for a respected business magazine in Jordan. It also looks likely that we will find a second home for the series in Hong Kong in the coming months.

Carbon Capture

We will be presented a co-written paper on the potential application of TRIZ to the global CO₂ problem at a one-day IMechE seminar at the beginning of June. Although mainly a discussion on the necessity to solve a contradiction or two if carbon capture is ever going to be a sensible solution to the problem, the paper does present a mini-case study showing the potential for generating breakthrough concepts.

Papers

Seems like no matter what we try and write, we are destined never to get a paper accepted in the Knowledge Management community. I wonder what they're afraid of? Never mind, we'll try again next year. In the meantime, we have had a trio of other papers accepted for conferences later this year – one at the European TRIZ Association Conference in Frankfurt, one at the Computer-Aided Innovation conference in Michigan and one at the AIAA conference on un-manned aircraft to be held in Belfast in September. The only minor outstanding detail in each case is actually writing the content. No change there then.

CAMPUS02

We just completed a ten-day TRIZ certification programme at the CAMPUS university in Graz. Expect several thesis dissertations as a follow-on output in the coming months from

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some of the students. It also seems like we've been invited back to repeat the programme starting next semester. Austria in November!

Mail Server

Apologies to anyone that has found it difficult to get a hold of us in the last week or two. For some reason our highly sophisticated mail server decided to adopt a new strategy; forget spam filters, we had a system that developed an uncanny ability to filter out important emails. The more important the mail, in fact, the more likely it was to be removed. Normal service has now been resumed with a somewhat simpler (and considerably cheaper) provider. Thanks for your patience during the change-over.