Systematic Innovation

e-zine

Issue 198, September 2018

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.

Our guarantee to the subscriber is that the material featured in the e-zine will not be published elsewhere for a period of at least 6 months after a new issue is released.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

If Methods Don’t Work, What Does?

98% of TOC-sparked innovation attempts fail
98% of QFD-sparked innovation attempts fail
98% of Lean-sparked innovation attempts fail
98% of 6Sigma-sparked innovation attempts fail
98% of Design-Thinking innovation attempts fail
98% of OBI-sparked innovation attempts fail
98% of Blue-Ocean innovation attempts fail
98% of Agile-sparked innovation attempts fail
98% of Scrum-sparked innovation attempts fail
99.5% of Open Innovation attempts fail

I’ve used the above slide at a number of conferences now. Usually to a reaction of either stunned silence or an eventual half-hearted challenge from an advocate of one of the methods I’ve chosen to include in the picture. It comes from an ongoing piece of research we’ve been conducting with client and other organisations to try and reveal the under-pinning DNA of their innovation success stories. Attempting such a feat is difficult at the best of times; doing it in the complex/chaotic environment that invariably accompanies any kind of discontinuous jump is a particularly hazardous job. A big part of the challenge is to somehow parallel-test the negative hypothesis. In this case, that goes something like this:

a) Identify the tools, methods and processes that you think contributed to the success of an innovation project.
b) Identify the tools, methods and processes that were utilized during innovation projects that subsequently proved to be unsuccessful

When it is possible to meaningfully grasp the answers to these two questions, ‘success’-contributing methods turn out to be no more or less likely to be present in both questions. Thus, as 98% of all innovation attempts fail, so we see that those that claim to have made use of Agile methods – to choose one at random – will also fail 98% of the time.

The only vaguely meaningful way to test the efficacy of one method over another would be to conduct some kind of parallel set of innovation-project experiments: one using TRIZ, for example, one using (another random choice), Design-Thinking, and one – the ‘control group’ using no formal support method at all. Such experiments are both expensive and fraught with the difficulties of trying to compare the un-compare-able. There are one or two examples, but really precious few that would pass any kind of academic scrutiny. That’s one of the big challenges of working in complex environments.

The most usual ‘alternative’ is the Jack Welch SixSigma ‘myth-builder’ strategy. Which basically involves never doing any kind of double-blind experiment, and instead telling people that ‘quantifying how much Six Sigma helped is good for your career’. Then, hey-presto, and surprise-surprise, any piece of moderately successful work ever done thereafter gets a Six Sigma label attached to it, until Jack is able to announce to the world’s media that the savings amount to ‘$9B’. Every cent of which is utterly fictitious.

Then there's a final twist of the knife pertaining specifically to the tools and methods that might be brought to bear during the 'fuzzy-front-end' period of an innovation project. By the time the project gets somewhere near to delivering success, this fuzzy-front-end is a long distant memory, and, unfortunately, if you're part of the method team, participants' memories tend to be short. After the 99% perspiration, people, in other words, tend to have forgotten where the 1% inspiration came from. It was the perspiration that delivered the success, not the weird bit at the beginning.

Taken all together, the overall picture can tend to make people in the innovation world depressed if you're not careful. Well, actually, the reaction can be quite amusing if you're that way inclined. Which we tend to be on occasion since it turns out to be a good initial filter mechanism for sifting out the pretend-innovators from the potentially real ones.

The real ones, when they're exposed to these kinds of result are much more inclined to ask whether there is *anything at all* that meaningfully distinguishes the 98% of innovation attempt failures from the 2% that end up being successful.

It turns out there is.

In the world of tangible tools, here are the things that we can safely say have a statistically significant likelihood of contributing to innovation success and a corresponding absence in innovation attempt failures:

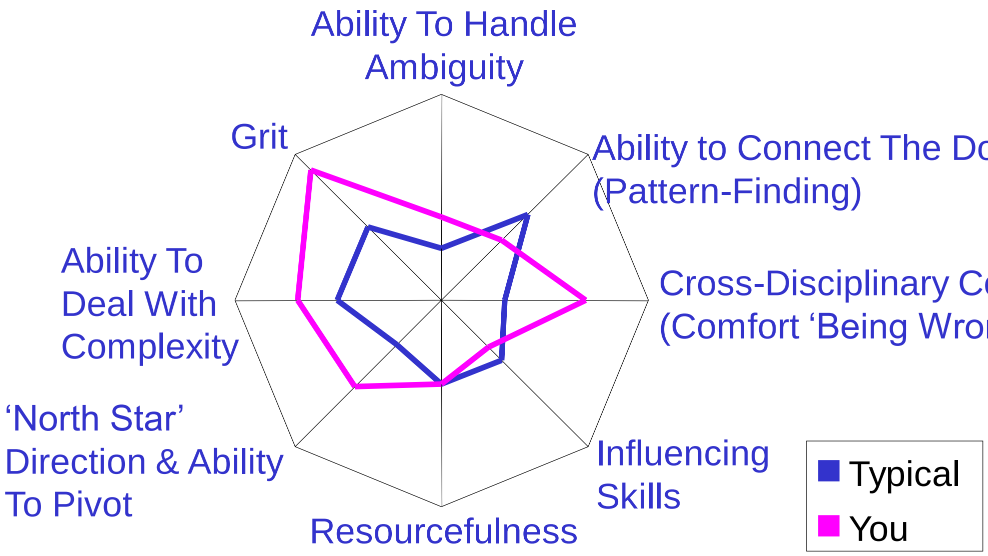
- The ability to identify and resolve trade-offs & compromises
- Having a clear meta-level compass heading relating to customer value
- Systems Thinking
- Management of the unknowns trumps management of the Gantt Chart
- Clear understanding of complexity - rapid-learning cycles, 'first principles', s-curves, patterns – and need for requisitely fast learning cycles
- Clear understanding of (von Clausewitz) 'critical mass at the critical point'
- Requisite understanding the customer/consumer say/do gap and how to deal with it

Important as these tangible – i.e. very teachable – elements are, they tend to get dwarved a little by the intangibles. Which look something like this:

- An excess of influencing skills
- Strong ability to working together in cross-disciplinary teams
- Persistence/bloody-mindedness/willingness to stick-with-difficult-stuff
- Strong ability to live with continual 'failure'
- Acknowledgement that 'ideas' have zero value
- Ability to design and manage a clear sense of progress across the team

This stuff is much more difficult to teach. Not impossible, but it does require a heap more time than most organisations are prepared to devote to the task. Interventions, these days, able to be assisted by the fact that we're able to measure a lot of these intangible success-driving elements, including the ones that spill over into the tangible arena.

Give us electronic narrative Company inputs like: Online presence URLs, LinkedIn/Social-Media links to key individuals, Annual Reports, Patents, Strategic plans, Press releases and, in some cases, specific narrative-inducing questionnaire responses, and here's the first prototype 'InnovationDNA' intangibles psychometric tool output we're able to automatically generate. Well, 'almost' completely automatically…



Give us a shout if you’d like to know more.

Case Study: Patient Compliance Small Picture

Back in April we wrote an article about the difficulties of achieving patient compliance within the healthcare sector (Reference 1). The focus there was very much on the big picture, and, as such, the conclusions we drew could be read as fairly depressing: the three main downward spiral issues conspiring to make patients not comply with their medication all seemed to be beyond the capabilities of today’s highly siloed healthcare sector. What it effectively also said was that there was little point in devoting lots of resource to solving the compliance problem until such times as some of the silo walls have been removed. One or two readers in the healthcare sector subsequently wrote to us to challenge the conclusion. Surely, they pleaded, there must be *something* we can do to help nudge the various disconnected systems in the right direction.

This article is a response to those questions. We’ll remain with the patient compliance theme, but at the same time hope that the specifics of the situation won’t detract from the more generic situation where innovation teams find themselves in similar ‘can’t do anything about the big picture, but want to do *something* to make progress in the right directions’ situation. Put another way, if we’re in a complex environment, what are the ‘adjacent possible’ solution directions.

A good way to start answering this kind of question is to go back to the Perception Map used to help manage the complexity of the overall situation. Figure 1, for example, reproduces a part of the Reference 1 article showing one of the big-three downward spiral issues:

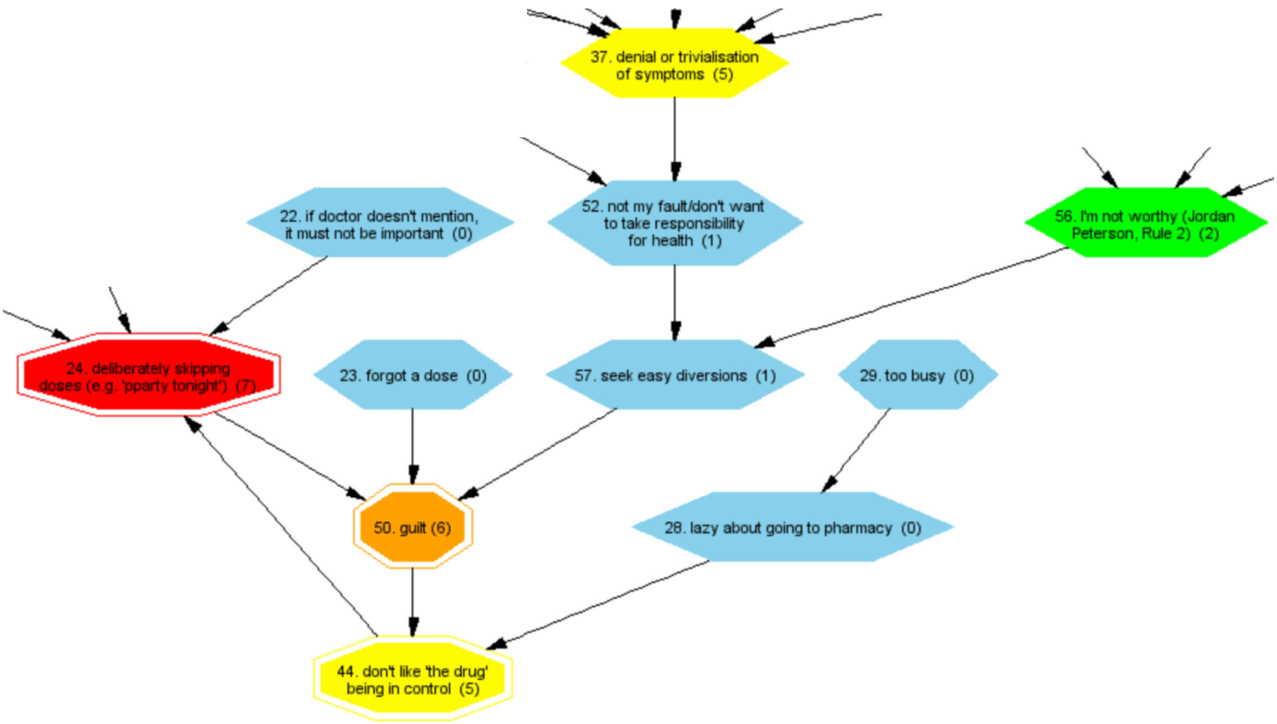


Figure 1: Patient Non-Compliance Loop 1 – Control/Guilt

Our focus back in April was on the downward spiral loop. Something we didn’t talk about during the original discussion were two other features of this Figure 1 map excerpt, namely the yellow Perception at the top centre of the map and the green perception on the top right. This pair of perceptions represent the significant Collectors ‘driving’ the downward spiral. The most important of which is the top-centre yellow perception, ‘denial or trivialization of symptoms’.

One thing we could usefully do – given that this Collector leads-to the ultimate downward spiral – is to tackle this issue. When we combine the Collector statement with the initial Perception Map starting question, in this case, ‘patients don’t comply with medication regimes because…’ question, we are able to formulate a conflict pair:

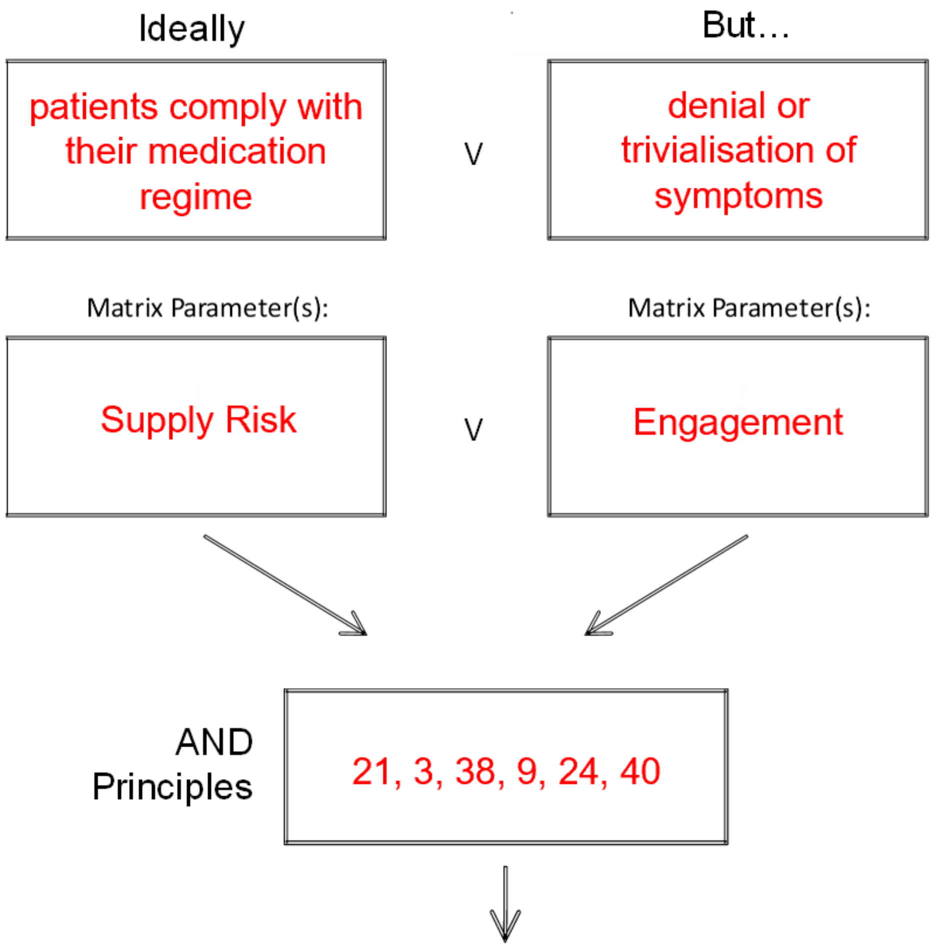


Figure 2: Mapping The Collector-Point Conflict Onto Business Matrix 3.0 (Reference 2)

One of the important factors in mapping problems onto the Business Matrix is distinguishing between tangible and intangible parameters. Compliance – or non-compliance – is very much a tangible issue. Patients either take their medication or they don’t. The phenomenon is very measurable. Hence Figure 2 shows how we have mapped the issue onto one of the tangible parameters in the Matrix. ‘Denial or trivialization of symptoms’, on the other hand is a much more intangible factor. Hence we have looked at the list of intangible parameters available in the Matrix and concluded that ‘Engagement’ is the one that appears to fit best. Having made our improving/worsening pair choice, we can then look up the appropriate Inventive Principle solution strategies successfully deployed by others in similar situations.

Translating these generic solutions into specific ideas to help the compliance problem, if we’re to do it in any kind of meaningful way, demands that we have some specific connection points we can make. Herein lies one of the fundamental difficulties of any ‘generic’ TRIZ/SI case study.

One way to make things concrete is to take a specific element of the current means of providing medication to patients. We could look at the process, the associated services, or the physical elements of the system. Actually, if we were looking at the problem for real, we really ought to explore all three. For the sake of this article and a hopefully concise but coherent deployment of the tools, we have decided to start with a very standard, very simple physical element in today’s systems, a strip of pills:

Figure 3: Simple Physical Aspect Of Patient Compliance Opportunity: A Pill-Strip

One of the downsides of choosing something so specific is that it brings a considerable degree of constraint to how the Inventive Principles might be deployed. It is difficult, for example, to see how Principle 21, Hurrying, can have much to do to provoke us to re-think a 30-day course of pills, above and beyond, of course, reducing the course considerably.

On the other hand, one of the upsides is that when we can make a connection between Principle and the object under consideration, it will likely lead to some much more tangible solutions. We can see such a thing by examining the second Principle in the Figure 2 list, Principle 3, Local Quality… which instructs us to look for things that are homogenous and then make them non-homogenous.

The most immediate ‘homogeneity’ in Figure 3 is that all of the pills are the same. On one level, this goes without saying – a course of pills is a course of pills. The clinician wants each pill to be the same (well, this may not actually be true – it may well be advantageous, for example, to alter the concentration of active ingredients over the course of a treatment to give a boost at the beginning, and tail-off gradually towards the end – but the option to make every pill different to every other one appears to present something of a logistical nightmare. All contradictions are, of course, solvable, but already the idea of different pills in the same strip with different properties sounds like a step too far.

On the other hand, a potentially much simpler way of introducing a non-homogeneous bit of Local Quality into the pill-strip packaging would be to colour the strip differently on different days. A good way to do this, knowing something about patient psychology, would be to colour the pills for the last week of treatment differently than the pills for the first 23 days.

If that sounds trivial to you, it probably is. But then think about what you would do if you were given such a pill strip. Do you think you’d be more likely to stay the course if the last week’s worth of pills looked different? Or how about if each week had a different colour?

We’ve recently had occasion to try the idea. You wouldn’t believe how effective it is. To the point that, apart from the fact that we’ve now revealed the idea, it might even be worth patenting.

Who knows, the fact that we have revealed the idea – so nobody can patent it – is potentially a good thing. Now every pharma company on the planet can explore the idea, see how effective it is, and put it on all their pill-strips.

References

1) Systematic Innovation e-zine, 'Case Study: Patient Compliance Big Picture', Issue 194, May 2018.
2) Mann, D.L., 'Business Matrix 3.0: Solving Management, People & Process Contradictions', IFR Press, 2018.

Not So Funny – TRIZ Before TRIZ

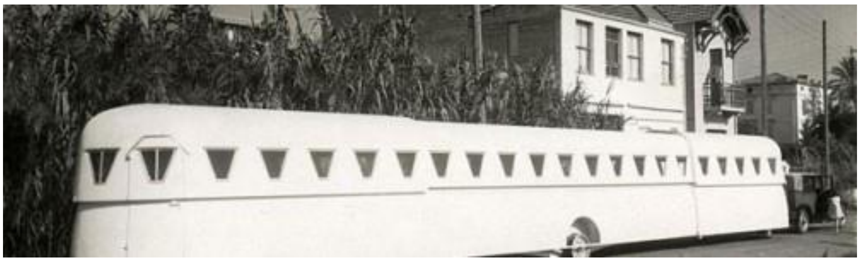
TRIZ research started after the Second World War. The ethos of the research originated around the reverse engineering of successful patents and inventive solutions. What's less clear is whether there was any parallel inverse research to establish whether the use of inventive strategies was also correlated to unsuccessful solutions. One tends to think this was a significant omission in the research. Especially in light of some of these examples from earlier in the Century:

Principle 30, Thin & Flexible, and a 1925 German life jacket design, made of inner tubes:

Principle 8, Anti-Weight, and the French 'Cyclomer' amphibious bicycle from 1932:

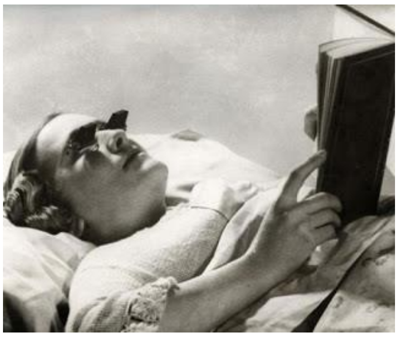
Principle 28, Mechanics Substitution, and An American 'Radio Hat' from 1931 (extra bonus marks for the Principle 17 cigarette holder… although not in the same league as the cigarette holder on the right, but then I guess the first smoking bans didn’t appear til after the war and so the need for six-foot long devices was less acute):

Principle 15, Dynamics, was also well understood by the 1930s. First up a piano for the bedridden (UK, 1935), and, to its right, an extending caravan (France, 1934):



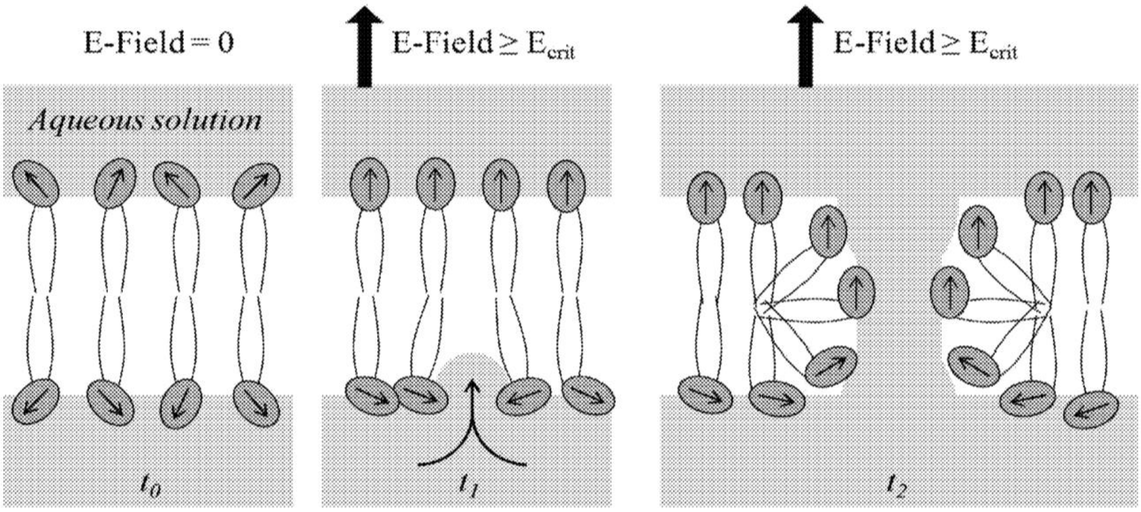
Or, how about this pair of copycats: a Dutch ‘folding bridge’ from 1926 and a ‘tool for catching dogs’, which just had to be British, from 1940:

Principle 17, Another Dimension, too, was at the forefront of the inventor’s mind by 1936. In the UK at least, with, on the left, a British ‘SUV’, ‘glasses for reading in bed’: and, on the right, from Canada, ‘snow-storm face protector’:


Finally, I think I like this one best. Principles 15, 17 and 30 all rolled up into the perfect solution to those pesky kids… enter the ‘outdoor toddler hanging barn’ from 1937. An enlightened year, parenting-wise…

Patent of the Month – Electro-Manipulation Of Cells



Patent of the month this month comes from a sextet of inventors at Old Dominion University in Norfolk, Virginia. US10,070,914 was granted on September 11, and primarily seems to concern the treatment of cancer cells, but it would also seem to have broader application to destroying unwanted bacteria in foodstuffs. Here's what the background section of the disclosure has to say about the problem being solved:

..the invention relates to apparatus and methods for stimulating death in cells and other biological tissues… Hyperthermia as a method to treat cancer, either by just its thermal effects or in combination with other agents (e.g., radiative cancer treatments) and has been explored for over 30 years. In such treatment methods, the temperature range generally does not exceed 42 C., but studies up to almost 50 C. have been performed. Further, it is known that by increasing the temperature it is possible to reduce the exposure time. For example, it is reported that hyperthermia can be obtained by increasing the local body temperature to about 50 C. Under such conditions, an exposure time on the order of 0.1 hours (6 minutes) was required to provide an effective treatment.

It is also known, that short pulses from milliseconds to nanoseconds can be used to initiate cell death. For example, melanoma tumors in mice have been successfully treated with 300 ns pulsed electrics fields with electric field strengths up to 60 kV/cm. These pulses were delivered to the tumor with needle electrodes, or with plate electrodes surrounding the tumor. In contrast to hyperthermia treatments, such pulse treatments are based on non-thermal effects.

The basic underlying problem is about collateral damage – we wish to destroy 'bad' cells, but we don't want to hazard 'good' ones. Here's how we will usually look to map this problem onto the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Amount of Substance (10)

WORSENING PARAMETERS YOU HAVE SELECTED:

Other Harmful Effects Generated by System (31) and Safety/Vulnerability (38)

SUGGESTED INVENTIVE PRINCIPLES:

35, 3, 12, 39, 40, 24, 10, 31, 19, 25, 36

And here's how the invention solves the problem:

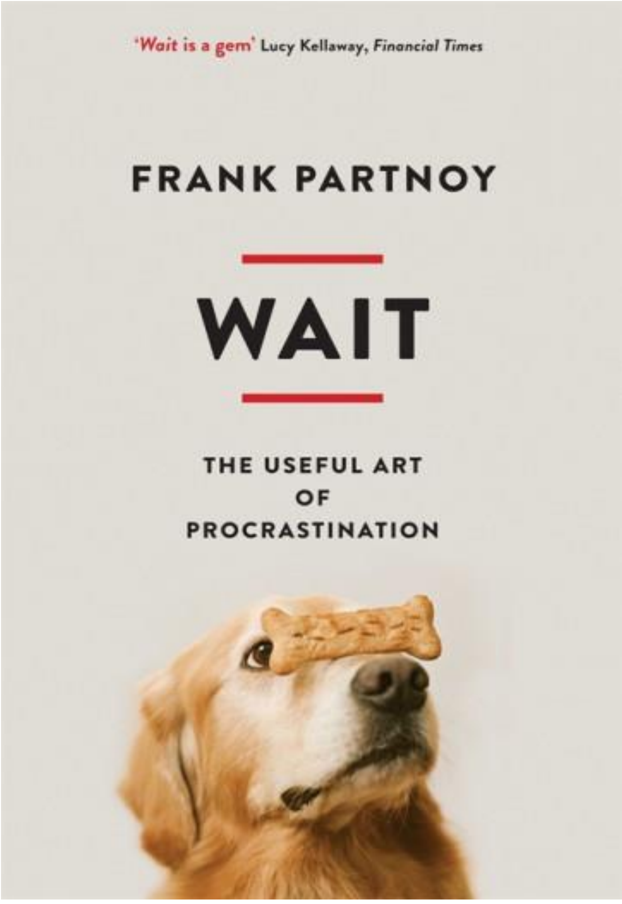
. A method for treatment of biological tissues comprising target tissues and other tissues, comprising: causing a temperature of the target tissues to be elevated and maintained at a treatment temperature range which is above a physiological temperature of the biological tissues and at or below about 47.degree. C.; generating, during the causing, an electric field extending through at least a portion of the target tissues using a pre-defined sequence of short duration voltage pulses applied between at least two electrodes; and synchronizing maintain of the treatment temperature range to overlap with applying the sequence of short duration voltage pulses, and wherein the pre-defined sequence is selected such that a magnitude of the electric field is configured to deliver an electrical energy sufficient to induce electromanipulation in the portion of the target tissues at the treatment temperature range and that is lower than a specific electrical energy sufficient to induce electromanipulation in the portion of the target tissues at or below the physiological temperature.

…which is basically a combination of the two previously known strategies… heating cells above a phase-change threshold (Principle 35) and combining this with the short electrical pulses (Principle 19). Except for this finding…

The effect of the decrease in viscosity with temperature… leads to a considerable reduction of the specific electrical energy required to achieve cell death, compared to pulsed electric field effects at (or less than) physiological temperature. In the studies at temperatures below 37degC the specific energy required to achieve a 25% reduction in viability was 2 kJ/cm.sup.3. It was reduced to 49 J/cm.sup.3 for the (very short, pico-second) pulses at elevated temperatures of 47degC. This is all the more surprising since a scaling law for membrane permeabilization predicts that, for shorter pulses, a higher specific energy is required to obtain identical results. This scaling law, which provides a scaling or similarity parameter is based on the assumption that the intensity of an observed bioelectric effect depends on the amount of electrical charges passing through the membrane when a pulse is applied. The effect of pulse number, N, is determined by a statistical (thermal) motion of the cells between pulses: S=S(E.tau. {square root over (N)}) (8) where E is the electric field intensity and .tau. the pulse duration. Bursts of pulses with the product of these three quantities being the same should produce identical results. According to this scaling law, pulses shorter by about a factor of 4, as is the case for 800 and 200 ps pulses, would require a four times higher electric field, or a four times higher specific energy (which scales with E.sup.2.tau.). In our results, we observe the opposite: the specific energy, decreases by a factor 40 when we reduce the pulse duration from 800 ps to 200 ps.

This looks like a fairly staggering example of a 1+1 >> 2 synergy. A closer look at the Old Dominion work and their affiliation with the Association of Bioelectrics reveals a long time fight with the medical profession to prove the merits of electric fields, and particularly pulsed ones. From a TRIZ perspective, both directions are inevitable. Maybe it's time now this 40x synergy evidence is in, to start believing the TRIZ trends rather more than the medical profession has thus far chosen to do. We sometimes get asked whether TRIZ can help with research type problems. I would say that applying the TRIZ trends to the cancer cell problem a long time ago to give some useful research directions would have saved humanity a lot of time and wasted effort. Good as the US10,070,914 solution is, I'd still like to think that the untapped Evolution Potential left in the current solution would allow the synergy multiplication factor to be upped by at least another order of magnitude. Watch this space…

Best of the Month – Wait



Almost everywhere you go, in Operational Excellence world at least, the word 'procrastination' is a bad one. If someone accuses you of being a procrastinator, you can be sure they're not complimenting you. We've argued in the ezine before about the merits of procrastination. If you're in a complex environment ('two or more humans' being the simplest way to tell if you are or not), procrastination – or 'delaying your decisions until as late as you can' – is very often exactly the right strategy. I suspect no-one believes us when we say it. So, thankfully, a little bit late in the day for us to make the connection admittedly (the book was published in 2012 – there's probably a joke in that delay somewhere?) – this month's Book of the Month choice helps offer up some real scientific evidence to back up the procrastination-is-good thinking.

Part of the rationale for our Wait-related procrastination was the, as it turns out, mistaken belief that Frank Partnoy's contribution to the thinking fast-and-slow debate was merely another re-write of Kahneman's seminal work. Or another version of The Two-Second Advantage (which we reviewed here in 2013). Or Blink. Or even The Hour Between Dog And Wolf (which we reviewed in 2014). And if you just read the first couple of chapters, you'd probably be making the right assumption. Yet another retelling of the Marshmallow Test story? Check. Review of sports-person reaction times in superfast sports like tennis, baseball or cricket? Check. Same old same old.

But then in Chapter 3 comes a stock-trading story that I think is not so well known about. Or rather I'd heard part of the story, but not the important part. The part of the story I had heard was that the big traders were moving their computers physically closer and closer to Wall Street because the speed of trades was so fast, big money could be won or lost in the extra couple of micro-seconds the signal had to travel to a computer placed next door compared to one placed a couple of miles away. So far so scary. But then Partnoy tells the story of UNX, who moved from California to New York to supposedly take advantage of the 30millisecond speed-of-light time reduction that would give them, only to find out that the costs of their trades went up significantly.

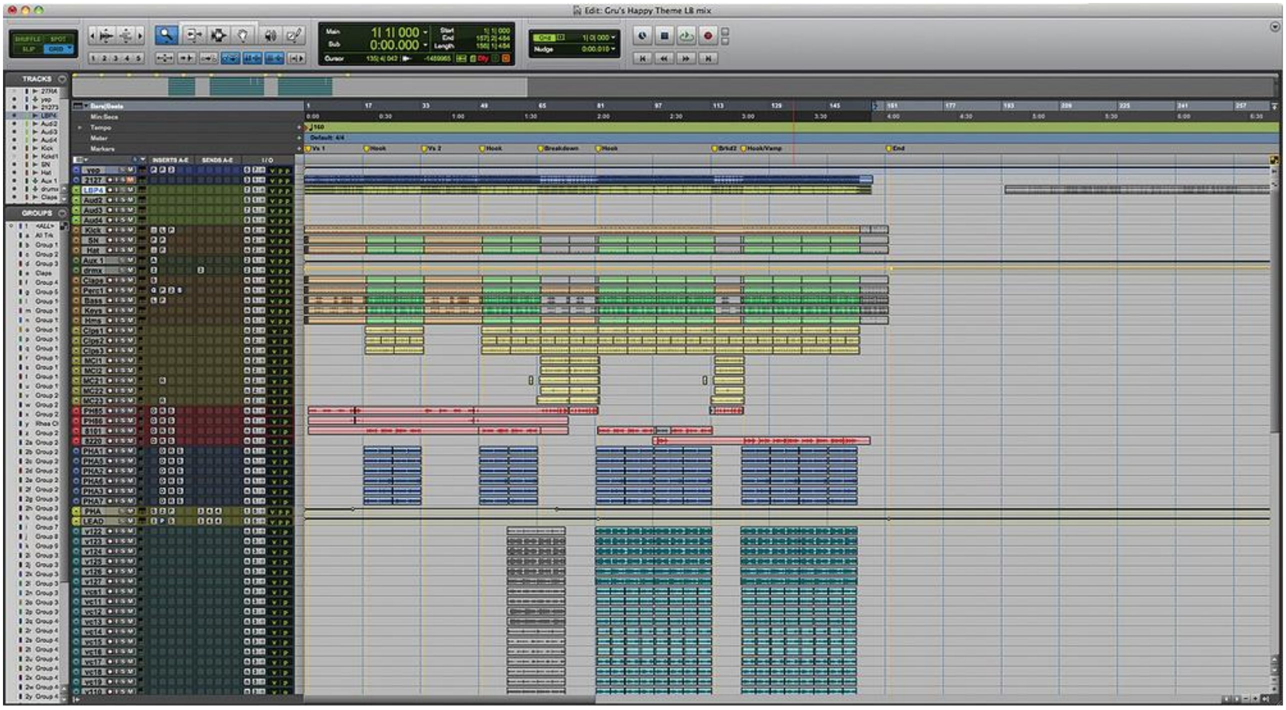
Ex-Morgan-Stanley trader Partnoy (who 'switched sides' and is now an academic at the University of San Diego) tells the story well, and uses it as a terrific platform for this pro-procrastination thesis. Then later, when we reach the integration with our much discussed John Boyd OODA model, things hit a whole new level: The person with the fastest OODA loop time wins… the person who can build the most delay into their loop time wins more.

Warren Buffett compares stock trading to great athletes: they excel not because of fast neurological responses, but because of their ability to delay as long as possible before reacting. Successful CEOs, fire fighters, and military officers all know how to manage delay to gather as much information as possible to get the results they need.
In Wait, Frank Partnoy argues that decisions of all kinds, whether 'snap' or long-term, benefit from being made at the last possible moment. The art of knowing how long you can afford to delay before committing is at the heart of many a great decision, whether in a corporate takeover or a marriage proposal. Apologies are better received if they are not rushed and people who can defer gratification are happier and more successful than those who must have everything now. Partnoy demonstrates that the ability to wait is crucial to getting the right answer and that gut instincts are often wrong.

The whole book flows beautifully – I read the 246 pages in a pair of two-hour flights – and, in case you're still in any doubt, you can currently purchase copies for a penny on Amazon… where, as it happens, I also noticed the books average review score is a lowly 3.3 stars. Which I often take to be a good thing. Especially when you look at the no-middle-ground range of scores. Readers either love or hate the book. And I think that's a key sign of something important happening. My advice is that if you invest your penny and get to Chapter 3, you'll fall on the 'love' side of the fence.

Don't wait. Then wait.

Wow In Music – Happy



Earworms. Yes. And no. Earworms are songs that you're unable to get out of your head. Sometimes that's a good thing, and sometimes it isn't. Scientists at the University of St Andrews have named the Top 20 official earworms in a study as to what makes songs addictive. The team of researchers at the university's School of Philosophical, Anthropological and Film Studies also developed a mathematical formula for explaining what makes an earworm.

Researcher Bede Williams said an earworm needs five key components: surprise, predictability, rhythmic repetition, melodic potency and receptiveness (how the listener feels about the song).

The formula is expressed as Receptiveness + (predictability-surprise) + (melodic potency) + (rhythmic repetition x1.5) = earworm. The most addictive earworm was named as Queen's 'We Will Rock You', with the band having three songs in the Top 20, the other two being 'Bohemian Rhapsody' and 'We Are The Champions'. 'Jingle Bells' was the oldest song in the list.

At number two in the list is our Wow choice for this month. Happy. "Happy" is a song written, produced, and performed by American singer Pharrell Williams, from the Despicable Me 2 soundtrack album. It also served as the lead single from Williams' second studio album, Girl (2014). It was first released on November 21, 2013, alongside a long-form music video. The song has been highly successful, peaking at No. 1 in the United States, United Kingdom, Canada, Ireland, New Zealand, and 19 other countries. It was the best-selling song of 2014 in the United States with 6.45 million copies sold for the year, as well as in the United Kingdom with 1.5 million copies sold for the year. It reached No. 1 in the UK on a record-setting three separate occasions and became the most downloaded song of all time in the UK in September 2014; it is the eighth highest-selling single of all time in the country. It was nominated for an Academy Award for Best Original Song. A live rendition of the song won the Grammy Award for Best Pop Solo Performance at the 57th Annual Grammy Awards. The music video for "Happy" was nominated for Best Male Video and Video of the Year at the 2014 MTV Video Music Awards. It also won the Grammy Award for Best Music Video at the 57th Annual Grammy Awards. The song was Billboard's number-one single for 2014. So, probably the ‘good’ version of an earworm.

While the song may sound effortless, the singer has revealed that its fruition was far from easy: "It was actually nine versions before I got to the 10th," he told US talk-show Good Morning America yesterday. "I got to point zero, and I just said to myself, ‘How do you make a song about a guy who is so happy and relentless in doing so?’ That’s when I realised that the answer had been sleeping in the question all along."

But what does that mean? What makes Happy work so well? The Guardian newspaper asked some experts to deconstruct the global pop phenomenon. Here’s what they had to say:

Andrew Fisher, Head of Commercial Composition, University of Southampton:
“[There's] something inherent in the music’s composition. It is an elusive combination of ingredients that makes any song appeal widely, but for this song what I think helps is a very clear form and a very strong chorus hook. The structure is a well-known verse/chorus form, but it’s very well judged; the simpler verse anticipates a more sophisticated chorus (Principle 37, Relative Change), which contrasts in terms of harmony, arrangement and instrumentation (37 again). The chord progression in the chorus – F minor 7 to Bb to F major – cleverly maps the word "happy" onto the harmony. The instrumentation, arrangement and mix are very important here, [with] classic soul and R&B instruments like an electric piano, bass and handclaps, but [it has] modern and slick production values to give it a timeless classic feel that has a contemporary edge.”

Paddy Bickerton, professional party and wedding DJ
“I think part of its big impact has been that it sounds so inviting, as nowadays everyone from indie boys to Beyonce are trying to make music that sounds weird and alien. But Happy is stripped back (Principle 2) with a good groove and a cool-sounding 60s Motown feel, so its success is down to the fact that it is pop music in its most fundamental state. It’s interesting in BPM terms, too: Happy is quite fast, and most pop songs that people [have recently requested] when I was DJing were at house tempo, which wasn't as immediate. The way it starts is great too: a high impact beginning that is a quick way to get people on the dance floor. People instantly recognise the four stabs, and they are off (Principle 21, Hurrying). It stands up to repeated plays too, so as a wedding DJ I am pretty happy about that. I’ve had people pick the song for their first dance, which is a rare thing, as people tend to go for less modern or more slow songs.”

Eric Clarke, Oxford professor and author of Music and Mind in Everyday Life
“One pervasive idea is that the sound of music in some way conjures up or conveys a sense of human behaviour or action … In very crude terms, [the single] has an upbeat type of tempo, so it distinguishes itself from those lugubrious and sad-sounding pieces. Upbeat music tends to convey high energy, and one form of high energy is happiness. When most people are happy [they] tend to, in quite physiological terms, have high muscle tone; they are in an active state and are aroused. Perhaps what makes Happy sound happy is that it not only has high energy, but it uses what has become a very culturally common association between major and minor in music. It uses mainly major chords which have a long history in western music as being associated with positive emotions. [Note: the song is actually written in the Fminor key, so part of the attraction is how the upbeatness originates from the contrast with the minor chord foundation (Principle 12).] Also it’s noticeable that it uses comparatively high-frequency sounds (Principle 35).

Pharrell Williams' own voice is high and light, rather than deep and heavy. There's a female backing chorus, all of which are these high and light sounds that are associated with a sense of lightness rather than darkness, and therefore sadness."

George Ergatoudis, head of music for BBC Radio 1 and 1Xtra
"Happy came out during a bleak time of year when people were feeling lower than they already were, given it was the tail end of a recession (Principle 36, Phase Transition) … [People] want songs that really give them a good feeling. The hit of elation is key to [Happy's] success. It's important for songs to really connect at this level. You have to have the artist's brand in a great place, as well as a great song. People who know who [Williams] is know he's really cool and appreciate that. We test our top 25 songs per week with our audience to find out how they're reacting, and Happy has had the highest "Passion Score" [percentage of the audience who love the track] of any song in the past 18 months."

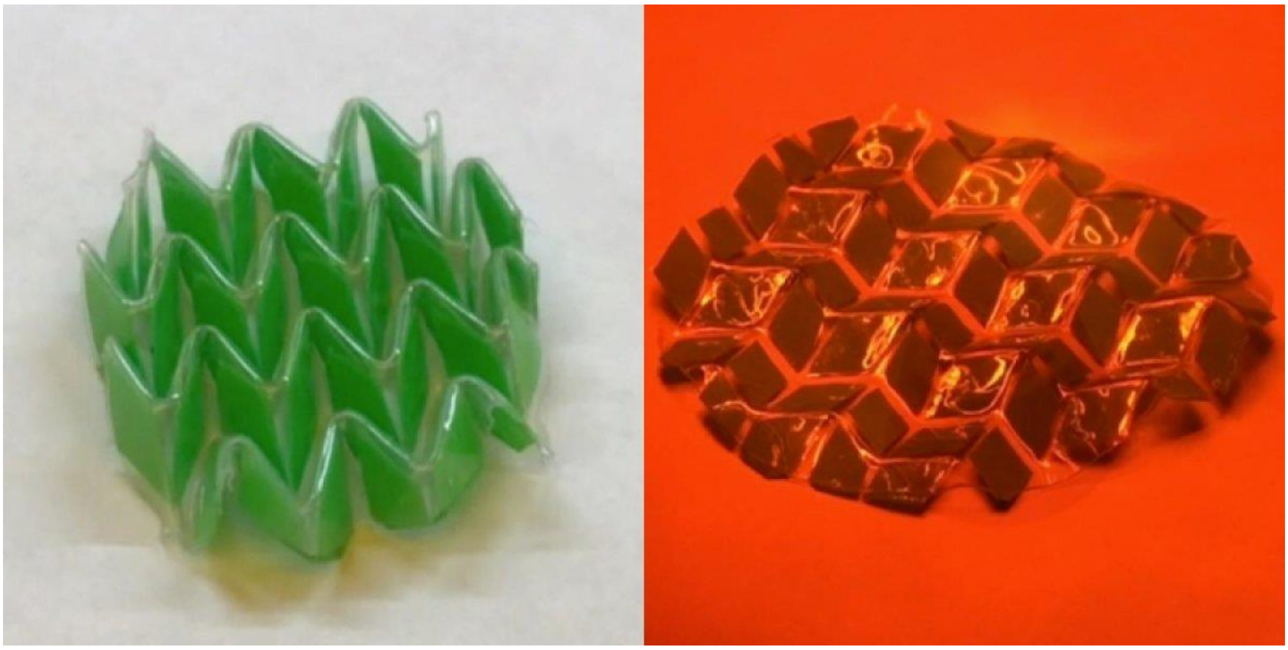
Or, how about this, from a source somewhat closer to the horse's mouth, mix engineer Leslie Brathwaite:

"…the arrangement for 'Happy' is positively Spartan by modern standards (Principle 2), and this is reflected in the session screenshot at the head of this article. There are just five programmed drum tracks — kick, snare, hi-hat, claps and percussion — a bass track, one keyboard track, a track containing a 'hmmm' sample, eight live handclap tracks, four lead vocal tracks, six Pharrell backing vocal tracks, and a multitude of tracks with the rest of the backing vocalists. Just two tracks of what's known as "the music" — ie. bass and keyboards — must surely count as a new record for minimalism in a 21st Century production. Moreover, it turns out, Brathwaite himself is similarly minimalist in his use of plug-ins, using the same de-esser, compressor and EQ on each of the vocal tracks, and also using several instances of a few other plug-ins on various other tracks."
(check https://www.soundonsound.com/people/inside-track-pharrell-williams-happy if you really wanto to geek-out on the technical details).

From my less-well trained musical perspective, what keeps me coming back for more are the handclaps. Two things in particular stand out for me, the first is the combination of both 'human' and drum-machine-originated claps (Principles 3 and 5), and perhaps more-so, the periodic shifts between one-per-beat and double-time claps (Principle 19).

At the end of the day, though, I'd have to concur with the majority, the true genius of Happy is its a less-is-more, Principle 2 masterclass.

Investments – Liquid Crystal Elastomers



A new material developed by University of Colorado Boulder engineers can transform into complex, pre-programmed shapes via light and temperature stimuli, allowing a literal square peg to morph and fit into a round hole before fully reverting to its original form. The controllable shape-shifting material, described today in the journal Science Advances, could have broad applications for manufacturing, robotics, biomedical devices and artificial muscles.

"The ability to form materials that can repeatedly oscillate back and forth between two independent shapes by exposing them to light will open up a wide range of new applications and approaches to areas such as additive manufacturing, robotics and biomaterials," said Christopher Bowman, senior author of the new study and a Distinguished Professor in CU Boulder's Department of Chemical and Biological Engineering (CHBE).

Previous efforts have used a variety of physical mechanisms to alter an object's size, shape or texture with programmable stimuli. However, such materials have historically been limited in size or extent and the object state changes have proven difficult to fully reverse.

The new CU Boulder material achieves readily programmable two-way transformations on a macroscopic level by using liquid crystal elastomers (LCEs), the same technology underlying modern television displays. The unique molecular arrangement of LCEs make them susceptible to dynamic change via heat and light.

To solve this, the researchers installed a light-activated trigger to LCE networks that can set a desired molecular alignment in advance by exposing the object to particular wavelengths of light. The trigger then remains inactive until exposed to the corresponding heat stimuli. For example, a hand-folded origami swan programmed in this fashion will remain folded at room temperature. When heated to 200 degrees Fahrenheit, however, the swan relaxes into a flat sheet. Later, as it cools back to room temperature, it will gradually regain its pre-programmed swan shape.

The ability to change and then change back gives this new material a wide range of possible applications, especially for future biomedical devices that could become more flexible and adaptable than ever before.

"We view this as an elegant foundational system for transforming an object's properties," said Matthew McBride, lead author of the new study and a post-doctoral researcher in CHBE. "We plan to continue optimizing and exploring the possibilities of this technology."

Read more:
Matthew K. McBride, Alina M. Martinez, Lewis Cox, Marvin Alim, Kimberly Childress, Michael Beiswinger, Maciej Podgorski, Brady T. Worrell, Jason Killgore, Christopher N. Bowman. A readily programmable, fully reversible shape-switching material. Science Advances, 2018; 4 (8): eaat4634 DOI: 10.1126/sciadv.aat4634

Generational Cycles – The Over-65 Gold-Rush

From a recent article in The Washington Post:

Executives at Gillette have for decades defined shaving as a rite of passage. The company famously mails out free razors — with "welcome to manhood" cards — to millions of men a year on their 18th birthdays. Its ads focus on the experience passing from father to son. But in recent years, executives have begun to see another milestone emerge in their customers' lives: the moment when sons begin shaving their aging fathers. "We started seeing it all over social media — men posting about washing, grooming and shaving their fathers," said Matt Hodgson, a design engineer at Gillette. "It's a very difficult and emotional thing to do."

It turned out there are a number of logistical challenges, too. Those who are bedridden don't have easy access to running water to rinse blades or wash off shaving cream. Traditional blades are quick to nick delicate skin.

"We're specialists in developing razors and yet all the products we could find were for shaving yourself," Hodgson said. "When you turn the razor outward, it doesn't work as well anymore. It was clear we needed to create something completely new."

After three years of observation, design and testing, Gillette is preparing to release the first razor built for caregivers to shave others. The Gillette Treo has an extra-wide handle and comes with a tube of clear gel that eliminates the need for running water or shaving cream.

The brand, which is losing younger customers to online start-ups like Harry's, is looking for opportunities to reach the country's fastest-growing demographic: Americans 65 and older. The number of senior citizens in the United States is expected to nearly double by 2050, creating a fast-growing niche for retailers and manufacturers.

Best Buy, which is investing heavily in technology for aging adults, is spending $800 million on GreatCall, the tech company behind the senior-friendly Jitterbug phone, which comes with extra-large buttons and screens, and alerts first responders when there's an *emergency. (The acquisition, scheduled to be finalized this fall, would be the largest in Best Buy's history.) Other companies are creating hairbrushes and combs with extendible handles, toothbrushes with three-sided heads, and sensor-packed shoes that can detect falls, all aimed at elderly consumers and those who care for them.*

"The tide is turning: Retailers are starting to realize there's a big opportunity here that they're not paying attention to," said Georganne Bender, a consultant who helps retailers accommodate aging shoppers. "For so long everyone's been focused on the younger customer, but if you look at the stats, ***Baby Boomers still control 70 percent of the country's disposable income****."*

Spending by Americans age 50 and up is expected to rise 58 percent to $4.74 trillion in the next 20 years, according to AARP. (Spending by 25- to 50-year-olds, by comparison, is expected to grow 24 percent.) At the same time, the number of adults taking care of elderly parents is expected to rise steadily in coming years.

"It's become a gold rush," said Danny Silverman, chief marketing officer of e-commerce analytics firm Clavis Insight. "Whether you're a hairbrush-maker or a technology company, you're thinking about how you can meet the needs of an aging population."

Around 70 million more Americans from this generation will be entering retirement over the next ten years. Combine their relative affluence (70% of disposable income!) with their retirement gives them a lot of free time to shop and flex their spending powers. According to Forbes, boomers will inherit about $13 trillion over the next 20 years. Companies should then be adjusting their marketing tactics to reach this large group of consumers. Here are five things you should know about marketing to Baby Boomers:

1. Baby Boomers Don't Like to be Called 'Old': Just because baby boomers are mostly retired doesn't mean they want to sit home and watch TV all day. Many people of this generation have the financial means and the desire to pursue the activities they didn't get the chance to do when they were raising kids or part of the workforce. These retirees plan to travel to exotic locations, go on safaris, and skydive. While the marketing tactics you'll need to use to get their attention may be different from other demographics, don't assume that certain products and services won't appeal to them just because of their age.
2. Baby Boomers Enjoy Reading Good Copy: Marketers should remember that baby boomers enjoy reading, so using trendy acronyms or Internet shorthand on ad copy will not be appreciated. Boomers want to see information clearly printed out, so don't be afraid of old-school, text-heavy advertising methods. A better approach for this generation is copy that's straightforward, instead of today's creative bells and whistles. Ad copy for boomers should address every possible question they might have. All the relevant answers and details should be included in direct mail ads, brochures, and on websites.
3. Baby Boomers Don't Like to be Rushed: Aside from being more receptive to traditional marketing styles, Boomers are also very careful when making purchases. Unlike the more flighty Millennials, Boomers consider each purchase an investment and will take time to study every product before making a decision. Their static budgets also mean this group is more careful about spending outside their limits. Boomers need to trust the brand. They need to fully understand the product, identify with other users and develop a rapport with the seller before making a purchase. While salespeople and marketers might be able to close a deal with a younger demographic with just one or two calls or emails, they would probably take a longer time handling senior consumers.
4. Baby Boomers Prefer a Personal Touch: Retirees have more free time on their hands which makes them more inclined to have lengthier social interactions with family, friends, neighbors and even salespeople. This opens a singular opportunity for a sales team to

create sincere relationships with these potential clients. Sales teams should be prepared to invest time with a Boomer. After all, the person at the other end has the luxury of time and willingness to listen and absorb your product's features and value.
5. Baby Boomers are Tech Savvy: Marketers should remember that Boomers grew up with technology. This generation has made use of a plethora of different technologies since the introduction of the first black-and-white television set. This makes them unintimidated by more recent technologies like the internet or social media. In fact, the Baby Boomer generation spends as much time online as they do watching television. Studies show that 96% of Boomers use search engines, 95% use email, and 92% shop for products and services online instead of shopping in stores and shopping malls.

Meanwhile. 70% of the disposable income? Wow.

Read the full Washington Post article here:
https://www.washingtonpost.com/business/economy/its-become-a-gold-rush-inside-the-race-to-create-smart-shoes-custom-razors-and-high-tech-devices-for-the-over-65-crowd/2018/08/31/fd7ecbc8-a55a-11e8-97ce-cc9042272f07_story.html?noredirect=on&utm_term=.a3bc00d69dfa

Biology – Mole

Despite the havoc they've managed to wreak in my vegetable garden this summer, I still maintain a sneaking admiration of moles. Weighing about 100g and having a length of about 12cm, they somehow manage to burrow their way through even the most compacted soil. We had a drought for most of the season, so the ground was particularly tough to work. At one point I had to dig a 40cm cube hole and it took me close to an hour. So how come one mole can, in the space of one day, dig a burrow from my broad-beans to the potatoes 10m away?

Answer, by being able to generate digging forces over 40x its body weight.

If I were trying to evolve an equivalently effective digging solution, here's how I would map it onto the Contradiction Matrix:

IMPROVING PARAMETERS YOU HAVE SELECTED:

Function Efficiency (24)

WORSENING PARAMETERS YOU HAVE SELECTED:

Force/Torque (15)

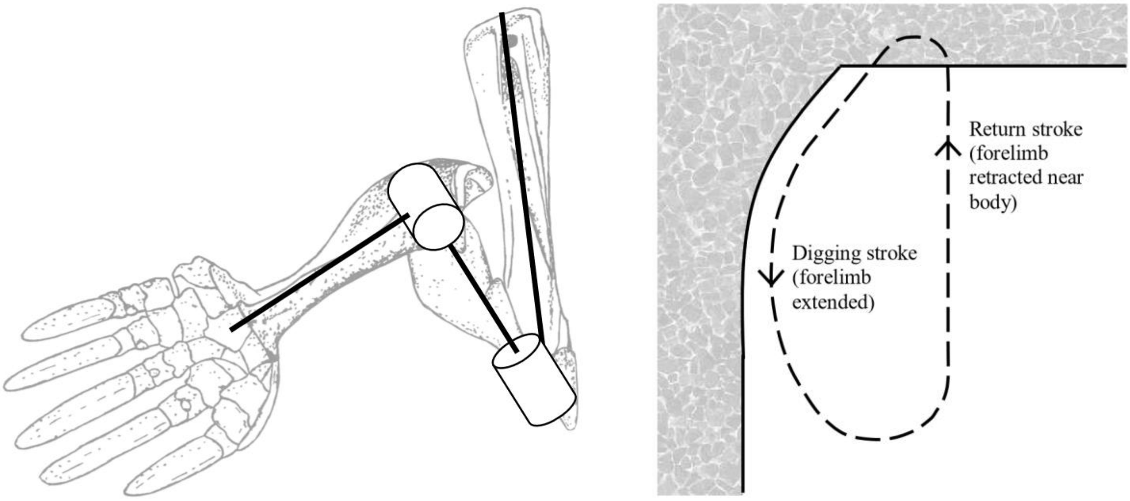
SUGGESTED INVENTIVE PRINCIPLES:

35, 40, 17, 13, 3, 9, 19, 7

As it turns out, a lot of similarities exist between what the Matrix recommends as solution strategies and what the mole actually does. Several academics, having recognized the extraordinary digging talents of the mole have studied how they do it. The best paper is probably this one - http://www.cs.man.ac.uk/~rob/publications/Scott_mole.pdf - from a pair of researchers at the University of Manchester.

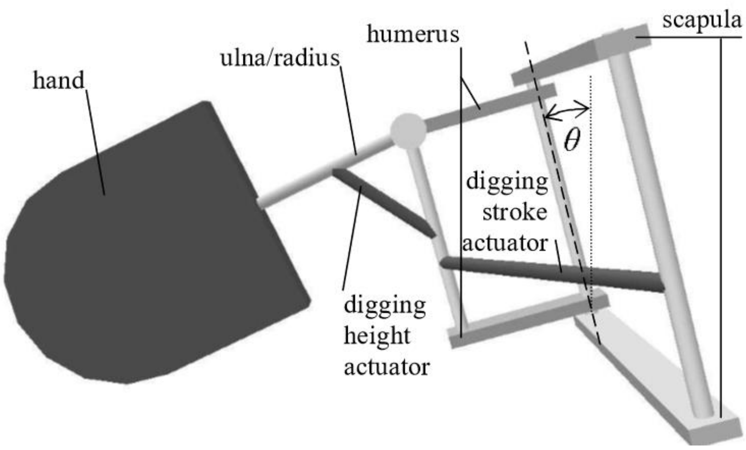
What this paper reveals are the following characteristics:

1) The mole digs one claw at a time (Principle 19, Periodic Action); when one claw is 'digging' (i.e. pushing earth backwards so the mole can move forwards), the opposite claw is helping to react the loads (Principle 9, Prior-Counter-Action) – a bit like, if you can imagine arm-wrestling, it is far easier to beat your opponent if you hold on to the table with your free hand.
2) The claw movement contains a number of interesting joint articulations that allow the forelimb to be extended during digging and retracted during return (Principle 17, Another Dimension):



3) The alignment of the elbow is such that the digging forces are transmitted through the elbow joint rather than the muscles (Principle 35, Parameter Change).
4) The density of the bones is nonuniform such that the centre of gravity position of each bone is optimised to further affect the digging performance (Principle 3, Local Quality)

The paper culminates in a concept design for a biomimetic robotic digger, which looks like this:



Which, I would say, combines the above mentioned Principles, but also manages to include some intriguing Principle 7, Nesting as well. Call it biology-plus. Especially if it doesn't destroy my potato crop.

Short Thort

"INDECISION, n. The chief element of success; "for whereas," saith Sir Thomas Brewbold, "there is but one way to do nothing and divers way to do something, whereof, to a surety, only one is the right way, it followeth that he who from indecision standeth still hath not so many chances of going astray as he who pusheth forwards" – a most clear and satisfactory exposition on the matter.
"Your prompt decision to attack," said Genera Grant on a certain occasion to General Gordon Granger, "was admirable; you had but five minutes to make up your mind in."
"Yes, sir," answered the victorious subordinate, "it is a great thing to be know exactly what to do in an emergency. When in doubt whether to attack or retreat I never hesitate a moment – I toss us a copper."
"Do you mean to say that's what you did this time?"
"Yes, General; but for Heaven's sake don't reprimand me: I disobeyed the coin."
Ambrose Bierce

"The scholar's greatest weakness: calling procrastination research."
Stephen King

News

TRIZmeta
By the time you read this, the trizmeta.com website should be live as should a special new TRIZmeta page at the SI online shop (http://store.systematic-innovation.com/trizmeta-playing-cards/). The first 100 customers of the new playing-cards will be given a substantial discount relative to the normal selling price… thought we'd give the SI ezine readers the first opportunity to take advantage of the offer…

TFC2018
…sadly, we won't be able to attend the TRIZ Future Conference in Strasbourg at the end of October. The biggest pity is that we'll miss the launch of the new TRIZ Games book. Fortunately, it looks like it will be possible that TRIZmeta cards will be available at the event alongside the new book.

IMechE
The IMechE has confirmed it will continue offering TRIZ workshops with us next year. The two public workshop dates in the diary are 9 April and 10 December, for those with longer-term TRIZ plans. They will probably be our only public workshops in the UK next year. The session scheduled for 4 December this year, meanwhile, is the one for those looking to do something sooner. It will definitely be our only other public workshop in the UK this year. Check out the IMechE website for details and online booking.

Issue 200
November will see the publication of the 200th issue of the SI ezine. Time for a little celebration we thought. And maybe a competition. Somewhere on the not too distant horizon is a Third Edition of the HOSI technical edition book. One of the things that always makes us happy when we're on our travels is seeing beaten-up, Post-It crammed copies of the book. We always forget to take photos of them, and then regret it. So, we thought we'd turn the story around the other way and request that people send us photos of their HOSI. The more beaten-up it looks, the better the photo will be. The idea is that we'll include the best of the photos in the Third Edition (a picture speaks a thousand words!). And there will be a prize for the best photo.

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

- FMCG – TrenDNA/Anthropology Study
- Automotive – SI Certification Workshops
- Utility – TRIZ Introduction Workshops
- Homeware – SI Project Mentoring
- Food – High-Potential Enterprise Identification/Coaching Project
- Mining – TRIZ Certification Workshops
- Healthcare – Innovation Strategy Project
- Retail – Problem-Solving Workshops